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Implementation Strategies for Integrated Office Information Systems

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ABSTRACT

This thesis is an investigation into the implementation of computer-based office information systems in organizations. The research methods employed are both qualitative and quantitative, and include fifteen case studies and a postal survey. A review of the literature and the case study research indicated that organizations are taking advantage of the integrative capacity of new technology in order to implement integrated office systems, but generally with little strategic focus or organizational change. A framework for the identification of strategic uses, based on information-processing theory, is presented, together with a discussion of their implications for organizational change.

Implementation is both a rational and a political process. The thesis covers both aspects, reviewing the literature on the relationship between information technology and organizations to show that many of the consequences of implementation for the organization are non-deterministic and emerge fromn the process itself. Structuration theory is shown to be a means of unifying rational and interpretative perspectives on implementation. This analysis indicates the nature of the managerial problem and forms the basis for assessing prescriptive approaches to implementing office systems and managing change. An implementation strategy for integrated office systems is outlined, and the use of IT and office systems to design new organizations and the use of new approaches to implementing second- and third-order change are flagged up as areas requiring further empirical research.

CONTENTS

Chapter One

Research Problem and Methods

1.1 The practical problem.

Peter Keen (1991) has estimated that information technology now represents more than 50% of all capital investment in the U.S. At the same time, there is increasing doubt about the effectiveness of IT investment. The MIT Sloan School of Management Corporation in the 1990's progamme, for example, notes that investment in IT in the U.S. has not been accompanied by improvements in white collar productivity (Scott Morton, 1991). A study by Franke (1989), both of the U.S. financial industry at aggregate level and of an individual bank, showed that increasing IT investment has coincided with declining capital productivity and profitability.

At the level of individual organizations, the problem is expressed in terms of major difficulties in implementation and failure to achieve the benefits anticipated from the investment. It is difficult to obtain accurate figures on the extent of the problem because most organizations don't like to publicise their failures, but estimates have been made. Willcocks and Mason (1987) cite a study carried out in 1984 for the DTI and Institute of Administrative Management, which estimated that 20% of expenditure on IT was wasted, and reports by the Comptroller and Auditor General which noted major losses in public sector IT projects. A survey of computer integrated manufacturing by A. T. Kearney (1989) found widespread failure to achieve anticipated benefits. Although data processing is a well-understood area of IT, large-scale development disasters are still not unknown, such as the £1.3 billion DSS computerised benefits system cost overrun (*The Guardian*, 6 July 1989; *The Independent*, 7 June, 1993) and the £7 million computer system at the Passport Office which increased delays in handling applications and provoked a strike by staff in the summer of 1989 (*The Guardian*, 5 August 1989). More recently, there have been the London Ambulance Service information system disaster, which resulted in several deaths (*The Independent*, 27 September 1992), and the cancellation by the London Stock Exchange of the Taurus share settlement system project at an estimated cost of £400 million, and a threat to the future of the Stock Exchange as an institution and the City of London as Europe's major financial centre (*The Independent*, 19 June, 1993).

More common than spectacular failures are disappointing, under-utilised systems and low levels of take-up, especially of office information systems. A study by the Butler Cox Foundation (Farmer, 1987) of office systems in more than 400 organizations in Europe and the U.S. found that 'About one in ten installations is a clear success; one in ten is a clear failure; and the remaining eight out of ten installations are non-events'. In a recent survey by the Institute of Administrative Management and Touche Ross (1991), a third of users did not think that office automation had yielded significant benefits to their organisations. Although most organizations had pursued mainly efficiency benefits, there were direct savings in less than 15% of projects.

The main sources of these problems are now widely recognised as not technological but

failure to address user and business needs. In large part, this is a failure of implementation approach. Implementation, defined broadly as the entire process of introducing new technology into an organization (Walton, 1989) is known to have a major effect on outcomes, in terms both of system success/failure and impacts on users and organizations (Klein, 1986; Kling and Iacono, 1989). In the 'traditional' system development life cycle implementation is seen as the stage after design and testing, when the completed system is handed over to users. A wider perspective on implementation sees it as including strategic and organizational change, as well as technological. An example is the Leavitt diamond (1965) (Fig. 1.1), a well-known heuristic device used to illustrate the interdependence of technology, task, organization, and people. This was adapted by the MIT Corporation of the 1990s programme as the framework for the entire project (Figure 1.2) (Scott Morton, 1991). In their version, 'task' becomes strategy, seen as the summation of all the organization's tasks, culture is added, and the role of management processes is to integrate them all. Implementation is the management process in introducing new technology.

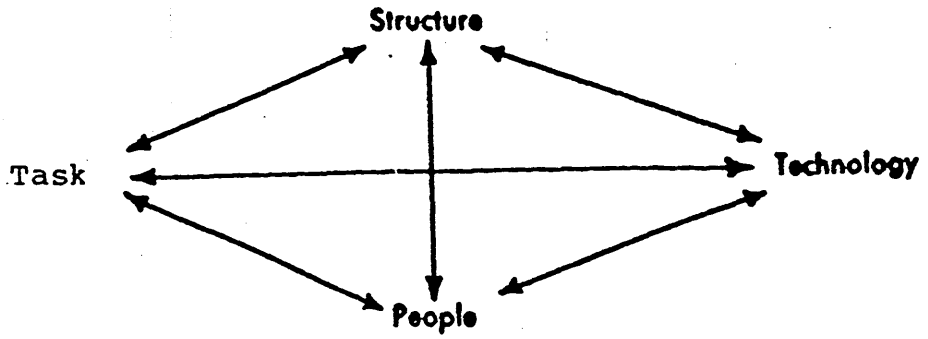
A basic argument of this thesis is that implementation has two equally important aspects, which can be called for now the rational-technical and the political-interpretative. So far, they have not been very well brought together. The IT-corporate strategy literature of the 80s concerned itself with finding strategic applications for IT, without paying much attention to the issue of how to implement them. The MIT programme also, to judge from the publicly available work, was more concerned with developing frameworks, raising awareness and vision among senior executives about the potential of IT, than with implementation. There are signs that this is changing; that the perceived problem now is less what to do with the technology than with how to manage the organizational change necessary to exploit it (McFarlan, 1992; Benjamin, 1993).

At the same time, there is an extant long tradition of research and practice on introducing technology, of which socio-technical systems, job redesign, and soft systems methodology are notable examples, and a body of work on managing organizational change, particularly from an Organization Development perspective, both of which deal with the 'political', people, 'soft' or 'messy' aspects of implementing change. Operational Research, Management Information Systems, and information systems researchers a) have discovered for themselves in their own research the significance of the social and organizational aspects of IT use and introduction; b) have increasingly turned to the body of theory and practice just discussed, as well as other areas of behavioural science, in order to explain their findings and obtain prescriptions for good practice. This has been a difficult exercise for many coming from the IT end because of their inadequate grounding in social science, and because of the major disagreements among social scientists over their own paradigm.

1.2 Office information systems.

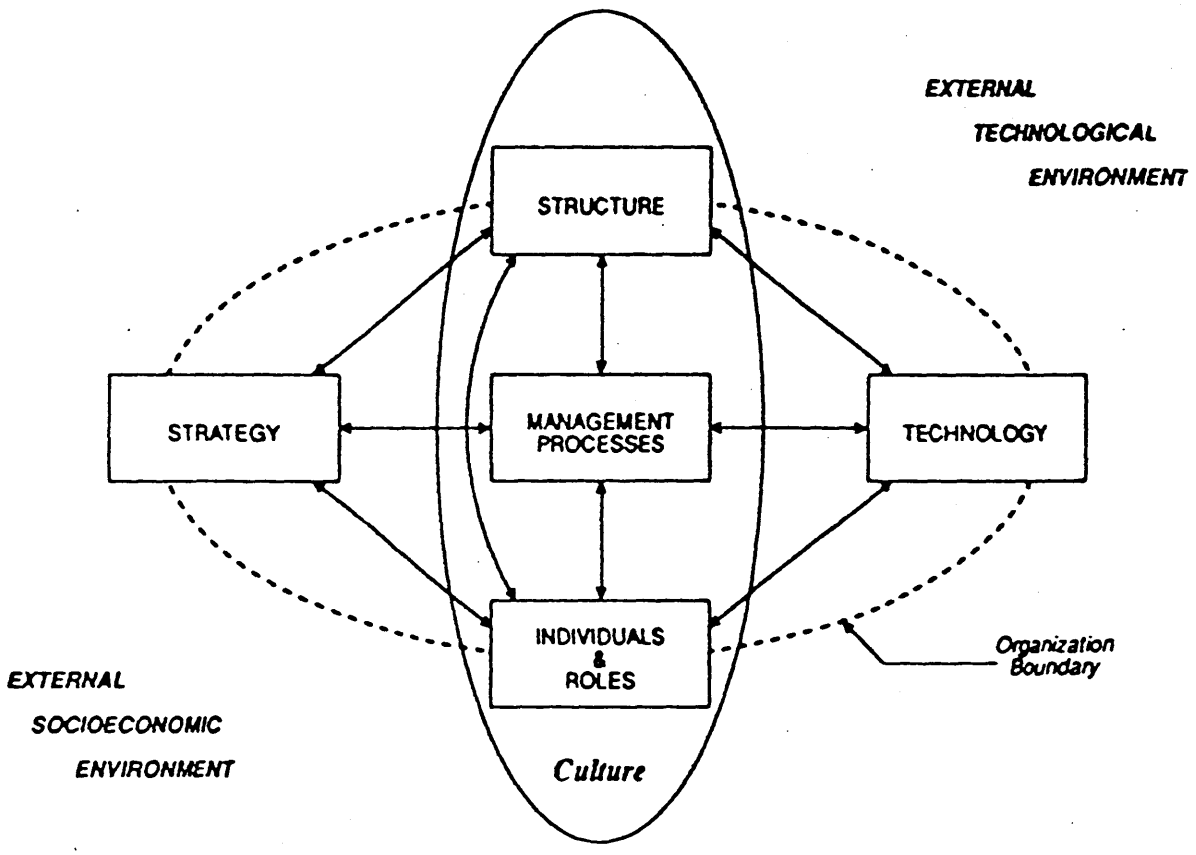
This research focuses on the branch of IT known as office systems (OS) or office automation (OA). In the 1980s there were a number of empirical studies of office systems, some

Figure 1.



Leavitt, 1965

Figure 2.



The MIT90s framework.

Scott Morton, 1991

of the more notable being the DTI OA pilot projects (KMG Thomson McLintock, 1986), Wainwright and Francis' 1984 study of five organizations, Long's 1987 survey of new office technology, HUSAT's work for the European Foundation (Eason, 1985), and the National Computing Centre survey of OS in the U.S. and U.K. (1986). A prescriptive literature on implementation also developed, much of it sponsored by the NCC. There were also studies of the effects of computers on white collar work (Webster, 1990; Liff, n.d.; Thompson, 1989). On the whole, the systems studied were not strategic and did not involve major organizational change. Although radical organizational implications for OS had been anticipated for some time (Price, 1979), the systems were largely departmental and addressed to lower level workers, so that the effects on organizations which were observed were mainly at job-level and involved secretaries, typists and clerks. Because these systems were still in the early stages of development, they had little impact outside those departments, and the effect on organization structure was minimal (NCC, 1986). OS as such had rarely reached management level, even when that was part of the plan. However, the technology and its uses have both moved on greatly since most of this work was done. One phase of the present research therefore involved finding out about recent developments in OS and updating knowledge about the implementation and 'impacts' of OS by studying current examples.

The main purpose, however, was to delineate an implementation strategy for office systems, which would take into account both the rational and political aspects. In an earlier review of office systems development methodologies (Noble, 1991), I had compared seven methodologies or approaches, and had found that on the whole those which were strong on meeting business needs were weak on user needs and organizational/social issues, and vice versa. I concluded that there was a need for a methodology or approach for contemporary office systems which could address both sides. This was the broad aim of the current project (although I would eschew use of the word 'methodology' both because it is technically incorrect and because it suggests a rigour and certainty which is not justified by our current state of knowledge).

1.3 Overview of thesis.

Because of the way I have defined implementation, this thesis covers not one but several different types of issues which I have brought together to bear on the problem. The organization of the thesis follows the pattern of the MIT/Leavitt model. The first two chapters deal with the 'rational' aspect, focusing on technology and strategy. (I am well aware that the strategy process is often far from rational, but the prescriptive approach to the strategic use of technology is overwhelmingly rationalist.) Chapter Two is a study of office automation/systems, their development and uses in organizations, from both analytic and historical perspectives. Chapter Three discusses past experience with the problem of making office systems meet business needs, and uses the IT-strategy literature and organization theory to develop an analytical framework for OS to indicate three areas in which OS can contribute most to business and strategic needs. The

case studies are presented at this point in Chapter Four for reasons which are discussed below.

The second half of the dissertation adopts the more political or interpretative perspective, and, following the MIT schema, is on the theme of the relationship between IT/OS and organizations and people. Chapter Five looks at these issues from a descriptive/theoretical point of view, discussing the 'emergent' perspective on implementing technology in organizations and exploring the contribution to it of structuration theory. Chapter Six reviews the prescriptive implementation literature with a focus on managing change, and outlines an implementation approach for strategic office systems. In the Conclusions I summarise my findings and their implications for further research.

1.4 Research methodology.

Because the research problem included such diverse aspects, different methods were required to investigate them. Case studies, discussions with practitioners, consultants, suppliers, and other researchers, and meetings of the British Computer Society Office Automation Specialist Group provided valuable information on technological developments, uses, and problems with office systems. Data from recent surveys conducted by the National Computing Centre, Price-Waterhouse, and the Institute of Administrative Management were used to gain a fuller picture of the extent of dissemination or take-up of OS nationally and internationally. I supplemented this by a postal survey of the MDs and CEOs of 250 leading UK companies, in order to find out senior managers' perceptions of the potential benefits of OS and their relation to business strategy.

Case studies were conducted in fifteen organizations which were currently implementing, or had recently implemented office systems. Half were brief 'snapshots', based on a presentation given to a public meeting, one visit to the organization, or both. These contributed insight into how OS are currently being used, the technology and strategy side, but generally did not cover implementation in any depth. The other case studies were considerably more extensive, involving interviews with a number of different people in the organization, usually over a period of months, and provided material on a wider range of implementation issues. As implementation is a change process, the most effective way to study it is through longitudinal studies in organizations, a contextualist research method which 'has its roots in pragmatism ..., has its focus on the event in its setting' (Pettigrew, 1985). I discuss the role of process models and the implied methodology for using them at greater length in Chapter Five. The case study questions covered 1) the inception of the OS, where the initial idea came from; 2) the reasons for introducing OS, benefits sought, and strategic aim, if any; 3) the design of the system, especially type and degree of integration, applications, and the work and the employees affected; 4) the implementation strategy or approach employed (both in intention and in fact); 5) the problems experienced and how they were dealt with; 6) results or outcomes to date in terms of benefits realised and disadvantages; 7) the relation between the introduction of the OS and organizational change with

respect to work roles and organization structure.

The case studies represent a variety of organization types, public and private, large and small, service and manufacturing. The sample was not selected with the intention of testing hypotheses, but to provide a variety of settings, because of the aim of observing how OS are currently being used. The number was limited by what was reasonable for one researcher to handle. However, in the later stages of the research, an attempt was made to find organizations which were using OS technology in 'more advanced' ways. The resulting sample includes a local authority department, two national government departments (one of which was later privatised), three manufacturing companies - one local, one part of an international group, and one part of a major multinational - and two major multinational IT suppliers.

The case studies provided qualitative information from semi-structured interviews with senior managers, wherever possible, with IT and project managers, user department heads, and direct users. Documentation such as project proposals, evaluation reports, and user handbooks were also obtained. In most cases, the organizations were visited several times over a two-year period, which provided an overview of the implementation process while events were reasonably fresh in the minds of participants.

The use of the case study material is descriptive and exploratory rather than explanatory (Yin, 1984); that is, it illustrates and generates hypotheses (Eisenhardt, 1989), but does not test hypotheses or choose between alternative theoretical explanations (Lee, 1989). Because some of the cases were very brief and illuminated only the technology and strategy issues, while others provided material on implementation and organizational change as well, the discussion of the case studies is placed after the technology and strategy chapters and before the implementation chapters.

The second half of the dissertation raises issues which could perhaps have been better explored empirically by using considerably more in-depth methods, such as participant observation in one or more organizations over a longer period of time. This could have produced far greater richness of detail, but due to limited time for the research, this would have been at the expense of the breadth which was gained by studying organizations in several different sectors and at different phases in their use of office systems. There was a choice to be made here. Since integrated office systems are still in their early stages, it seemed preferable to learn from the experiences of a wider variety of organizations, accepting the limitations of this approach, while indicating how theory and practice could be advanced in future by other approaches.

In conclusion, this is not a dissertation which explores a narrow area in great detail and contributes a jot to theory. The thesis is wide-ranging, descriptive and theoretical, and seeks ultimately to improve practice. It brings together empirical information from a variety of different sources (including fresh case study material) and literature from several different

academic traditions to bear on the practical problem of implementing office systems. In organizing and analysing the material, I have attempted to make an original contribution in each of the broad areas covered, and in integrating these at the end.

Chapter Two

Developments in Office Systems

Introduction

This chapter examines the nature of the office and the role of information in it, and develops an information-processing view as the basis of a classification of offices. Office information systems are distinguished from other applications of IT, and changes in the use of computers in the office over the past three decades are examined, showing the increasingly integrated character of contemporary OS.

2.1 Nature and functions of offices.

2.1.1 Definitions and typologies.

The study of office systems must begin with some conceptualisation of the office. Offices vary in many respects: the occupations of those who work in them, the kinds of work done, size, physical environment, the sorts of organizations they are part of and their functions in those organizations (Pava, 1983; Doswell, 1983; Hirschheim, 1986). However, what offices share is that they process information rather than producing or handling tangible physical objects (Hirschheim, 1985b; Doswell, 1983; Wainwright and Francis, 1984; Newman, 1987; Tsichritzis, 1986), and this makes them obvious targets for information technology.

Because of the great variety of offices and office work, there are a number of typologies which have selected different aspects of the office as bases of differentiation. Doswell (1990) for example shows that the office has been modelled as: 1) a place and its equipment, 2) activities that occur and who performs them, 3) activity types or functions, 4) communication flows, 5) conversation, 6) procedure flows, 7) decision making, 8) databases, and 9) agents. He concludes that no one model is sufficient, as an office consists of all of these aspects. Hirschheim (1986) distinguishes typologies according to their underlying theoretical perspective, which can be seen as a continuum, ranging from the 'analytic' perspective at one end to the 'interpretative' at the other.

> The former sees the office as an environment where people perform a variety of functions to support the successful running of the organization. The functions are conceived of in terms of largely formal and structured actions or activities. The latter conceives of the office in terms of mostly unstructured and informal human action (p. 30).

Hirschheim notes that the analytic view is much more prevalent and underlies most classification schemes. The three analytic approaches are the office activities view, which is concerned with what activities are performed and by whom (time spent in meetings, and so on), the office semantics view, which is concerned rather with the reasons the work is performed, with procedures and goals, and the office functions view, which concerns procedures which can be combined into higher level functions, the functions combining so as to relate to the organization's goals. As the semantics view seems to be a subset of functions, the activities and functions views

will be discussed here.

Software development has tended to focus on office activities because activities are observable, relatively unambiguous and measurable, and easier to apply technology to (Hirschheim, 1985b). In the activities view, the information processing task is conventionally broken down into information capture, storage, manipulation, retrieval, and distribution (Hirschheim, 1986; Wainwright and Francis, 1984). Office work is seen as comprising sets of tasks, such as 'production of correspondence and other text, taking messages and passing them on, filing and record keeping, time scheduling and diaries, dealing with incoming and outgoing mail', etc. (Antill and Clare, 1991, p. 13).

Office activities are also commonly classified in the IS literature according to the routineness of the work (and the closely related issue of the type of worker), probably because routine, structured work lends itself to computerisation. Newman (1987) thus classifies office tasks as either procedural (routine; ways of dealing with recurring tasks) or problem-solving (dealing with the unexpected). He points out however that there are many procedural elements even in problem-solving work, to which computer technology can be applied. Panko and Sprague's typology of offices (1982) is based on the routine/non-routine distinction: Type I offices are 1) volume-routine - high volume of transactions, routine information processing - mainly clerical workers; Type II offices are concerned with policy-making, planning, R&D, finance - mainly managerial, professional and non-clerical staff. Wainwright and Francis located types of worker on a continuum, with those who organize and disseminate information (professional, managerial, technical) at the creative end, and those involved in storage and retrieval (mainly typists, clerks, and secretaries) at the routine end. Pava (1983) developed different methodologies for computerising routine and non-routine office work.

An exclusive focus on office activities can result in the computerisation of procedures as they currently exist under the manual system, losing many of the potential benefits of applying technology (Simons, 1984; Tsichritzis, 1986). It may also underestimate the amount of routine information-processing carried out by managers and the amount of non-routine work handled regularly by 'lower-level' workers, thus rigidifying existing organizational roles. In any case, the routine/non-routine distinction is more appropriate to the data processing era than to today's technology which can be used to support, not automate, many non-routine tasks.

Types of activities performed and by whom are less significant from a business perspective than the purpose or function of the office in the organization. Gunton (1983) lists seven types of office, based on a functional classification:

Managerial office - direction and co-ordination
Transaction office - group of clerks receives and processes documents - high-volume processing
Working professional office - individual tasks together constitute the function of the office
Casework office - clerks responsible for progress of one or more cases

Engineering office
Machine room - like typing pool
Physical handlers - e.g. post rooms, stationery stores.

Gerstein (1987) has a similar functional typology; four of his types correspond to Gunton's:

Administrative office - 'general office', including executive and managerial
Back office - processes transactions
Professional - medical, dental, legal.
Technical office - design, scientific

But he adds:

Service office - provides information to customers, suppliers, or members of the organization.

Newman (1987) proposed a functional classification which is less descriptive and based more on the way the office supports the business:

1) Contract negotiation: selling and promoting products, purchasing materials, recruiting staff, negotiating with labor unions.
2) Contract implementation: paying bills, invoicing, paying staff.
3) Organization of work: planning, assigning tasks, scheduling activities, monitoring results -- all of the functions directly associated with management.
4) Support: typing, mail collection and delivery, reception, secretarial support.
5) Supplying information to clients and customers. Researching, collecting and processing data, writing, consulting. Generally through either project or case work (newspaper, solicitor).

Newman notes that while 'the first four functions exist within every organization ... information supply is prevalent in organizations within the information industry'.

2.1.2 An information-processing view.

Both the activity and functional typologies are more descriptive than analytical, and derive more from an IT perspective than a management or organizational one. If we apply a systems perspective, an organization is seen as an open system seeking to maintain its integrity and stability while interacting with its environment. Information is required to deal with or reduce variety and uncertainty (Ashby, 1956), which can arise from three sources: task/technology (Perrow, 1971; Galbraith, 1973), the environment, and the interdependencies between tasks which require co-ordination (Thompson, 1967; Tushman and Nadler, 1978). Uncertainty, and therefore information-processing needs, are greater: the greater the complexity of the task, the more dynamic the environment, and the greater the interdependence among subunits. The main function of the office is to handle the organization's information-processing needs.[2]

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2. Organisations also require information in order to reduce equivocality or ambiguity arising from task, environment, and interdependencies. As equivocality involves lack of clarity rather than lack of data, it is reduced by rich media such as face-to-face communication rather than by

A parallel view of the organization sees it as consisting of three main aspects: an operating or technical core concerned with performing primary tasks ('production'), an outer ring or strategic level which deals with the environment, and a co-ordinative level which mediates between the two and integrates specialised activities (Kast and Rosenzweig, 1974; Parsons, 1964). Organizations may or may not be formally structured so that units focus around these three basic aspects; usually they are not. Lawrence and Lorsch (1967) have discussed the organization design implications of the core/boundary distinction for structural differentiation and integration.

Some typologies of offices reflect these different kinds of information processing needs and aspects of organizations. Thus, Butera and Bartezzaghi (1983) identify two main functional types of offices: 1) main process offices which perform a primary task; 2) control and co-ordination offices, which are mainly concerned with managing organizational units. The DTI reports made a similar distinction between line and support activities and added a forward planning function: 1) line - client services, such as sales, orders, deliveries, after-sales support); 2) support services - resource management: staff, buildings; 3) future options - R&D, corporate planning.

In examining the strategic use of IT, Porter (1985) and Porter and Millar (1985) also made a basic distinction between primary and support functions:

> primary activities are those involved in the physical creation of the product, its marketing and delivery to buyers, and its support and servicing after sale. Support activities provide the inputs and infrastructure that allow the primary activities to take place.

Porter and Millar took into account the information intensity of both the product and the process. The greater the information content of the product and of the processes in the primary activity, the greater the relevance of IT to competitive advantage.

Besides primary and support offices, the information-processing view points to the importance of boundary-spanning offices (such as Newman's 'contract negotiation' office), which deal with the environment, either at the immediate interface with the customer or supplier, or in terms of surveillance and long-range planning. Marketing, sales, service, links with suppliers and distributors, and corporate planning and much top management activity is concerned with the environment, although at different levels and with different time horizons.

From the information-processing perspective therefore there are three main categories of offices:

primary (perform the core value-adding task of the organization),

boundary-spanning,

co-ordinative (manage the relations between the other two, and among organizational

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information systems. This indicates one of the limitations of information systems. Nevertheless equivocality is an an important issue in organization design from an information-processing perspective (Daft and Lengel, 1986).

units).

This simplified scheme focuses on the functional importance of the office's work to the organization, allows one to consider the industry dimension via the information intensity of the product and primary processes, and directs attention to the possibilities for strategic office systems.

The scheme can be elaborated as follows:

I. Primary. In industries where the information component of the primary activity is high, the main activity of the organization is carried on in offices - e.g. financial services, information services, government, professionals (solicitors, architects, general practitioners). These core offices may be front-office - deal directly with the customer or client, back-office - process orders, claims, accounts, records, or both at the same time (especially in small organizations). Tasks will be both routine and nonroutine. Even in industries with tangible products, a large amount of information processing goes on, both indirectly and directly supporting manufacturing operations.

II. Co-ordinative. All industries have administrative offices, which support the organization as a whole. They include functional departments such as personnel, payroll, accounts, as well as the executive functions of planning, control and co-ordination. In a small organization these functions are combined in one general managerial office; larger organizations typically have large departments, often with several subdivisions, devoted to each function. These are generally back-office in that clients, customers and suppliers normally do not have access to them; they are concerned with the internal functioning of the organization.

III. Boundary-spanning. In all industries the main activity of the organization is necessarily supported by boundary-spanning offices which handle inputs and outputs, such as sales, service, purchasing. Their importance to the business varies, depending on the industry - in some they are critical for survival because they are closely linked to the success of the primary activity (examples are booking services for airlines, hotels, and theatres; raw material procurement in some industries [Porter 1985]). They too usually have front-office and back-office aspects but they are often combined in the same physical space.

2.1.3 Interpretivist and social action perspectives

The information-processing view of the organization is analytical and rationalistic; it reflects the organizational imperative view of the relationship between organizations and information systems (Markus and Robey, 1988) and a technical as opposed to a political or critical view of the nature of management and organization (Reed, 1989). It is particularly useful in thinking about information systems in strategic terms, as I will attempt to show in the next chapter, but it is only partial.

Reflection on the nature of information shows why an interpretivist perspective is particularly relevant to office systems. The difference between data and information is that data

does not become information until a meaning is attached to it by a human observer. Information can be defined as a symbol to which a meaning is attached (Checkland and Scholes, 1990); it therefore depends on interpretation, which is itself dependent on social norms including language. Further, information is itself highly symbolic (Feldman and March, 1981) and a source of power. The social character of information indicates the possiblity of differences of interpretation and interests, the complexity of office work and the potential difficulties in implementing technologies which handle it.

Writers including Suchman and Wynn (1984) have demonstrated the highly social and context-dependent character of office work, where informal interaction is often an essential aspect of getting the work done. Office work is often co-operative, unstructured, discontinuous, and rich in variety. Office information systems then need to be seen as social action systems with a language and organizational context, not just as technical systems (Lyytinen *et al.*, 1991).

Hirschheim (1985b) observes the following differences between the analytic and interpretative perspectives:

	Analytic	Interpretative
Office operations	Deterministic, rational, overt	Non-deterministic, political, covert
Organization as:	Structure	Agent, culture
Office action	Manifest behaviour	Shared social meaning of actors
	Observable, empirical	Symbolic, non-empirical
Research paradigm	Formal models, empirical	Phenomenological
Research methods	Quantitative	Qualitative
Focus	Analysis	Understanding

There is a danger of going so far down the interpretivist track, however, that one overlooks the existence of structural constraints on human action. An adequate account encompasses both the rational-analytic aspects of office systems, ie. the intentions behind the introduction of technology, which may act as constraints, and the way that technology is interpreted and shaped by social actors at different organizational levels. This point is developed further in Chapter 5.

2.2 Developments in office systems.

2.2.1 Definition of office information systems.

Office systems can be defined as the convergence of computers, telecommunications, and office machines, used to support office functions and activities (Olson and Lucas, 1982; Jarrett, 1984; Hirschheim, 1985b; Long, 1987). Beyond this, there is not much agreement as to what office systems are or how exactly they differ from other kinds of information systems, although a difference is generally perceived. Confusingly, the terms 'office automation', 'office systems', and 'office technology' are used by different writers to refer to what appears to be the same thing (Hirschheim, 1985b). Some writers simply provide a list of facilities, including word processing, electronic mail, and electronic filing (Boddy and Buchanan, 1986; Lucas, 1981). This is a

technology-based, not a business definition and reflects an activities view of the office. We clearly need a good classification of the applications of information technology (Mason, 1984).

2.2.2 Analytical approaches.

Some analytical approaches to computer applications have been based on Anthony's (1965) structural model, which divides management activity into operational control, management control, and strategic planning. The degree of structuring of the activity is often also taken into account. Thus, Lucas (1982) classified information systems according to Gorry and Scott Morton's framework for decision support systems. The dimensions are the nature of decisions and type of managerial function (Fig. 2.1). Transaction processing falls outside the framework altogether because it is routine clerical work and not managerial. MIS are seen as supporting management control and strategic planning decisions. Lucas noted that most IS so far were in the structured operational control cell because 'these problems are similar in many organizations and are among the most easily understood'.

Figure 2.1
Types of Information Systems
Adaptation of the Gorry and Scott Morton Framework

Transaction processing
Routine clerical

	Type of Function		
Decisions	Operational Control	Management Control	Strategic Planning
Structured	*Order processing* *Accounts payable*	*Budgets* *Personnel reports*	*Warehouse location* *Transportation mode mix*
Semistructured	*Inventory control* *Production planning*	*Analysis of variance*	*Introduction of new product*
Unstructured	*Cash management*	*Management of personnel*	*Planning for R&D*

After Lucas 1982

Churchill, Kempster and Uretsky (1969), using the dichotomies structured/unstructured and planning/control, developed 'a hierarchy of computer applications based not only on increasing levels of sophistication but also on the outputs of lower types being necessary inputs for higher types' (Figure 2.2). Types 1 and 2 are clerical systems, while type 3 and type 4 systems 'are oriented towards ... managerial rather than clerical activities. The essence of management-oriented systems is that they involve either unstructured environments or planning functions' (Friedman, 1989). Churchill *et al.* regarded their types as four stages in the development of computer applications, which most organizations would probably go through in sequence.

Figure 2.2
Computer Applications and Management Activities

Type of computer application	Categories of mangement activities	
Type 4	Planning unstructured activities	
Type 3	Planning highly structured activities	Controlling relatively unstructured activities
Type 2	Controlling highly structured activities	
Type 1		

Churchill *et al.* 1969, in Friedman, *op. cit.*

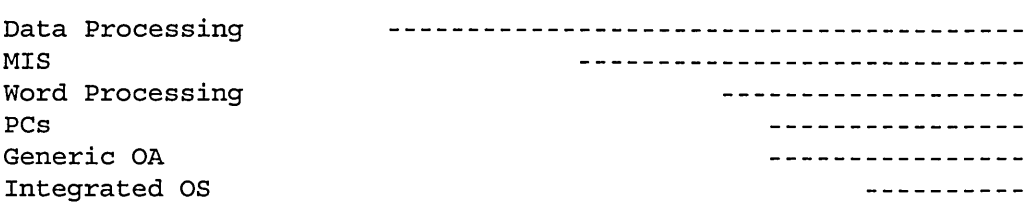
These analytical schemes help to show how computerisation has progressed from structured, operational systems towards less structured activities and managerial functions. They do not help us distinguish office systems from other kinds of information systems, because office work includes all three levels and both structured and unstructured tasks.

2.2.3 Historical approach.

The conceptual confusion about office systems is due in part to the fact that their nature has actually been changing very rapidly. An historical approach is therefore useful for understanding the nature of office systems. The aim of this section is to show how the use and meaning of 'office automation' and 'office systems' have changed, and how technological and organizational developments have led towards integration.

Electronic technology has been applied to the office in four overlapping stages, which are data processing, isolated applications, departmental office automation, and integrated systems (Figure 2.3). Putting dates to these stages is to some extent arbitrary, because at any given time a few 'leading edge' users are well ahead of the rest, the earlier stages continue into the present (Ward, 1990), and there is a great tendency within IT to anticipate the next stage, what Friedman (1989) calls 'advancing the clock'. One has to distinguish between what is technically possible and what is in widespread use. The phases used here concern technology which is generally available and widely utilised in the appropriate contexts.

Figure 2.3
Development of Office Systems



2.2.3.1 Data processing and management information systems.

When the term 'office automation' was first used, it referred to the computerisation of standardised office tasks previously carried out manually by clerical workers. Routine clerical work which involved number-crunching was the first candidate for office 'automation'.

> ...in the early 1960s, the term 'office automation' was widely used to connote the use of computers in such applications as billing and invoicing, accounts receivable and payable, payroll processing and the like. Today we regard these as accounting applications that have long been moved into the domain of the data processing organization, but at the time in question, these functions were performed by office personnel; consequently, implementing them by computer was 'office automation'. (Hammer and Zisman, 1979.)

This use of computers in the office is now almost entirely subsumed under the term 'data processing' or 'transaction processing'. The practice spread from the information-based industries where it was first extensively used to control the costs of an expanding clerical work force:

> By the mid-1960's most large businesses had turned to computers to facilitate such routine 'back office' tasks as storing payroll data and issuing checks, controlling inventory and monitoring the payment of bills (Giuliano, 1982).

Management information systems, which developed in the 1970's, fed off the data processed by the mainframes and were intended to improve management control. Rockart and Scott Morton, writing in 1984, documented the development of MIS through what they called the accounting, operations, and 'information' eras:

> In the first era accounting functions were automated. In the second, during the mid to late 60s, the emphasis changed from systems aiding the accountant to systems aiding first-line operational personnel. In this era, manufacturing control systems and on-line order entry systems were instituted. As in the first era, most of the second wave of systems merely enabled companies to process paperwork faster and more accurately..... The first two eras, in which accounting and operational applications were developed, produced many internal data bases useful to management.... (the) third era of applications focuses on providing information to middle and top mgmt.... and on facilitating both data analysis and communication of analytic results and other facts.

The objectives of this first phase of office automation were to increase productivity and obtain tangible cost savings by reducing staff levels or increasing output with the same number of staff. It was largely technology-led in that applications were determined by the ease with which computers could be applied to them, not by strategic need. Efficient data processing could be strategic to the organization in some circumstances (Ward, 1990), for example if cost leadership was essential to its competitive stance (Porter, 1985), as in information-intensive industries such as insurance and banking. In most other cases, although the computerisation of routine back-office functions could be cost-justified, it conferred no real strategic or competitive advantage on the organization (King *et al.*, 1988).

Problems

Friedman (1989) has pointed out that the main constraints on computer system development from the mid-60s to early 80s were technical ones. Mainframe computers were large and expensive, programming was difficult, and so most installations were overseen by technical specialists, with little involvement of users or functional managers. Because installations were technology-led and neglected users' needs, there were many problems in implementing both data processing systems and MIS. The result was many unusable DP systems (Wainwright and Francis, 1984), and managers wading through reams of computer print-out which seemed to provide every kind of information except what they could actually use. There was also considerable fear that the automation of office work would lead to white collar unemployment and to mind-deadening jobs (Hoos, 1960).

2.2.3.2 Isolated applications.

In the late 70s and early 80s, processing capacity increased and appropriate software was developed which made the high-volume routine handling of text technically feasible and thus made computing much more widely applicable in the office. Doswell noted in 1983: 'the automation of office procedures is not now mainly concerned with data processing', and cited Strassman's 1976 estimate that less than 7% of all organizational information processing costs could be attributed to number-processing activities.

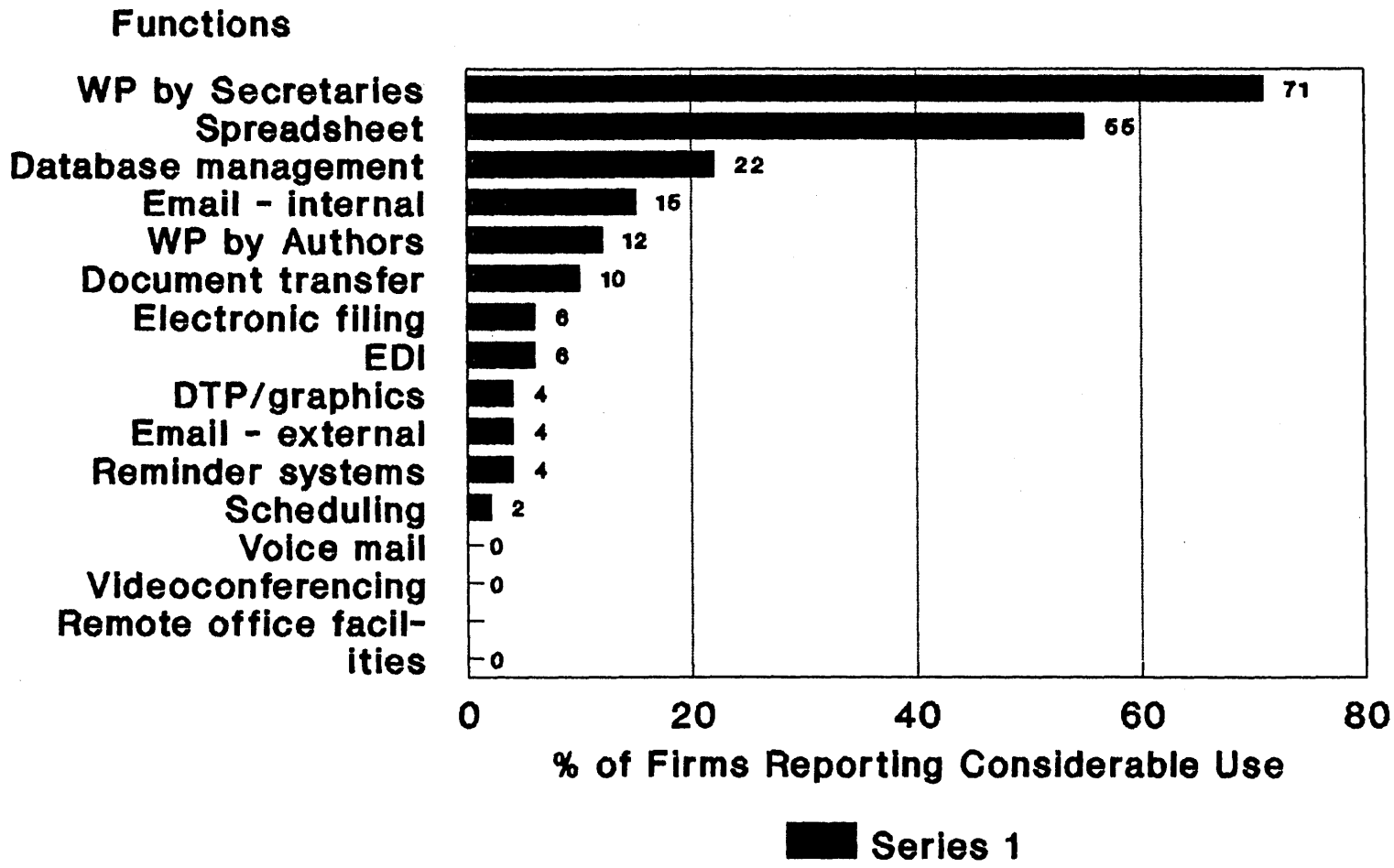
Although hardware suppliers began to offer OA products at about the same time, what turned out to have more lasting significance in the 70s and 80s was the use of microelectronics in isolated pieces of office equipment, notably in word processing and personal computers. By 1983, the Policy Studies Institute found that two-thirds of British offices which were already computer users had word processing. An Infratest survey for the European Foundation in the UK in 1984 found that 100% of financial organizations used some computers, some WP and telex. 86% of manufacturing organizations and 68% of commercial and professional organizations used some computers. The figures for WP were 58%, 64% and 70% respectively (see Figure 2.4) A survey of the use of OA facilities in 1987 among Price Waterhouse's panel of companies with five or more DP staff showed that 71% reported considerable use of word processing by secretaries - by far the most widespread 'office automation' facility (see Figure 2.5).

Figure 2.4
Percentage of U.K. Organizations with Each Form of Equipment

	Manufacturing	Public	Commercial	Financial	Professional
Some Computers	86	37	68	100	68
Some WP	58	74	64	100	70
Telex	86	--	20	100	44
Fax	31	16	32	16	53

Infratest 1984 in EF Working Paper Series

Figure 2.5
Spread of Office Automation Facilities



Price Waterhouse UK Computer Opinion
Survey - Office Automation - Nov. 87

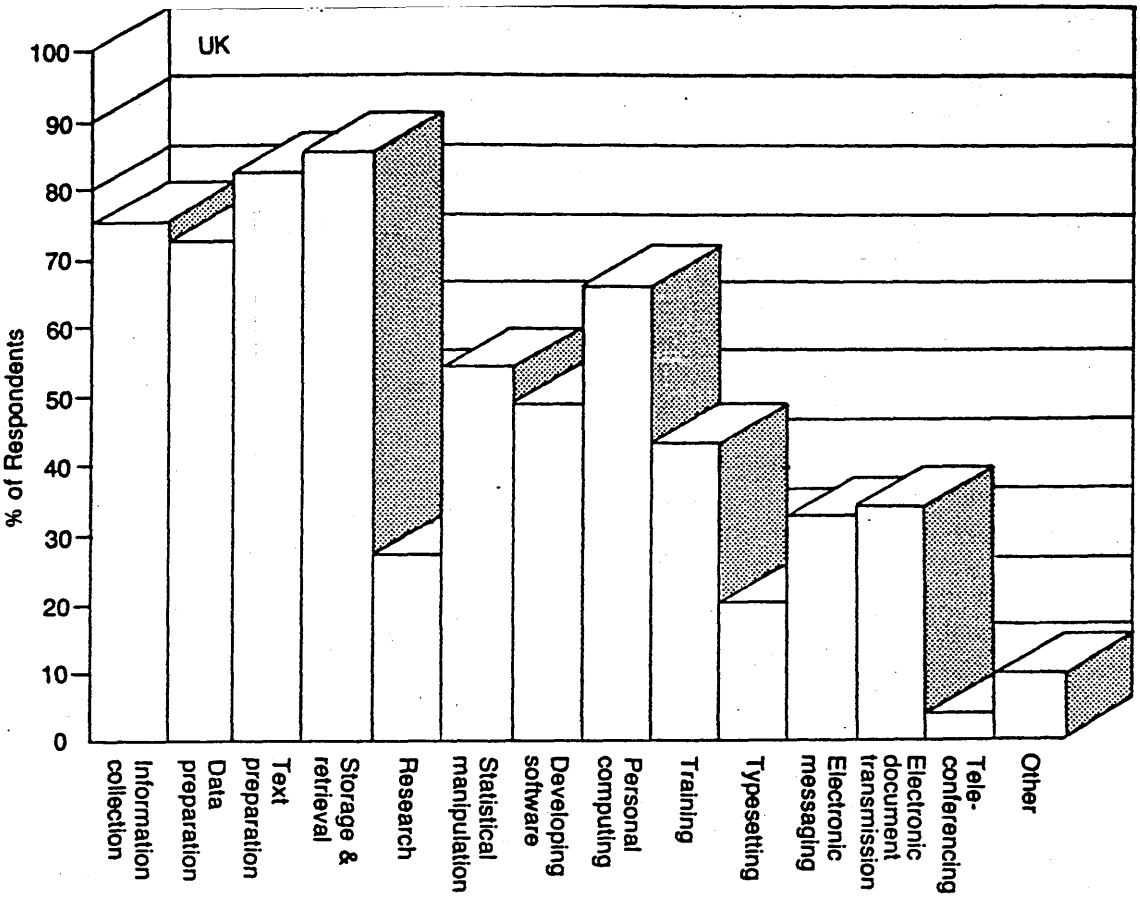
It is significant that the only other facility with considerable use at that time was spreadsheets. After stand-alone word processing, the major office technology success of the 1980s was the personal computer. The dramatically reduced costs of microprocessors, the introduction of the IBM-PC in 1981, and the frustration of managers and professionals with the delays of the DP department in dealing with their requests for system development led to a proliferation of PCs in the office, to the point where organizations became anxious to re-exert control (Jarke, 1986).

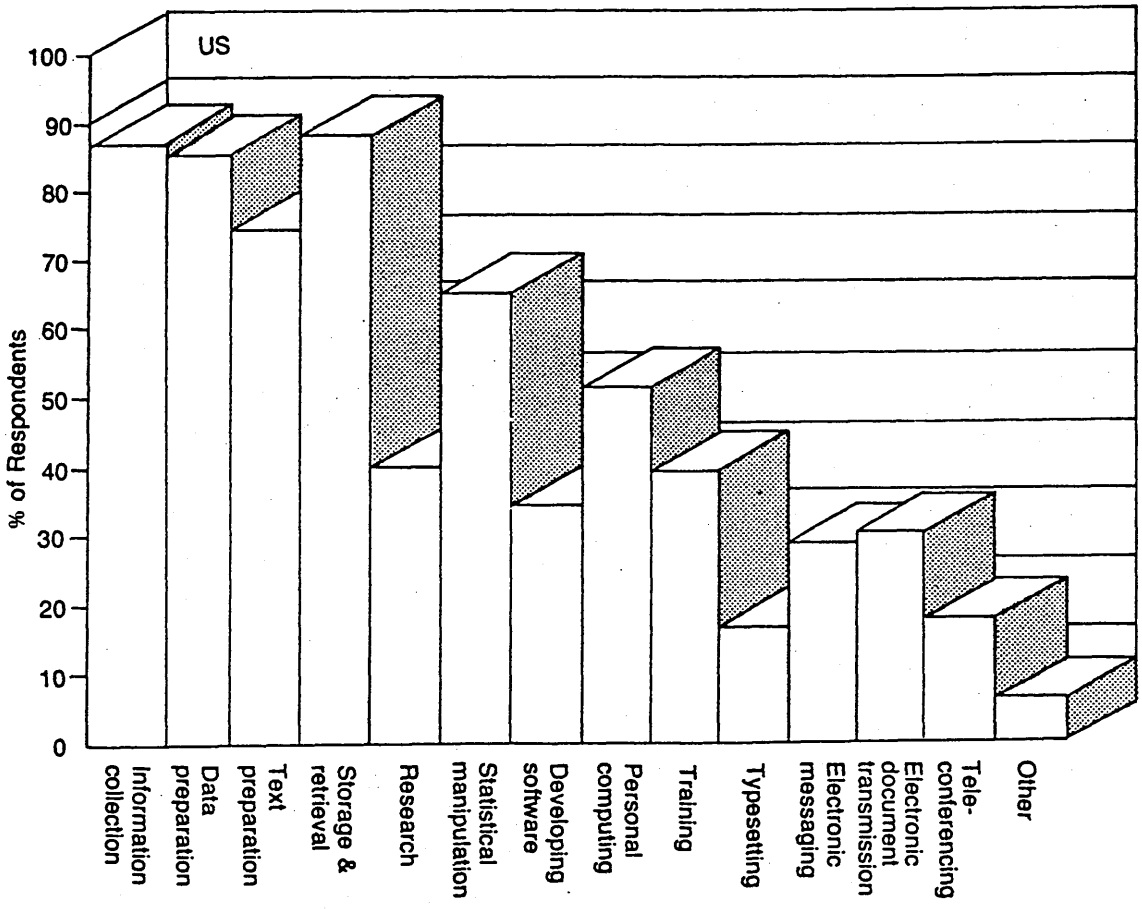
A large-scale survey of the use of office technology by U.K. and U.S. organizations published in 1986 by the National Computing Centre found that the most widely used applications were storage and retrieval, text preparation, data preparation, and information collection (see Figure 2.6). The electronic office equipment in most general use was still photocopiers, electric typewriters and dictation machines, but the use of stand-alone WPs and micros exceeded 60% of organizations. In continental Europe, a cross-national survey carried out for the European Foundation found that less than 2% of the small and medium sized firms studied had a DP system, microcomputer, or WP system.

Lists of equipment are not very informative as to how it is being used. Surveys of applications show that for the most part office technology was being used in isolation. Thus the Price-Waterhouse survey showed that in contrast to the widespread use of WP and PCs, less than a third of the organizations in their sample used an integrated OA package. In the earlier NCC study about 30% of organizations used electronic messaging and less than 10% used LANs. The European Foundation (1986) noted 'when it comes to the actual introduction of new systems there is a degree of caution and reservation. Preference is given to those systems which do not involve organizational changes in the company, e.g. the introduction of word processing or graphic systems alone'.

While PCs had from the start been conceived as personal support tools, and the concern was more with increasing effectiveness than with efficiency, the objectives for introducing WP were to extend the efficiency gains for data-handlers to handlers of text, ie. from clerks to typists and secretaries. Cost savings were often sought by organizing word processors into pools, which was generally unpopular both with the word processor operators themselves and with their internal customers. While staff were on the whole enthusiastic about word processing, there was failure to reach the full potential and it was often used like a typewriter because of lack of training and poor implementation (Liff, n.d.; Johnson and Rice, 1987). PCs have been generally extremely popular with individuals, although they have presented many problems to organizations, especially lack of standardisation and control (Immel, 1985; Jarke, 1986).

This phase of office automation represented the mechanisation of isolated activities and not integrated systems (Tsichritzis, 1986). The technology was usually introduced piecemeal (Butera and Bartezzaghi, 1983; Pava, 1983) and facilitated the work as it was currently being





National Computing Centre 1986

carried out (Long, 1987). It was directed mainly at typists, secretaries, and clerical workers (Wainwright and Francis, 1984; Long, 1987), although many professionals and some managers enthusiastically took up PC use. However, the very widespread use of WP and PCs has served to familiarise many office workers with computers and thus to prepare the ground for the next phase.

2.2.3.3 Generic office automation.

There appeared to be a need for a type of computing which would support various kinds of office work and which would be more integrated. In the early 80s, hardware manufacturers brought out minicomputers linked to terminals and peripherals such as printers, usually together with a software package including several facilities such as word processing, electronic mail, databases, diary and calendar. This phase or type of system I refer to as 'office automation' because of the conception which lay behind it of automating the individual office. Some examples of packages from the 80s (many of which are still around in some form) are: IBM Profs, Disoss (now replaced by Office Vision); Data General CEO; Olivetti-Quadratron Q-Office, DEC All-in-One; ICL Officepower. In retrospect, generic OA can be seen as a first step towards integrated office systems, because it integrated different facilities into one software package, and linked previously independent devices to each other.

The role of OA in relation to other forms of computing was perceived differently by various writers. Meyer and Boone (1987) saw OA as supporting unstructured office work on behalf of individual users:

> OA is distinguished from MIS in three important ways. First, OA provides tools to individuals and groups of users, who then operate the tools themselves. MIS operates a centralised resource on behalf of the entire organization. Second, OA applies to unstructured knowledge work, while MIS processes routine, well-structured transactions. Third, OA tools work with data that belong to the users, while MIS processes organizational data.... If an information service is interactive, operated by and at the discretion of a user, it is considered part of the domain of OA.... We define OA as 'computer- and communications-based tools for thinking' (pp. 4-5).

Jarke, in a study of micro-mainframe links (1986), located the function of OA as the support of the working group.

> microcomputers were originally perceived as personal support tools, whereas most mainframe applications concern the organization level.... Micro-mainframe technology [which includes OA] allows another organizational level to be supported: the working group which synthesizes individual contributions into a completed project or work task... Here, the computer-commmunications systems serve as a medium of cooperation and negotiation among group members. (Emphasis added.)

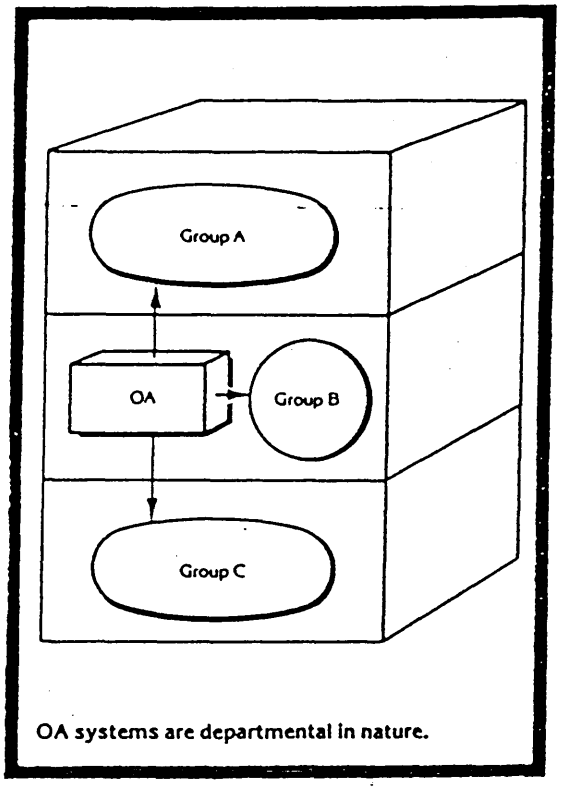
The DTI report saw OA as supporting the departmental organizational level; OA 'fills the middle ground of computing, providing an important bridge between individual resources provided by PCs and more conventional mainframe (or super-mini) computing' (see Figure 2.7).

The DTI office automation pilots constituted an important part of a flurry of interest in

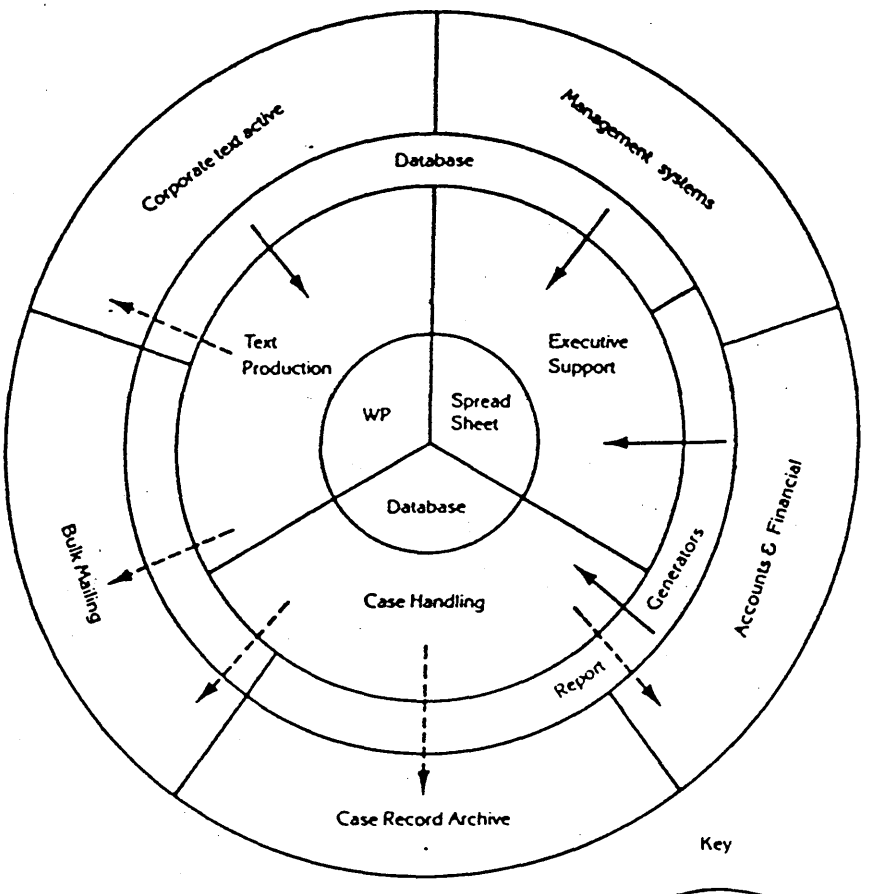
Figure 2.7

OA as Departmental Systems

OA systems are departmental in nature, providing facilities to groups. The group facilities are broadly similar to those provided to individuals via popular PC packages.



OA systems are departmental in nature.



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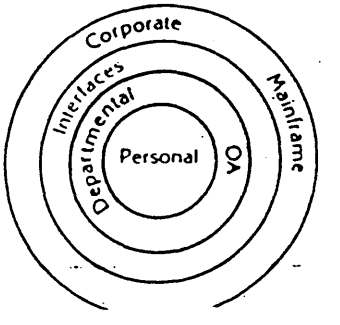


KMG/DTI

OA in Britain in the early 80s. The NCC began a major programme of work on OA in 1980 (published in 1982-3), and 1982 was Information Technology Year. The DTI-sponsored office automation pilot projects (1981-85, publ. 1986) were conducted in twenty organizations, with the objective of helping both user organizations and suppliers learn how best to exploit the technology.

The DTI reports (KMG, 1986) suggested four generic application areas for OA: text production, case handling, management support, and the management of large, especially geographically dispersed projects. The pilots included examples of the first three. The relation of the different applications to existing software is shown in Figure 2.8, and the facilities required by each application type are shown in Figure 2.9.

Fig. 2.8
Office Automation - Application by Software

Types of applications	PC Software
Text production	WP
Case handling - integration of WP with information storage and retrieval	Database
Management support - planning/decision making	Spreadsheet
executive communications	
general (diary etc.)	

KMG/DTI

Figure 2.9
OA Facilities Required by Application Type

User level	Personal (PC)	Dept. (OA)	Corporate (DP)	External
Typing	3	3	0	0
Clerical	0	3	1	0
Professional	3	2	0	3
Mid Mgmt.	3	3	1	1
Top Mgmt.				
self	1	1	2	1
their staff	3	2	3	3

Key: 3 = Yes 2 = Probable 1 = Possible 0 = No

KMG/DTI

Problems

The problems with the DTI pilots varied according to type of application. The case handling system, which was the integration of WP with information storage and retrieval, was used as WP. In management support, the users' needs were not understood and the benefits ill defined. In text production, which was seen as joint drafting of reports using but beyond WP, the need for the facility had been over-estimated, and it was considered benefits would be major

only when several people needed to work together to meet a deadline. Part of the problem was resistance to change within the organizations, but suppliers were implicitly criticised for giving insufficient support and not focusing on business needs. The report stressed that OA should be application-driven, whereas the hardware manufacturers were concentrating on providing more and better quality facilities. The report also noted that links to mainframe and to PCs were essential. The results were therefore on the whole disappointing, although a great deal of learning had taken place (NEDC, 1987).

The main problems with generic OA were lack of take-up, and that it was technology- not business-led. A generic facilities-based approach had been developed for the administrative office, and was not directed at specific business needs. One seldom hears of large-scale failure, as with DP, because the systems had been pitched at the administrative level, use was discretionary, and failure was represented by unused boxes sitting in cupboards or storerooms, low levels of financial benefits realised, and low levels of exploitation of the facilities available.

The 'paperless office' also turned out to be an illusion (Immel, 1985). Where OA had been introduced paper was not only still in evidence but had actually increased, and the total numbers of staff had not noticeably dwindled at that time, partly due to the need to employ numbers of computer specialists (Long, 1987). Lack of take-up or failure to invest resulted from lack of understanding of what OA was supposed to do, and of how it could be cost-justified.

2.2.2.4 Integrated systems.

The need for integrated office systems (integrated - between systems, across functions, between sites, inter-organizational) had been recognised throughout the 80s (Simons, 1984). Gunton (1988) had observed that where office systems were introduced departmentally they were 'islands of automation' within the organization; possible links with existing DP systems were overlooked. Long (1987) foresaw a new phase of office technology which

> involves the outright elimination of many intermediary (routine information handling) functions, and has been brought about by the proliferation of p-c-s and the increasing ability to interlink them with one another and with databases... (a) movement towards ultimate integration and interlinking of three underlying technologies (data processing, telecommunications, office machines) is now underway with the development of the 'multifunctional work station', which will integrate information retrieval, processing, storage and communication into one functional unit.... This second phase will also see the routinisation and even automation of some aspects of professional and technical jobs ....(and) will allow organizations to make dramatic changes in their structure and functioning, and to provide new products and services.

Farmer (1988) observed:

> ...in the mid- to late 1980's, a significant minority of large organizations began experimenting with application systems that linked central databases to electronic mail, or word processing to electronic mail and spreadsheets, or some other combinations of data processing, office systems and personal computing. To facilitate these integrated application systems, leading suppliers began providing various sub-routines (called 'application program interfaces'...) that eased the integration process... integrated applications systems break traditional boundaries between data processing, office

automation and personal computing, to meet specific, not general, business requirements.

The reasons integration had not been achieved earlier were both technical and organizational. They included lack of integration of software and hardware, incompatible standards, cost, managerial and professional resistance to keyboards, and unusable systems (Wainwright and Francis, 1984). The existing base of incompatible computer systems which survive from the previous eras acts as a major obstacle to investment in integrated systems. There are still technical obstacles, but while it was once nearly impossible to create links, there are now products which enable systems to work together. Suppliers are far more concerned with the issue, some have joined together to promote Open System Interconnection standards, and some unlikely partners have begun to work with each other (e.g. IBM and Apple). At the same time user organizations are more aware of the problem and establishing IT policies to ensure greater standardisation of hardware and software among their units.

'Integration' currently has several different meanings:

1) the integration of data and text with image and voice (multi-media);
2) the convergence of equipment based on different technologies, especially communications with computers (NEDC, 1987);
3) the integration of existing software facilities (WP, email, databases) into one coherent package with a consistent interface to the user, and consistent procedures across facilities;
4) integration of existing systems: networking of PCs and links with mainframe computing, or of OA with PCs, DP and MIS;
5) integration of departmental systems with each other across functional boundaries, into corporate, organization-wide networks;
6) integration of communications across organizational boundaries (inter-organizational systems).

All of these different forms of integration are going on concurrently. The more technical forms of integration facilitate and support organizational integration. The focus here is on the integration of systems (Integration 4, 5 and 6) and through them, of organizations.

Several writers have commented on how OA is being integrated with end-user computing and other systems:

> End user computing involves two main strands of activity which are increasingly difficult to distinguish. The first was the development of mainframe tools which could be used by staff outside data processing to analyse corporate data...The second strand... has been the use of personal computers.... A third related activity has been the spread of 'office automation', in particular word processing, which can no longer be seen as separate from either corporate information processing or end user computing....'office automation' is merging into end user computing on the one hand and corporate information processing on the other. Today end user computing involves the convergence of Information Centres, personal computing, and part of 'office automation' (Lockett, 1988). (Emphasis added.)

As I define it, an integrated office system will usually include standard OA facilities such as word processing, electronic mail, and access to databases from one terminal. Ideally, these different facilities will have a common interface to the user and a consistent set of procedures (Integration 3). Further applications will depend on the needs of the particular type of user and

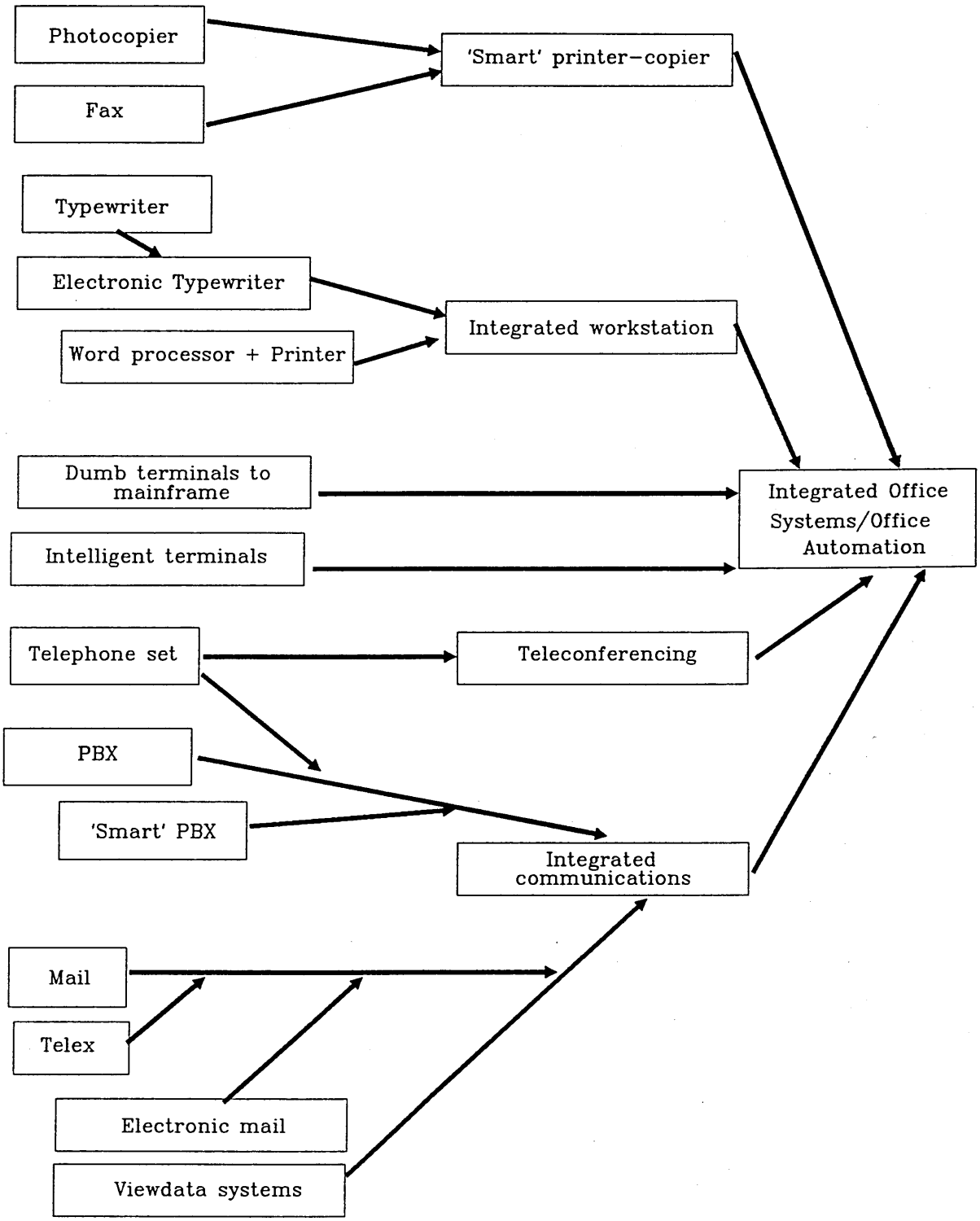
the nature of the business - desk-top publishing, spreadsheets, etc. Various architectures are possible; integrated systems may be distributed, ie. consist of PCs and peripheral equipment such as printers, interlinked by local area networks (LANs), or linked by means of a mainframe, a minicomputer or a PC which acts as a fileserver. Terminals may have their own processing power and storage facility or not, again depending on user needs. An essential feature is electronic communication: people on the system are linked by way of electronic mail and access to shared files and databases. External communication from the computer via email, telex and fax, and access to databases outside the organization are also possible (see Figure 2.10).

Whereas the staff affected by the earlier phases of OS were mainly clerical and secretarial, integrated systems are intended to include professionals, technical workers and managers - ie. all information workers. Thus integrated systems have to be able to deal with far less structured problems, must be flexible, easy to learn and adaptable to user needs. The aim is not to automate the work, but to support workers in their tasks (Newman, 1987). Since much office work is co-operative rather than individual, systems must be able to support group working (computer-supported co-operative working). They may support business processes and will be at least departmental, probably cross-functional, interdepartmental or organizational in scope. The rationale for investment is far more likely to be improved quality of work, organizational performance, and service to customers and clients rather than conventional forms of cost-benefit analysis.

While at present it is still possible to distinguish between office systems, DP and MIS, and personal computing, in the very near future these differences will be eroded as they all become linked together in integrated systems, which can have profound effects on organizations. From being merely administrative support systems, office systems can become the basis of organizational computing. Because they will affect more levels, different types of work and worker and cross functions, sites, organizations, etc., they are likely to have far greater organizational impact than departmental systems. We know from the IS literature (Keen *et al.*, 1982) that integrated systems are particularly difficult to implement. Thus the objectives and implementation process for integrated OS should differ from those of past OS. These issues will be discussed in the next chapters.

Figure 2.10

Convergent Technology in the Office



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Chapter Three

The Organizational Uses of Office Systems

Introduction

In this chapter I show how the uses of office systems in organizations have moved from an exclusive focus on productivity and cost-displacement to more strategic objectives. I apply the information-processing view which I developed in the previous chapter to indicate strategic uses for OS.

3.1 The benefits of IT.

Investment in new technology occurs for three broad types of reasons: increasing efficiency, increasing effectiveness, and improving strategic position (Lockett, 1988). Increasing organizational efficiency involves improving the ratio of inputs to outputs (Hofer and Schendel, 1978). Increasing effectiveness means improving the ratio of benefits to costs, for example by improving quality, performance and flexibility. 'Efficiency is productivity (output over input); it is cost-oriented; it is concerned with internal performance, action without waste, doing things right. Effectivenesss is value (benefit over cost); it is results-oriented; it is concerned with doing the right things' (Synnott, 1987, p. 74). Meyer and Boone (1987) refer to cost-displacement versus value-added benefits. The former focus on efficiency and productivity, while:

> value-added applications make the user more effective, although they do not necessarily save time. The effectiveness has leverage on a greater portion of the organization - it in turn produces profits, making many others more productive.... The term 'value-added' refers to those applications that focus on organizational effectiveness.

Strategy concerns the way in which an organization seeks to match its distinctive competences and outputs to its environment, so as to realise its goals - above all, organizational survival. Competitive strategy involves positioning so as to achieve a sustainable comparative advantage in competitive markets (King *et al.*, 1988). While efficiency, effectiveness and strategic benefits are analytically distinct, technological and structural innovations are often introduced to obtain several types of benefits at once. Also, efficiency and effectiveness often promote a particular business strategy. Nevertheless, the term 'strategic' implies a higher order of benefit, which will not only help the organization to perform more effectively but to perform excellently, compete successfully, or to survive.

As we have seen in Chapter One, there has been a general concern about failure to realise returns from IT investment (Child, 1987; Strassman, 1985). One explanation is that benefits exist but are not visible or are passed on to the consumer. Another explanation is that the lack of payoff to firms is real, and has occurred because investment has been applied to low-payoff areas or has not been accompanied by any real change in the way the organization worked or was organized. Franke (1989) speculated that technological change would not produce productivity improvements until experience in producing and using the technology had been accumulated.

Another reason it is difficult to measure real benefits is that the nature of the benefits sought tends to change as experience with the technology gathers. Mohrman and Lawler (1984) have distinguished three kinds of change: alpha change, which is a change in the level of existing outputs; beta change, the adoption of new standards for the same kind of output; and gammma change, which is non-comparable change, meaning that things are done differently, there is a new world view, and hence a redefinition of effectiveness. Information technology, because of its cybernetic nature, is often adapted by users to achieve new goals. A focus on achieving only low-level, alpha objectives will lead to disappointing results.

There is a correspondence here with Naisbitt's idea (1984) that technology goes through three stages: initially it takes the line of least resistance and is used in limited areas; in the second stage, it is used to improve existing products, and in the third new uses are found growing out of the technology itself. The kinds of objectives sought tend to change with the development of technology, which makes possible new applications.

3.2 The objectives of office automation.

As we have seen in the previous chapter, there has been a general problem of making office systems meet business needs. This was caused partly by the limitations of the technology itself which made integration difficult, but also by management's focus on traditional capital investment criteria and computerising routine work at lower organizational levels. With very few exceptions, organizations have invested in office automation and office systems in order to increase efficiency, increase productivity, save costs, or avoid future costs. The cost-displacement objectives of the DP era persisted into word processing and beyond into office automation. The studies conducted in the 80s showed that the focus of generic OA continued to be on cost savings and improving the productivity of typists, secretaries and clerks. (Pritchard and Cole, 1983; Long, 1987, Gunton, 1988; King *et al.*, 1988). The NCC's 1984 postal survey of 750 UK and 750 U.S. organizations (1986) found that organizations on the whole applied the same kind of justification requirements to office technology that were applied to DP and as a consequence 'most were still concentrating on the short-term productivity benefits of automation'.

According to the survey on office automation conducted recently by the Institute of Administrative Management and Touche Ross (1991), this attitude to office automation/systems is still by far the most common one. The survey found that nearly all the benefits sought by OA users were efficiency benefits at the task level, and OA was aimed primarily at administrative and clerical workers.

The problems with a focus on efficiency and productivity are, first, that the benefits themselves are small and difficult to realise, and second, that it diverts attention from the much greater benefit to be gained from increasing effectiveness and organizational performance. The well-known Booz, Allen and Hamilton study (Data General Corporation, 1983) of office

productivity calculated time savings of 15%, which was supported by NCC research (Wilson and Pritchard, 1983). However, these could only be converted into cost savings if employees were able to use the time saved in productive ways, or by reorganization or reduction of staff numbers (Farmer, 1988). Strassman found that when IS/IT was used to automate repetitive information intensive tasks the return on investment was much lower, only 5-10% (Ward *et al.*, 1990). The IAM/Touche Ross survey found that a third of users did not think that OA had yielded significant benefits to their organizations, and there were direct savings in less than 15% of projects. 78% experienced either no change or an increase in staffing levels. However, over half of users sought, and thought they had attained, the objectives of better management of the business, increased productivity, and improved information flows.

Lack of understanding of what OA is supposed to do, and of how it can be cost-justified, have resulted in low take-up or failure to invest. The non-users in the IAM/Touche Ross study gave as their reasons for not investing in OA: no clear office systems strategy (48%), costs (44%), unclear or intangible benefits (35%), unsure of what OA can do (23%). The main benefits they would have anticipated were improved information flow (80%) and better management of business (just over 50%). The suppliers' focus on efficiency and cutting staff costs and paper have obscured the true gains which could be made in terms of effectiveness, performance, and job satisfaction.

There has also been reluctance to invest large sums in what are seen as merely administrative systems, which are assumed not to have any major impact on performance or competitiveness, and whose costs therefore must be kept as low as possible (Price, 1979; King *et al.*, 1988). Cost justification is complex because of the intangible and in many cases unquantifiable nature of the benefits, especially when users are managers and professionals. Value-added benefits in particular may not be sought because they are intangible and therefore often difficult to cost-justify (Price, 1979; IAM/Touche Ross, 1991; Meyer and Boone, 1987).

> As the benefit potential shifts from savings, which provide a measurable target, to business improvements, dubbed the 'intangible benefits' area... future computer applications will increasingly involve the company in speculative, business risk. In this respect, much of tomorrow's IT investment will be no different from any other form of strategic innovation. (Price Waterhouse, 1988/89.)

The systemic nature of OS also presents difficulties in justifying the investment:

> One of the main obstacles to the implementation of the more wide-ranging facilities of office automation is undoubtedly the difficulty of justifying the total system by adding together the cost-effectiveness contribution of each of the elements of the system.... office automation is less of a series of 'applications' than an 'enabling environment'. It will not always be easy to attribute benefits to the presence of a device such as a terminal and those benefits may arise somewhere other than where that terminal is sited (Hughesdon, 1984).

As part of the current research, I conducted a mail survey of 250 leading British

companies in order to find out the extent of use of office automation/office systems and the companies' objectives in investing in them (details of the research are given in the Appendix to the chapter). Of the 41 who replied, 27 used office systems, and a further 8 planned to introduce them within the next two years. Although the response rate was too low (and probably skewed towards OA users) to generalise about the extent of OA use, the results on the main objectives in investing in office systems contrast with the IAM's survey. In this study, 83% of those replying saw office systems as important to their company's strategic objectives, and use of office systems was related to the perception that they are strategically important.

Improved communications and customer service were clearly the leading strategic objectives (Table 3.1 in the Appendix), followed at some distance by cost reduction and improved management control. Co-ordination of functionally and/or geographically distinct parts of the organization (not easily distinguished from communications), was another important theme. Many respondents had both effectiveness and efficiency in mind in considering the strategic use of office systems, but in general, effectiveness outweighed efficiency issues by about 3 to 1 when office systems were considered in relation to MDs' strategic objectives. This study therefore indicates that while efficiency and cost reduction are important, effectiveness and strategic issues such as better communications and internal co-ordination, customer service and responsiveness outweigh them as reasons for OA investment.

One cannot be sure of the reason for the apparent conflict with the IAM/Touche Ross findings, but it could be due to characteristics of the sample, ie. the nature of the organizations and the level of the respondents surveyed. Unlike the IAM study, the organizations were selected for their high performance, and the respondents were chief executives. One would expect this group to be more likely to think strategically about their IT investments than a cross-section of managers and organizations. Another possibility is that office automation/systems were defined differently in the two surveys. The CMRU findings are consistent with the those of the Price Waterhouse IT Review 1989/90 to the effect that the benefits sought from IT generally are moving from savings and coping with data to more intangible and strategic ones.

3.3 The strategic use of IT.

This section draws on the IT and corporate strategy literature and organization theory to suggest how integrated office systems can provide strategic benefits.

One response to the disappointing experience with generic OA and low take-up was the view that real benefits could not be gained from generic OA, but from either DP (cost savings) or from business-specific, bespoke applications, which 'have a direct impact on the main function of the organization - that is, they affect in a significant way the "customer" or the service provided' or 'specific operational applications intended to improve operational procedures associated with a particular business function.' Clients were advised to begin implementing IT with specific business applications and to add on generic OS later (Farmer, 1988.)

However, it is not that clear that business-specific applications must always be built first. In integrated systems, generic office facilities can be linked to specific applications, used as a front-end into them, or may be used as a prototype for discovering or designing specific applications (see the Tetrapak and Bank of Scotland cases in Chapter 4). Also, strategic applications may grow from the use of generic OA, especially with user learning and innovation. It is the integrated character of office systems not the business-specific applications which provide strategic advantage, as is shown below.

Strategic applications for IT became in the 1980s a sort of Holy Grail; academic authors and consultants vied to show they had the best means of finding them. Those (known and publicised) examples where IT had demonstrably provided competitive advantage appeared in one textbook after another, and various schemes for matching IT strategy to corporate strategy were devised. Integrating IT with the business also became a major concern of practitioners. Price Waterhouse found that in 1988 the top issue of concern to DP managers was integrating IT with corporate strategy. 'For the first time, a technical concern with making the computer work has been ousted by a management concern with making it work for the company.' At the same time the benefits sought were moving from savings and coping with data to more strategic ones: 'follow-the leader applications, tying-in customers, suppliers, resources, etc., improved sales through IT enabled marketing strategy, product improvement and distribution systems'.

However, doubts emerged whether there were in fact many applications of IT which could confer a sustainable competitive advantage, ie. one which would not be immediately wiped out by competitors catching up (Scott Morton, 1991; Finlay, 1991). The problem for most organizations was not so much being the innovator as matching the industry standard. Any lasting advantage for the pioneers might be, not the specific application itself, but the experience and organizational learning which had gone into finding and implementing it, which could provide a higher platform for further innovations (Porter, 1985). It is also doubtful whether strategic applications will be found through strategic planning procedures which may be slow, cumbersome and excessively bureaucratic. The evidence is that most strategic applications have been discovered by users (Ward *et al.*, 1990; Meyer and Boone, 1987). In any case, it appears that some of the most widely-publicised methods and strategic planning for IT are not used by many companies, and strategic uses of IT to deal with the marketplace or other aspects of the environment are not being found as a result of the information technology strategy formulation process (King *et al.*, 1988; Galliers, 1988). It is difficult to link IT to strategy because of 1) the nature of the corporate strategy formulation process (or in some cases, entire lack of it), which Turner (1986) has described as diffuse, covert and obscure, 2) problems of communications between IT specialists and top managers, few of whom understand IT.

Although the strategic IT literature is rationalistic in its assumptions, it helps provide a very useful focus on how information technology could be deployed to serve the mission and

strategy of the organization as a whole, as well as ways of identifying strategic applications. There is considerable convergence on the idea that IT can be applied strategically in four main areas: 1) external links, 2) internal integration, 3) new or improved products and 4) executive support.

Ward *et al.* (1990, p. 22) abstracted from 150 empirical examples four main types of strategic systems:

1. those that link the organization via technology based systems to its customers/consumers and/or suppliers
2. those that produce more effective integration of the use of information in the organization's value adding process
3. those that enable the organization to develop, produce, market and deliver new or enhanced products or services based on information
4. those that provide Executive Management with information to support the development and implementation of strategy.

Venkatram (1991) identified five 'levels of IT-induced business reconfiguration':

1. localized exploitation, where the concern is with efficiency only;
2. internal integration, which aims to increase all three types of benefits;
3. business process redesign - similar to the value chain;
4. business network redesign - external links with suppliers;
5. business scope - new products.

The first two levels are achieved in an evolutionary way. The changes required for Levels 3-5 are revolutionary, in that existing business processes are no longer treated as a constraint on the IT infrastructure, but 'the basic logic for configuring the business activities itself is questioned' (p. 137). He argued that technology push and competitive pull would force firms to reconfigure. Earl (1986) had also argued that IT could be applied strategically to facilitate new ways of managing and organizing, and to develop new businesses.

One of the main findings of the Management in the 90s programme was that IT enabled integration of business functions including: within the value chain; end-to-end links of value chains between organizations; substituting part of the value chain via subcontracting or alliances; internal or external electronic markets (Scott Morton, 1991). Benjamin and Scott Morton (1986) argued that the steadily improving cost-performance ratio of IT and ability to improve interconnection led to new cost-effective applications, allowing new products and new forms of integration of organizational forms and processes which support strategy. They saw technical integration, especially interconnectivity and data accessibility, as fostering:

1. process integration between several people or groups;
2. functional integration - combining, rearranging, eliminating the process performed; changing functional boundaries, e.g. between engineering and manufacturing in product development;
3. inter-organizational integration.

Rockart and Short (1988) saw the contribution of IT to corporate strategy as lying in the

effective management of interdependence, which is the need to 'achieve concurrence of effort along multiple dimensions of the organization', ie. between product, functional, and geographic divisions, and within each dimension. From empirical research, they found IT enabled integration in six organizational contexts:

1. across the value-added chain in the three main functions: new product development, product delivery, and customer service;
2. within functions, improving co-ordination across sub-units;
3. supporting team-based work via 'groupware', including email, voice mail, computer and video conferencing;
4. planning and control for senior managemnt - team-based planning cycle may be conducted on-line via a network;
5. between line businesses and IT function;
6. inter-organizational.

3.4 Strategic uses of office systems.

In a parallel to the strategic use of IT, Wainwright and Francis (1984) argued that office automation enabled an organization to: improve co-ordination of the same activities; take on new tasks, enter new markets, expand operations; and adopt different structural forms. Gerstein (1987) identified three major areas where OS could provide potential benefits: enhancing the organizational infrastructure, especially through improved communications; providing tools for effectiveness, such as document management and support for group working; and redesign of the work process by automating the flow of work.

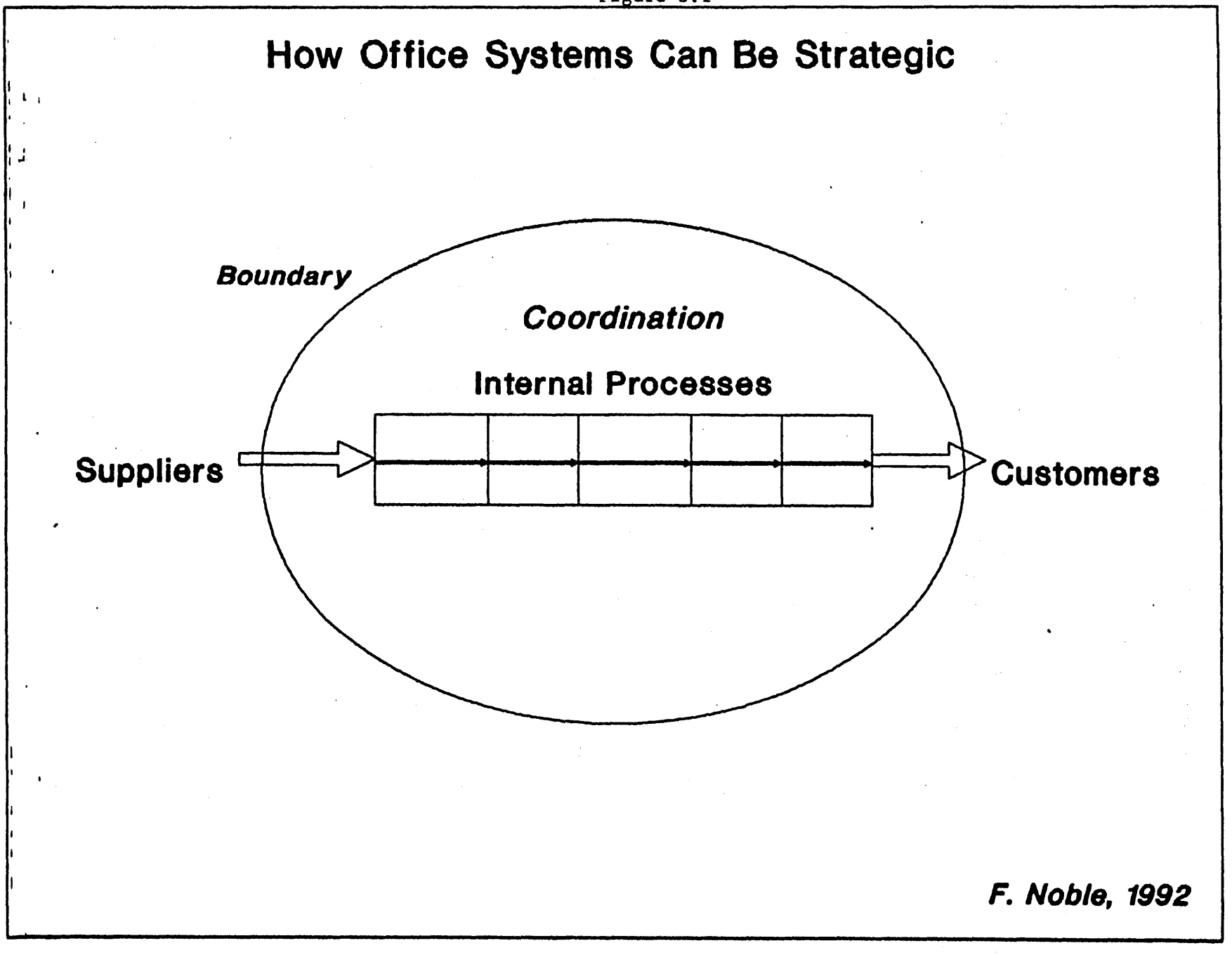
Office systems, integrated systems in particular, are strongly implicated in the organizational integration strategies discussed in the strategic IT literature. These include integrating the value chain, links to customers and suppliers, computer-mediated group working (team support), and organizational infrastructure. They can be seen either as part of the delivery system, or as a platform for it, because they can provide the common 'front-end' through which links are accessed, especially electronic mail, data bases and group working.

Three of the main strategic uses of IT which I have abstracted from the IT strategy literature (external links, internal integration, and executive support) can be related to the information-processing view of the office which I derived from organization theory and discussed in Chapter Two. Information needs are greatest 1) in internal processes, especially in primary tasks where the information content of product or process is high (internal integration); 2) in areas which span the boundary between the organization and the environment (external links, some aspects of executive support systems; 3) in co-ordinating the relations between the core and boundary-spanning areas, and among other organizational units (internal integration, control aspects of executive support) (Figure 3.1.) Each of these is discussed in turn below.

3.4.1 Internal process integration.

As we have seen, uncertainty arises from task variety and complexity (Perrow, 1971) and from the interdependence of subunits which work together to perform the primary task

Figure 3.1


How Office Systems Can Be Strategic
Boundary
Coordination
Internal Processes
Suppliers
Customers
F. Noble, 1992

(Tushman and Nadler, 1978). Although this interdependence is usually thought of as linear and sequential, it often includes a great deal of reciprocity, and processes can also be intensive, extensive, or mediating (Thompson, 1967; Mason, 1984) (Figure 3.2.) Much office work consists of these non-linear conversion processes (Pava, 1983).

In intensive technologies (Thompson, 1967), many inputs go into a single unique object, as in a custom product or human services. In the office, this type of technology is represented archetypically by the case management or case processing system (Mason, 1984). Producing a document which is a joint effort, or preparing a bid which involves several different departments is also of this type. Computer-mediated group work and electronic document management are especially relevant to this kind of technology (see the Training Agency, GKN and BAe cases in Chapter 4).

Mediating technologies match diverse inputs to diverse ouptuts; the brokerage firm is the exemplar, but the type also includes estate agents, airline reservations, dating bureaux, banks and other financial institutions, which use information to identify and service suppliers and customers and match them. Here information is central, and the application of IT is a major source of competitive advantage. (See the Bank of Scotland case in Chapter 4).

Extensive technologies produce diverse outputs from a single input, such as oil refining. The application of IT here is in support of OR models which aid allocation decision-making.

In internal operations, OS can improve integration between interdependent activities and for complex tasks, better understanding of what is happening within each activity. The benefits are improved efficiency and speed of processes, reduced costs and improved customer service (e.g. on-time delivery with reduced inventory (JIT)), leading to greater competitiveness. Application of IT to internal operations can therefore support different generic competitive strategies (Porter and Millar, 1985) and is a particular factor in time-based competition (Stalk and Hout, 1990).

Porter (1985) has shown how IT can be applied strategically to internal processes within functions and between functions across the value-added chain, the input-output or transformation process by which the firm creates value (Porter and Millar, 1985). The idea of the value chain focuses attention on work and information flows, on interdependencies which exist between activities which may well cross functional boundaries, and how to reintegrate them. Within the chain, every activity has both a physical and an information-processing component, the balance between the two varying by industry and also historically. The greater the information intensity in the value chain, the more strategic IT will be, because information is used to co-ordinate and smooth the flow of activity from one stage to another, and as a factor of production at any individual stage (Mason, 1984).

The value chain applies above all to primary activities, which are not however identified exclusively with operations; they include inbound logistics, outbound logistics, marketing and

Inputs:		
One Distinctive	Long-Link Technology	Extensive Technology
Many Distinctive	Intensive Technology	Mediating Technology

Figure 2. *Long-Link Technology*

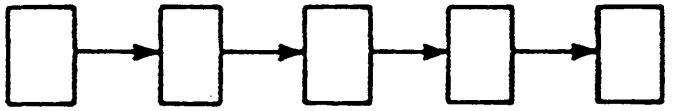


Figure 3. *Extensive Technology*

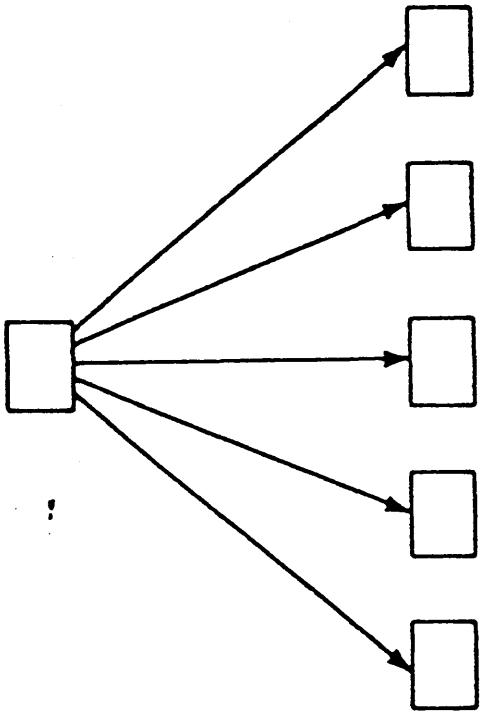


Figure 4. *Intensive Technology*

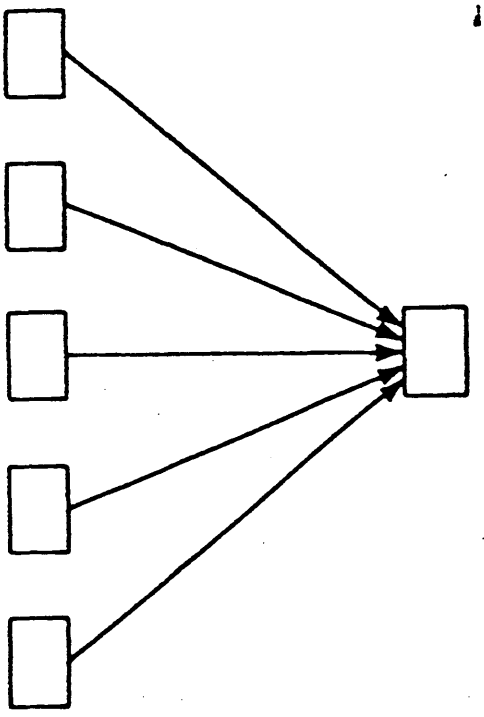
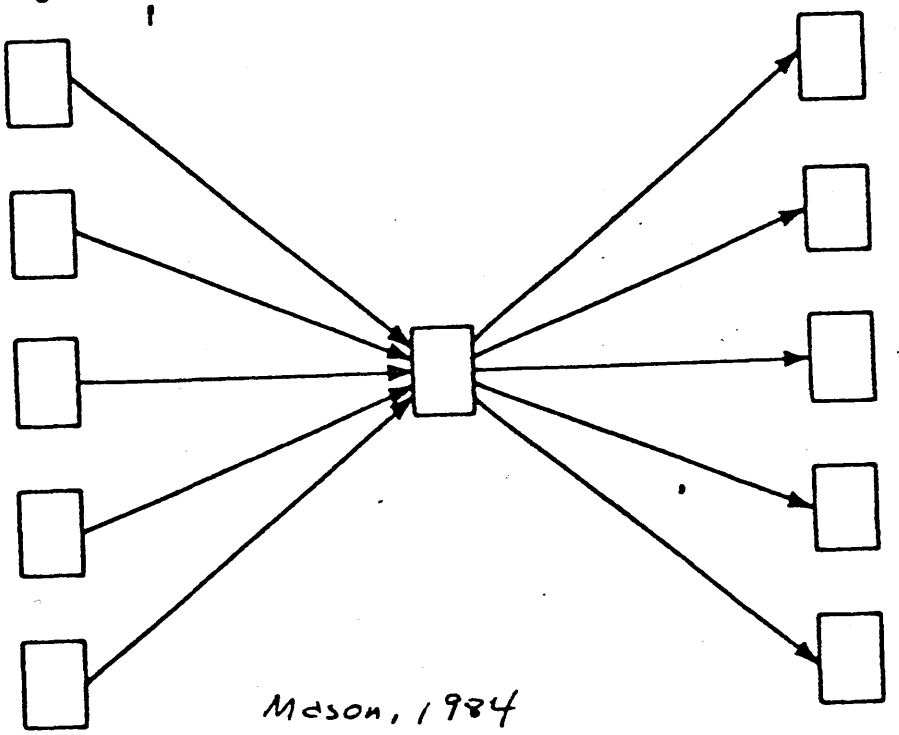


Figure 5. *Mediating Technology*



Mason, 1984

sales, and service (Figure 3.3) - all activities with a high information-processing component, many of which are carried out in or from offices. The value chain concept can also be applied to secondary tasks or support activities, most of which are carried on in offices.

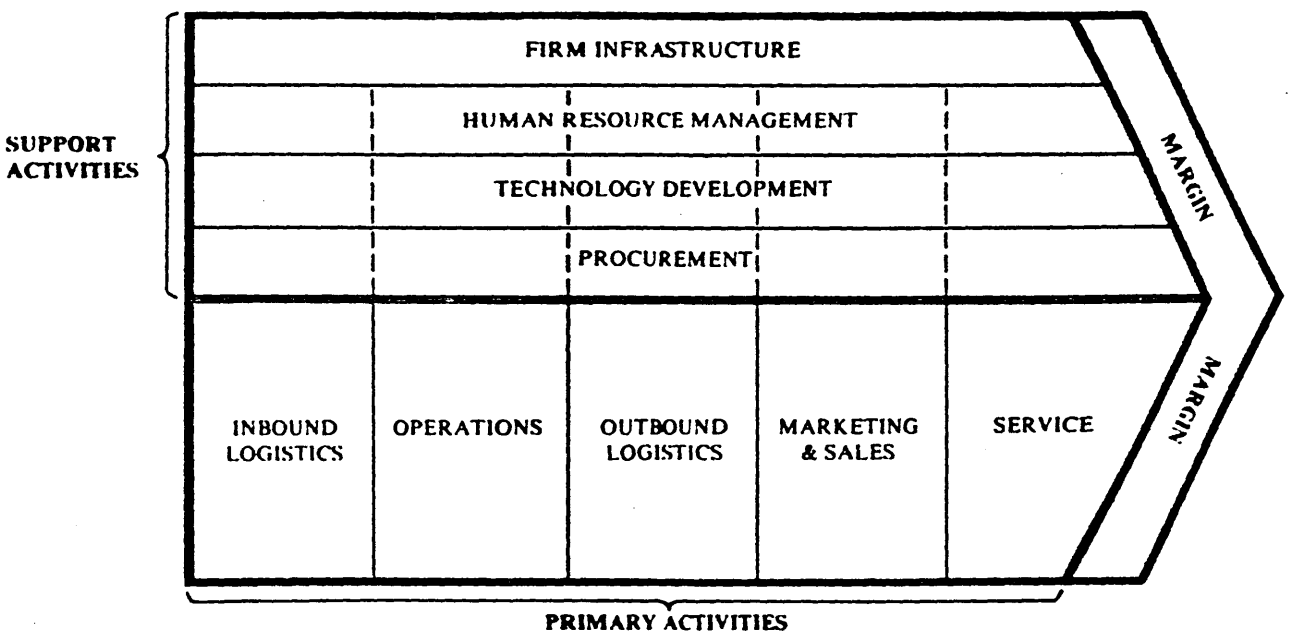
Porter (1985) intended that the value chain idea could be applied to any industry. Obviously, the kinds of offices in which the value chain concept has the most strategic application are primary activity offices. However, the ability to co-ordinate linkages between parts of the value chain, and between primary and support activities, where IS may be essential, can also be strategic.

The value chain does not necessarily correspond to existing organizational demarcations or functions; it provides a broader perspective on organization structure and suggests how functions could be reorganized to promote effectiveness. Hammer (1990) develops this theme in his article on reengineering work processes, in which he argues IT should be used not to mechanise old ways of doing business, leaving existing processes intact, but to radically redesign business processes. The technology which facilitates this includes shared databases, computer networks, and expert systems. The potential benefits are staff reduction, faster turnaround times, and staff job enlargement. Fundamental processes must be identified in terms of what they are trying to accomplish, ignoring functional divisions. Linear processes can be compressed, and jobs designed around outcomes rather than specific tasks - the jobs of the 'case manager' and 'customer service representative' are given as examples. If work is reintegrated in this way, decisions are made by those who do the work and controls built into the processes, the need for managers to supervise and co-ordinate it is also reduced. Hammer's examples are all of office work. Venkatraman (1991) similarly argued that organizations should aim to 'reconfigure the sequence of tasks to better exploit IT capabilities'. Reconfiguration is not simply a consolidation of stages but a 'reassessment of the fundamental logic of the business process' (pp. 137-8).

Time-based competition is one of the strategic reasons for process redesign. The need for speed of response is a driving force behind highly-coupled integration and communication systems (Gunton, 1989). Rockart and Short (1988) showed how IT could provide tighter coupling both within and between the three main areas of organizational activity: product development, product delivery (which includes but does not equal manufacturing), and customer service. All three are major factors in competition (Stalk and Hout, 1990), and can be speeded up by IT-enabled process integration across functions (Keen, 1986; Benjamin and Scott Morton, 1986).

The IAM/Touche Ross report also found that successful OA projects support or automate specific business processes rather than individuals, and are targeted at work groups whose 'job functions are directly related in performing a specific business activity'. They recommend that an organization planning to implement OA 1) identify key workgoups, 2) analyse key functions and tasks, 3) determine information flows, 4) decide on revisions if necessary to existing pattern of working, using O & M and business systems analysis to develop a system to meet the needs of

Figure 3.3


FIRM INFRASTRUCTURE
HUMAN RESOURCE MANAGEMENT
TECHNOLOGY DEVELOPMENT
PROCUREMENT
SUPPORT ACTIVITIES
MARGIN
INBOUND LOGISTICS
OPERATIONS
OUTBOUND LOGISTICS
MARKETING & SALES
SERVICE
MARGIN
PRIMARY ACTIVITIES

the group.

The idea of business process redesign is being applied by in the U.K. by organizations such as Reuters, Rank Xerox, and National Provincial, and by management consultants Nolan-Norton/KPMG and the Butler Cox Foundation. It has been carried out extensively in the U.S. by Texas Instruments, Ford, Kodak, Motorola, Hallmark Cards, AT&T, IBM Credit and Bell Atlantic (*The Financial Times*, 24 May 1993).

3.4.2 Spanning boundaries.

OS can be used in three main boundary-spanning areas: 1) customer response; 2) inter-organizational systems, in the supply chain; 3) in surveillance and strategic planning functions such as marketing and competitor analysis, where both external databases and expert systems are applicable.

A logical extension of the internal value chain is across organizational boundaries to customers and suppliers. These boundary-spanning activities are information-intensive and primarily office functions, and many of the well-known strategic IT examples come into this category (American Hospital Supply, American Airlines). The improvement of what Porter (1985) calls 'vertical linkages' between the firm's value chain and those of suppliers, distribution channels, and buyers, can benefit both parties and provide strategic benefits. The supply chain is a main focus of time-based competition (Stalk and Hout, 1990). Information systems can play an important role in joint optimisation of activities on both sides and improved co-ordination between chains. They also can provide greater responsiveness to customers, with faster delivery and turn-around times. They depend not only on creating electronic links, but on a good IT infrastructure. The export insurance case study is an example of improved customer response, faster delivery and turn-around times.

3.4.3 Organizational platform/infrastructure.

The integration of business activities through an IT platform is the distinguishing feature of Venkatraman's (1991) second level of organizational transformation. He envisages it as a combination of technical and organizational integration, which will be strategic in that it will 'permit exploitation of efficiency-related benefits of compression of time and distance as well as effectiveness-related benefits of information sharing across the business process'.

An organizational IT infrastructure may be seen as providing considerable effectiveness benefits and thus be implemented for these reasons. It is also strategic in that it provides the necessary base for strategic applications (Venkatraman, 1991). According to Scott Morton (1991, 20) 'a robust information technology infrastructure..., including an electronic network and understood standards', is one of the preconditions of successful organizational transformation. But such an infrastructure can also be strategic in its own right as a major factor in organizational co-ordination.

According to the MIT research, many fewer organizations say they have reached this level

than the first one, but that 'a major initiative among leading corporations is the creation of an IT platform that could permit organizational integration of their business processes' (p. 132). According to Chris Yapp of ICL, 80% of organizations are now struggling with this stage. The survey of MDs I carried out for this project indicated that improved communication was the main objective for implementing office systems. Major computer suppliers such as IBM and DEC (see case studies) have already created such platforms, and American Airlines is implementing one (Hopper, 1990). Another example from the case studies is Tetrapak.

3.4.4 Designing new organizations - the new management paradigm.

A fourth strategic application for office systems, which emerges from those just described above, is enabling the design of new organizational forms.

The emphasis of the 1980s was on how to use IT to support existing corporate strategy, which was derived from matching the firm's capabilities to its environment. By the end of the 80s, technology had come to be seen as an environmental factor in itself, which should be taken into account in the formulation of strategy. The continuing order-of-magnitude improvements in cost/performance ratios were seen as making possible new strategic choices.

What seemed to stand in the way of these choices being made was the persistence of bureaucratic organizational forms (Andriessen, 1991) and the continued attachment of management to an organizational paradigm rooted in the previous technological era. As we have seen, there is a lag between the introduction of new technology and the making of the organizational changes necessary to exploit it successfully (Child, 1987; Franke, 1989). Liu *et al.* (1990) have argued that the existing technology system is stagnating because its designers share an outdated paradigm for organizing:

> new technologies have immediate effects on the contents of jobs and on skills and qualifications, but for a while, they do not modify the existing organization. However, the old organization design increasingly becomes sub-optimal with respect to the possibilities the new technology creates...from that point on, a new form of organization that was at first only marginally applied, gains importance and diffuses, because it provides ways to apply the new technology for producing new products with superior performance and/or radically reduced production costs. (p. 10)

Freeman, Perez and Dosi (Dosi *et al.*, 1988) have similarly argued that IT represents a new techno-economic paradigm, having pervasive effects throughout the economy at national and global level and requiring organizational and institutional change.

Freeman, in one article, refers to these ideas as 'the new technological determinism'.

> just as the process of world-wide diffusion of major technical innovations is a prolonged one, taking several decades or even longer in some case, so is the process of diffusion of managerial and organizational innovations at enterprise level, and of social innovations at national level. This applies especially to those organizational and social innovations which have facilitated and accompanied the most radical technological innovations and there are numerous examples of this interdependence in the world-wide diffusion of new technologies, such as the assembly-line or, at an early stage of industrialisation, the applications of steam power. Both of these entailed major changes in the structure of

> industry and in management systems as well as in much new machinery and equipment (Freeman, 1987).

Discontinuities arise while organizations seek to discover the forms which are needed to exploit the technology. Firms which are successful in adapting their organizations will succeed with the technology and in the marketplace, so that eventually all competitors will be forced to adopt the same forms.

Freeman *et al.* do not specify the kinds of organizational changes required; however, Liu *et al.* hypothesise that: work will be organized to regulate unpredictable variances, not routine tasks; co-ordination need not be separated from production; the organization will be more concerned with open process, having rationalised and computerised as much as can be, and will manage complexity more than reduce it: organizations will be 'designed as explicitly collective learning processes' (p. 18).

The need for flexible organizational response to an unstable or turbulent environment is a truism of contemporary organization theory. Mintzberg for example has argued that a dynamic, complex environment requires a decentralised, organic organization and co-ordination by mutual adjustment (1979). According to Kanter (1985), innovative companies are integrative, in that they are:

> matrix-style,
> have vague and ill-defined roles, overlapping territories (redundancy), encourage team work,
> have an integrative, participative management style,
> lateral relations more important than vertical,
> less emphasis on efficiency, quantitative measures,
> strong local autonomy.

These interrelated and consistent policies regarding organization structure, human resource management, business strategy and other aspects of organizations can be seen to represent a new management paradigm.

Work from manufacturing has also suggested what the features of a new organizational paradigm might be. According to Child (1987), flexible response to an uncertain market environment and successful exploitation of AMT (advanced manufacturing technology) appear to require:

> multi-skilling, role convergence, multi-functional teams
> integrated control, devolved initiative ('simultaneous loose-tight properties')
> rapid mutual adjustment, high degree of integration between groups and levels.

Whiston (1989) has argued that greatly increased organizational integration must occur for technological integration in manufacturing to be successful:

> (firms) begin to evolve toward an integrated free-flowing anatomy (in short, an organic unit with many operational feedback loops) to develop further the market sensitivity and

effectiveness of delivery to the marketplace of the total system (pp. 580-1).

> Full effectiveness is reached when the shop-floor operatives are much more fully involved and participative in the total operative system; when the management hierarchy layers are reduced and when... departmental functions - R&D, marketing, design, operations - are much more closely interwoven into a much more organic unit (600)

IT researchers have long anticipated that IT could be used to redesign organizations (Beer, 1974 and 1981). Checkland, for example, had written in 1978 that if an organization were treated as a system of information flows, it could be 'usefully treated as a net of semi-autonomous work groups linked by an information network' (1990, p. 77). Since then, a number of other writers have seen information technology as 1) facilitating 2) making possible 3) requiring, the kinds of organic structures which organization theorists and management educators had been advocating for many years. IT becomes a tool for 'organizational transformation' (Scott Morton, 1990).

Malone (1985, 1988, 1991) uses economic arguments based on Williamson's transaction cost theory. He argues that computers have been applied successfully to the production function and can now be applied to their second major function, which is co-ordination. If organizations group to minimise the costs of co-ordination (ie. communication and decision-making), the cost of co-ordination is one of the main influences on structure. According to Malone, IT reduces the unit costs of co-ordination - the transmission and processing of information - and may therefore lead to a shift back from less to more co-ordination-intensive organizational forms, e.g. from product hierarchies (divisionalised form) to functional hierarchies (centralisation of some functions, such as R&D), or to decentralised markets (to retain maximum flexibility). IT will lower the transaction costs of markets, leading organizations to replace vertical integration with the use of external suppliers. This can be seen in both the DEC and IBM examples in the case studies. Another consequence of the reduced cost of co-ordination will be increased use of internal markets:

> For example, the widespread use of electronic mail, computer conferencing, and electronic markets can facilitate what some observers have called 'adhocracies', that is, rapidly changing organizations with many shifting project teams composed of people with different skills and knowledge. These organizations can rely heavily on networks of lateral relations at all levels of the organization rather than relying solely on the hierarchical relations of traditional bureaucracies to co-ordinate people's work.

This is illustrated in the case studies by DEC.

Rockart and Short (1989, 1991) incorporated the idea of IT-enabled networks into their earlier argument concerning organizational integration. They never define the concept of networks very clearly, but what they imply are electronic communication networks (presumably based on electronic mail) which provide horizontal and vertical linkagaes, on an ad hoc basis as necessary. Networks are neither part of the formal nor the informal structure but a

'communication-rich environment', which is seen as critical to managing interdependence. They allow firms to maintain or increase their size and complexity and still be responsive to the environment; they therefore affect both structure and strategy. Applegate, Cash and Mills (1988) have also argued that IT enables large organizations to have the advantages of small ones. 'Cluster' organizations (network or adhocracy) present new options for managerial choice of organization structures, management processes, and human resources management.

Huber (1984, 1990, 1991) and Huber and McDaniel (1986) argued that environmental complexity and turbulence, together with the increased availability of information, require organizations to engage in better and faster decision-making, adaptability and innovation. The increased data storage, transmission and processing capacity of advanced IT facilitates communication across time and space, faster and better organizational intelligence and decision-making. IT will affect organization design because it affects central organizational processes. The environment and competition will eventually force organizations to use IT to support organizational goals; managerial intention will play more of a role as experience is gained. New organizational forms ('symbiosis') will appear, especially where the product is knowledge or knowledge-based. They also foresee the use of adhocracies, network organizations, and the increased importance of organizational learning (Huber, 1991).

Keen's (1991) analysis is that organizations attempt to meet environmental complexity by increasing their organizational complexity, which leads to many problems. IT platforms enable organizations to reduce their complexity by simplifying work procedures and co-ordination (via video conferencing, groupware, EDI, telecomms), making firms location- and structure-independent (interfirm networks), and supporting teams of specialists.

Drucker (1988) has gone further and suggested that IT and knowledge-based organizations require a different kind of organization, specifically: 1) reduced management levels and numbers, 2) more expertise in operations, rather than in central management, 3) more knowledge at lower levels, 4) organized around task-focussed teams, rather than (functional) departments, 5) increased individual responsibility. All this is to be achieved by 1) a shared mission with clear simple objectives, and 2) self-control of work and performance via feedback.

Andriessen (1991) carefully reviewed research on the organizational effects of the communication aspects of IT. While qualifying the notion of impacts (see Ch. 5), he concludes that electronic mail, computer conferencing, and video conferencing do increase the efficiency of existing communications, increase interactivity and therefore foster the growth of groups. Organizational communication and collaboration are thereby improved. IT however does not entirely replace face to face meetings, especially for negotiations, and while some remote working is popular with professionals, teleworking is not replacing traditional patterns of employment. He concludes that the organizational implications of the use of electronically-mediated communication are: increased interaction across vertical and lateral boundaries, and therefore less

hierarchical structures; rapid co-ordination via mutual adjustment; more use of markets, networks, and interfirm collaboration. The reason that more organizations have not adopted the technology is that it requires a completely new management philosophy, 'non-Tayloristic and non-bureaucratic', which is either not suited for or not acceptable to all of their units. But it may come about as a result of conscious strategy (adaptation to market forces) and unintended change from below. The very thorny issue of how to implement a new organizational paradigm is discussed in Chapter Six.

Chapter Four

The Case Studies

Introduction

As discussed in Chapter One, the research included fifteen case studies, seven 'snapshots' and eight more extensive ones. They all illustrate the different perceptions, uses of and objectives for office systems, and the trend towards integration discussed in the second and third chapters. The more extensive studies also provide material on implementation and organizational change, which are the topics of the next two chapters. Although the case study material has been used to illustrate general points made in other chapters, they are presented here in full so they can be understood coherently, in context. The brief case studies are grouped together and analysed first, followed by the longer ones. The individual cases are organized under the headings: Background, Initiation and Objectives, Design (a brief description of the system, especially the degree of integration), Implementation, Outcomes and Organizational Change (where appropriate).

4.1 Snapshots.

1. BRITISH AEROSPACE MILITARY AIRCRAFT DIVISION 1990

Background

The BAe Military Aircraft division is an example of the use of an office system for administrative support, which had unanticipated strategic benefits. Each of the highly independent businesses of British Aerospace does its own IS planning; however, BAe as a whole had decided in 1986 to standardise on DEC, although IBM DISOSS was still in use at some sites. Bridges had been built between the different businesses, although they do not ordinarily need to communicate except in customer-supplier relationships. BAe has a private global network for messaging, but this was used abroad mainly by travelling staff. The Military Aircraft division occupied six sites, employing 3000 people in 1990. The finance and technical departments already had information systems.

Initiation

Plans were developed in 1985 for office automation covering two sites and 1200 users in Kingston and Weybridge, partly because the limits of the capacity of the existing VAX had been reached in any case and would have had to be supplemented by another VAX. Kingston was already running All-in-One for 200 users. The plan was to provide individual office support to management and professional staff and their secretaries, to provide access from anywhere within BAe via the internal communications network and worldwide by use of dial up links, and to provide managers with access to general and national business information. Links were to be provided so that users at these sites could communicate with other sites, including non-All-in-One services (an emulator allowed connection to ICL services and a DECnet/SNA gateway allowed connection to IBM).

Objectives

It was recognised that the system would be difficult to cost-justify, but OA was anticipated to be cheaper than meeting the demand for computer facilities separately. Cost reduction was important because government contracts were no longer on a cost-plus basis. The objectives for the system were to increase administrative and management productivity, control staff costs, reduce paper, and increase communications. The IT manager also saw it as a way of controlling PC use, and saving valuable data otherwise lost on PCs. But investment was on the whole an 'act of faith'.

Design

The system installed was based on DEC equipment and All-in-One. Telex, phone messages, and external document transfer were available from computer, and they were looking forward to having fax and telephone on as well. The system had few links with manufacturing. Small applications were developed centrally for user departments.

Outcomes

The IT manager found it difficult to evaluate quantitative benefits but secretarial and other administrative staff had been reduced. There had been no organizational change except for the role of the secretary, who had become more of an administrative officer. 'Even' senior managers were beginning to use the management information systems. There had been an estimated improvement of close to 7% in management productivity, but this had not resulted in there being 7% fewer managers, and the whole question was regarded as a joke. The OS could facilitate organizational change by improving internal communication downward, but they have in any case been going towards a more open system of management. The division had not yet got to the sharing of information throughout the organization.

Conclusion

This was basically a generic OA system with some intraorganizational links but otherwise little integration and which was not perceived strategically. There were however benefits which could be regarded as strategic, including better decision-making and timeliness. The Ministry of Defence and foreign governments were increasing their demands for information from suppliers of military equipment. The office system made it easier to put together proposals for contracts, resulting in better bids put in as late as possible. One contract gained in this way could pay for the whole system. This result was seen as incidental to the OS, whereas it could have been the rationale for investment.

2. GKN GROUP SERVICES 1988

Initiation, Objectives and Implementation

GKN Group Services at Group Headquarters Administration began implementing an interdepartmental office system at corporate headquarters in 1983 with a DTI grant. There was no cost justification; the objectives were to improve communications, timeliness, and quality of

information. Implementation had been incremental, department by department, and voluntary - no department was forced to be on the system.

Design

The Xionics OS was a text-based database system with three levels, corporate, departmental, and individual user group directories. There was access to external databases via Telecom Gold. Otherwise the system was not integrated. GKN's operating divisions didn't have and didn't want an OS. Xionics was not compatible with any other system. Group HQ could not interact with their own IBM mainframe (for data processing). They could only transfer text via Telecom Gold, and had to communicate with their subsidiaries by fax and telex. Consequently they were looking in the future to Unix, shared databases, and networks.

Outcomes

Despite its limited integration, the system supported that part of the corporate strategy which involved growth by acquisition. Takeover bids were put together on a project basis at corporate HQ, with teams from the legal, corporate finance, taxation, and business development departments working together. Project directories would be set up for the user group on each bid, which could be put together more efficiently and quickly on the OS. Therefore, this was a good example of computer-supported group working on strategic projects, although the term itself was not used.

3. TETRAPAK 1988

Background

Tetrapak is a worldwide organization owned by a Swedish family but based in England which specialises in packaging liquid food - milk, fruit juice, etc. The firm mainly does not make cartons, but sells machines and packaging materials to food producers. It is now one of the largest packaging companies in the world, and has 46 marketing companies worldwide, with strength in Europe and the Far East. It is also geographically dispersed in the UK, with production in Wales, offices in Scotland and Dublin, etc. At the Kingston HQ, there are thirty administrative staff, including a small data systems department, finance, and the chairman's office. In addition there are 345 production staff, 40 sales and marketing, and 110 technical service staff.

Organizational communications are difficult because of the geographical spread, and also because of language; English is the official company language but Swedes will speak Swedish together.

Initiation, Design and Implementation

From the late 60's the company had Data General mainly for financial systems. In 1982-3 they decided to go into office automation to overcome the shortcomings of PCs and minis, and installed two office systems, Wang and CEO on an experimental basis; the users chose CEO because of ease of use; it used exactly the same keystrokes across different functions. A pilot group taught others as demand grew eventually to 2500 users, linked desk-to-desk at 60 sites

throughout world using the same software. CEO can be used as a front end for other applications and vice versa. In the future they were looking to connectivity; users should have total access wherever they are, to be able to print out remotely, internationally without knowing how to designate printers. Another issue was compatibilty, the interconnection of IBM PCs with CEO, which Data General was working on.

Outcomes

Savings were estimated at 10% on administrative staff costs. Evaluation showed that there was significant demand for email but not for word processing. Electronic mail answered the problems of difficult communications internally, language, poor information distribution and the disruptive effect of time zones. People move around offices a good deal, and can now be contacted through any terminal throughout the world. Email provided large cost savings compared with other means of communication, and also reduced delays. Foreign customers could cope with written English better than with the spoken word. Also salesmen visiting customers could give them up-to-date technical specifications on the spot, providing competitive advantage. They had expected an increase in vertical communications, within departments, but found there was an increased flow of horizontal peer-to-peer communications. The production site had the lowest number of users, but they used it for more important matters, such as the changeover between shifts.

Conclusions

Tetrapak, in introducing an organization-wide office system, had built for itself a global communications platform. Although not yet fully integrated, it was a good basis for integration, which it was moving towards.

4. BRITISH TELECOM INTERNATIONAL 1988

Background

British Telecom International is a division of BT which controls satellite TV (for the UK) and all satellite links globally. It is co-ordinated with BT through the Board. BTI implemented an office system with intra-company global links and was in 1988 moving towards greater integration.

Initiation and Objectives

The OS was initiated in 1984 in a proposal to the Board from the computing department. There was no cost/benefit analysis; OA is seen as a corporate resource, a central overhead. Department managers who wanted to come on the system had to come up with a business case, but it was not costed. Improved communications was the main reason they gave.

Design and Implementation

The office system is based on Digital 'All-in-One', a standard OS package with links to external data bases and to MIS. The system is country-wide, and also communicates with BTI offices all over the world. Implementation started from the top, the MD's office, and followed

levels of management. In 1988 they were at level 3, people who control budgets, and were going to level 4. Development of applications was user-led. There was no compulsion to use it, but everyone wanted it.

Outcomes

There had been no loss of jobs so far, but the system had changed the work of one department. They were seeking more integration, developing links into existing IBM systems. They could access the IBM, see the data, but couldn't as yet do anything with it.

5. ROYAL MAIL 1991

Background

The Royal Mail at Chesterfield was attempting to build an organizational platform, but became rather bogged down in pilots and trials. Existing IT systems were piecemeal: PCs, DP for finance and personnel, and a generally low level of computer literacy. The organization did not have an IS strategy regarding technical standards, hardware and software products, and naming conventions. In 1991 they were evaluating a two-year OA trial, with plans to implement throughout the business. If this went ahead it would cover 4,500 users across the country, including headquarters in London and Croydon, and 64 district offices with their satellite offices which handle delivery of mail.

Initiation and Objectives

Initiation of the organization-wide project came from the IT department to the MD, and was seen as linked to the organization's mission statement, concerning improved management processes, products, customer and employee care.

The OA pilot was conducted at two sites, one district and one central headquarters department. The Ipswich district headquarters and its satellite offices with 160 users (which later became Anglia Division with 18 offices and 180-190 users) piloted a system consisting of Office Vision on AS400s plus PC Support ('file transfer', so people could use spreadsheets etc.). They had documented seven communication flows, including operational systems (information on traffic, staff hours, absenteeism) but had not yet tackled work processes. So far the OS had been seen as a support tool which made tedious tasks easier and eliminated unproductive work. Evaluation found that the main benefit was to speed up management account reports. Managers using facilities on the system were better able to select and focus on the information they really needed.

At the headquarters site, the Personnel Department in London and Croydon, they installed a LAN with QED, including some OA facilities and standard PC packages. This was not as successful as they'd hoped because it missed out most of their communications, which were outside to the districts. However, the Personnel Director was won over; 'now I know what you mean by increased morale'.

In any extension of the project, the IT department would be expected to quantify

productivity benefits. A reorganization was underway into nine fairly autonomous divisions, with links to headquarters mainly for strategy. They anticipated increased need for communication of management information, but the main information flows would probably be within divisions, with reporting links to headquarters. Lateral communications between divisions was not currently seen as important but could be in future, and they wanted to make that possible. Some of the project would be funded by the business, but the divisions would decide how to progress at their own expense. The IT department wanted to develop a standard template for a division, with 90% of it transferable. In late 1991, a meeting of the Policy Committee for the project was to decide whether to extend the system and how; in fact it decided to conduct more pilots and trials with Lotus Notes.

6. BANK OF SCOTLAND CENTRAL BANKING SERVICES 1989

Background

The Bank of Scotland had always been progressive in its use of technology; it was the first UK bank to introduce branch terminals in 1968, home banking in 1985, and international small payments in 1987. It saw rapid response time and its low cost base in Scotland as providing its competitive edge.

Initiation and first phase

In 1983, the Central Banking Services started a new line of business, syndicated home loans, and it was the assessment and approval of loan applications which was the object of this study. Assessment and approval of one home loan application could involve the writing of 40 different letters, to the seller, the applicant's banker, employer, solicitor, surveyor, the insurance agent, insurance company, syndicate members, securitisation, and the Bank of Scotland's own Accounting System. They expected growth to double and
computerised the assessment of applications by bringing in an OA package. In 1984 they selected Data General CEO because they wanted a system in in four months which would also be able to grow, be applicable to other areas, and reasonably compatible with IBM mainframes.

Outcomes

Despite problems arising from user underestimates of the number of letters per day and insufficient disk space to handle all the filing, they were able to meet their target and to get an agreement out to the customer within 48 hours 80% of the time, and could cope with a quadrupling of their volume of business without increasing staff. They reckoned that the cost of £1.5 million was paid for in 8 months. The cost justification was based on staff cuts because it was tangible, but that was not perceived as the real benefit.

Second phase

Expecting the business to double (in fact it quintupled), they decided to embark on a second phase by at least doubling the hardware. They installed a DG MO/10000 with an ethernet link to the previous system, and added bespoke programs, links to the London office, and a link

via an emulator to the IBM mainframe as before. CEO became more of a shell into user applications, subordinate to the bespoke system.

Conclusions

This OS was clearly strategic in that it computerised a business process and enabled the bank to get in a system quickly in order to support growth in a new product. It would not have been possible to identify the requirements beforehand because users didn't understand the technology and had too little experience with the new product. There were difficulties with the initial implementation because users were swamped with work and management were not in control. The bank could be said to have used the office system package as a prototyping tool, a means of discovering their requirements for more tailor-made application software for the new product. They were also moving towards greater integration of the OS with other systems.

7. FORWARD TRUST 1989

Background

Forward Trust is a wholly owned subsidiary of the Midland Bank, whose business is lending/leasing via motor dealers and factoring for small businesses. It has a small head office in London, but the directors and processing are in the Birmingham head office, which includes Management Services and Finance Services.

Initiation and Objectives

The organization perceived speed and quality of response as increasingly decisive to competitive edge. Also they saw they were in a technology race with competitors. Their objectives, which included reducing defaults and a more sympathetic approach to customers, could be achieved only through use of the technology.

OS were used strategically to improve speed of response for internal business processes and external links, and for internal integration. This was fully cost-justified and could be done at low cost because they built on mainframes already used for DP.

Design

In the middle of 1988 they standardized on IBM PCs, replacing all 350 terminals in their network with IBM PS/2's with DISOSS, PROFS, and Lotus on Tokenring. They had 1200 internal terminals, a ratio of 1:2, and anticipated moving to 1:1 in 1-2 years time. 250 to 300 out of 2000 people were on PROFS, and they could put on another 400 who would benefit. In the London head office the majority of people were on PROFS. All of the factoring was done on PROFS. The idea was to have everyone from the MD down to the junior supervisor linked. Business centres would be integrated by packet-switching.

Lending was done directly and through dealerships and building societies. Thirty-eight business centres handled relations with dealers via on-line systems, which had been very successful. Forward Trust provided 700 terminals for dealers in their own premises.

Outcomes

It had been a successful low-cost operation, which had also gained them new accounts. They expected to be virtually paperless in about 18 months. They had been looking for staff savings, and were now looking for revenue increase not cost reduction. The next project was credit processing. This would change the culture and cut out many layers, as authorisation would pass electronically.

Conclusions

Forward Trust illustrates the advanced strategic use of OS to support business processes, intra- and inter-organizational communications in an industry based on information. The OS is an essential part of the means of running the business, and an enabler of strategically necessary organizational change.

4.2 Extended studies.

8. BLT LTD. 1990-1991

Background

BLT Bridge Ltd. is the U.K.'s leading independent producer of commercial vehicle springs, formed in 1987 as the result of a management buy-out from British Steel. Manufacturing and administrative offices are together at one site. Many changes were introduced by the new owners, including Total Quality Management, updated Human Resource Management policies (fair pay, single status, multiskilling, share ownership, improved communication), and a management development programme. There was a large capital investment in plant, but very little new spend on IT, with the result that existing systems had become 'isolated islands of automation with no upgrade path, slow and unreliable, out of date, with whole areas of the business not supported'.

Initiation and Objectives

The consultants who were advising the buy-out urged the company to apply for a DTI grant for a Manufacturing Systems Review. This was carried out in 1989 and identified problems in most functional areas, outdated and manual systems, lack of integration within functions and between functions, with consequent need to transfer data and inaccurate/inconsistent data. The consultants identified as reasons for investing in IT: 1) inadequacy of existing systems; 2) cost reduction; 3) better management information; 4) to support delegation of responsibility to lower levels; 5) dramatic improvements in response time. The company's competitive strategy emphasised quality, technical innovation and new product design, and responsiveness to customer demand. IT investment was seen as a means of meeting these strategic objectives as well as improving internal control, co-ordination, and planning. BLT perceived itself as having fallen behind other companies in IT, and as having to make an enormous leap to catch up and if possible, to get ahead in some areas.

Design

The plan was for four main systems integrated by a common database: material control, manufacturing control, financial control, and CAD. CAD was seen as significant in improving responsiveness to customers and technological innovation. EDI links to customers and suppliers were another important feature. The company was already electronically linked to three customers - major vehicle manufacturers - due to customer pressure, but the system which already existed involved rekeying, while the new one would make it possible to eliminate this and to transfer designs directly. An MIS was planned for when the information became available, but they did not yet have it. What were defined as 'internal networks' including electronic mail and word-processing had relatively low priority, after all this had been accomplished.

Implementation

Implementation began as the recession was beginning to bite in 1990. This assisted implementation in that fewer orders had to be filled during the changeover period, but people were also being made redundant because of the drop in orders, which could be blamed on the new system. The Financial System was implemented first, because it was relatively self-contained. For this reason, and because the department was already computer-literate, there were few problems. The core MRPII system however was all integrated and had to go live all at once. It had been developed in six months, very fast compared with the supplier's other customers.

Outcomes

Even three months after implementation, there were still many problems, because the shop floor workers were not used to computers and had had inadequate time for training before the system went live. In the offices, responses varied. The Sales Department were said to be resistant, because they had a purpose-designed system tailored for them over the years which suited them perfectly, and they didn't want to change to the new one which did not meet their needs so well. The Purchasing Department were quite positive about it because it reduced computer print-out and would provide more management information. In Planning there were many problems which required additional programming. EDI and CAD were said to be going well.

Organizational Change

Managers thought they could only have made so big a leap in technology because of the organizational changes they had already carried out and the 'strong culture' thus established. As for subsequent organizational change, it was thought at first that this would come about in an evolutionary fashion, after people got used to the system. However, five months after implementation began the IT manager was talking about making radical changes to jobs soon, rationalising lines of communication and responsiblities. This was not only because of the technology, although the system did highlight some deficiencies. Consultants who were then in were recommending changes in practices which were perceived as having been wrong before

anyway.

Conclusions

The case study shows the strategic nature of IT to a small manufacturing company, and the large amount of information required in the manufacture of even quite a simple product. Having fallen behind in IT development, the company's basic need was not for an office system, but to control production and planning through MRP and MIS. However, CAD and EDI were definitely factors in competition, and EDI had already been imposed by customers. Office systems in the sense of generic OA were very low priority, probably because they were not required for intraorganizational communication. However, office functions such as planning, sales and purchasing were necessary parts of an integrated system. BLT also illustrates some of the problems arising from the rapid implementation of integrated systems, and the complex two-way relationship between the introduction of IT and organizational change.

9. KFS TOOLS 1990

Background

KFS Tools is the world's largest manufacturer of high speed steel cutting tools, employing about 1100 people in the U.K. The main site at Sheffield manufactured twist drills, reamers and some cutters; other products were manufactured at Worksop, Nuneaton and Aldridge. (Manufacturing was subsequently moved from the Sheffield site.) Company headquarters were at Sheffield with branch sales offices in London, Bristol, Birmingham and Glasgow. Since 1975, the company has been a member of the KFS Group which has headquarters in Gothenburg, Sweden, manufacturing plants in Sweden, Italy, Germany and Brazil, and sales companies in France, Belgium, Germany, Holland, Spain, the U.S. and Canada. The main product of the group is bearings; tools make up 12% of turnover.

The company's marketing strategy is based on consistent high quality, a broad range of products, and excellent service. The manufacturing strategy is to produce top quality engineers' cutting tools by means of continuing investment in modern methods of manufacture and machinery. KFS has a total quality management programme and has been engaged for some time in introducing HRM policies including a flexible, multiskilled work force, less direct supervision, and new bonus incentive systems. They were looking towards computer-integrated manufacturing (CIM) eventually but currently lacked money for the investment; meanwhile, they were concentrating on making other improvements in manufacturing.

Initiation

KFS had already undergone significant computerisation in the office. The first mainframe had been introduced in 1966. Ten years before the initiation of the office system, the mainframe in Sheffield handled DP with 50-60 terminals, and there was stand-alone WP. During the 1980s, functional managers, led by the MD, began using PCs extensively. KFS had examined IT strategy in relation to business strategy about four years previously, using critical success

factors among other techniques, and had implemented most of what they had planned by the time of the interviews.

The objectives for the office system PCS (Personal Computer Service) were 'administrative efficiency and managerial effectiveness through an integrated system'. One aim was to integrate WP with electronic mail so that typists could share facilities with others, removing the need for printing out and sending on memos, and reducing paper. Electronic mail was seen as particularly useful because it allowed communications with other factories in the UK, and with branch (sales) offices. Electronic links with customers and distributors were viewed as part of a differentiation strategy. IT was an important element in an effective distribution strategy, because customers value quick delivery. The idea of the customer link appears to have come from the Board, who said they 'should just do it and be the first'.

Design

PCS ran from the mainframe through VMS which had recently become available for mainframes of this size. PCS was used by over 200 users in the UK, including 6 directors, 50 managers, 104 departments, 8 secretaries, 77 staff, and 68 international links. Facilities included email, word processing, notepad, graphics, memos, and personal documents. They could receive and send telex on the system and had been looking at fax but considered it very expensive. The system included general company information such as lists, directories, room bookings, company policies, procedures, and regulations, which standardises company-wide information and makes sure it's up to date. It also contained general information such as country codes and exchange rates.

PCS has linked the office system with data processing and corporate databases. From the same terminal users can go into either PCS or data entry, for those who need to change data, including sales order processing, manufacturing support systems, personnel, payroll, WIP, the bonus incentive system, assets register, and material control. PCS has been an important extension to existing MIS and managers' use of PCs. Facilities including spreadsheets can be brought down from the mainframe to the PCS. An important use has been access to company data such as sales and production information via (IBM) Stairs databases. They can for example see whether any large orders came in yesterday, send listings, make queries regarding stock, etc. Company databases can be drawn down, bits extracted, manipulated, incorporated in a document and sent on or printed out as a report.

One of the objectives of PCS was to get management information on the system and keep it there, to avoid piles of print-out. The MIS on PCS presents current performance measures in colour graphics. Most are updated monthly, some are updated automatically daily. The principle is exception reporting; routine information is recorded in the system, and only anomalies called to the attention of the manager for action. Management information includes lead times and variances between how long a factory estimates that a job will take, and how long

it actually takes. This can be collected for each factory and compared, enabling improved management control.

Electronic mail is used internally and externally, nationally and globally. The 'KFS telenet' (dial-up packet switching via BT and X.25) facilitates internal integration of the five factories and branch offices in the UK. Production planning is done centrally; orders are assigned to factories, which then decide how to carry it out locally.

An electronic catalogue and electronic links with customers and distributors are used to support a differentiation strategy. At the time of the research, no competitor was using such links. The on-line ordering system provides direct computer links with 17 major customers and sales companies. The customer links his or her own computer via a modem and BTel to KFS's system, amd can query and order from a menu. The customer provides a specification and the system comes up with number of recommendations, advising the speed, cost, etc. of various alternatives from the KFS range. When the customer makes a choice, the order is picked up by the KFS mainframe, sent to factory or warehouse and if in stock goes out within 2 hours on the same day. The ordering system provides speed of response, and has saved orders which might have been lost to a competitor. There is also a catalogue on diskette which KFS sends customers to use in their own PCs. This contains technical information and is mainly for browsing.

Implementation

The implementation strategy has been top-down and incremental. IT has been led from the top, by the vision of the then MD, and the IS manager. The PC phase, for example, began with the introduction of colour graphics to the MD. When talking to a customer, the MD would have up to date sales information regarding buying patterns etc. on his desk. The functional managers soon demanded to follow, because they were at a disadvantage without one - 'the MD would call up on the PC information (say about sales) in the morning half an hour before everybody else, and ring them up about it; if they didn't know they'd look stupid'.

The IS department developed the system with the cooperation of MDs over the years. The good relationship between the IS manager and top management was seen as indispensable. Their approach was to give users generic facilities, not specific to function, which could then be tailored to suit their needs, and altered again as the users gained experience. They described this as very top-down, 'autocratic', but felt they had to take the lead, 'because users don't know what they need, know what they want, when they get it decide they didn't want it'. They designed PCS themselves from scratch, and added on facilities in an evolutionary fashion instead of planning it all out in advance. Ideas for applications came from managers, depending on how knowledgeable about IT they were. The Swedish parent company had been very supportive and had a good system without which could not have developed their international links.

Outcomes

One major benefit has been speed of communications, and the ability to disseminate

information more widely. Sales offices can see what is in stock and tell customers what they can have now and what will be available in three days. Orders are sent from any of three warehouses in the UK, whereas they used to be linked to local sales offices. The number of sales branch offices has been reduced from five to three. They have gained competitive advantage abroad because they can handle sales queries quickly via electronic mail. The system has taken one week out of the ordering cycle, reduced stocks, and evened out the demand pattern. For example, the Canadian warehouse was growing fast and couldn't manage its stocks. They would just stop ordering when they had too much, resulting in peaks and troughs. Ordering is now automatic, so there is a smoother pattern, and better inventory management.

Another advantage has come from improved management information, e.g., the ability to interpret trends. Email has saved on telephone costs. They had reduced staff by more than half with doubled business, and had halved the number of secretaries. Apart from this it was hard to see any organizational changes as a direct result of the technology, but they acknowledged that knowing the technology is there could influence future decisions about organizational change.

The amount of paper had not decreased. Another concern was over-use of email, resulting in everyone receiving copies and wasting time having to go through it all. In some cases when a memo went to several people it was not clear who was supposed to act on it, and if several did there was duplication of effort. A need for filters and for discipline was recognised.

Conclusions

KFS provides a good example of clever use of IT/OS in a manufacturing company. Evolutionary development, a conscious policy of accumulating organizational learning and experience with technology under the guidance of an aware and informed top management, and a history of cooperation between senior management and the IT department, all contributed to the eventual development of strategic applications of IT/OS to intra- and inter-organizational communications.

10. IBM HAVANT 1990

Background

At the time of the research, the Havant plant of IBM UK had been in existence for 20 years, employed 2,000 people, and made one-third of all disk files for IBM internal use. These went into PS2s made in Greenock, into AS400s, and sometimes direct to customers. The plant also made communication controllers, banking machines, and flexible circuits for IBM. Disk files are also made in Japan, and there is internal competition for IBM business. There are research labs at Winchester, head office at Portsmouth, and offices in London.

The then Director of the Havant plant, John Ward, had been impressed by Japanese management practice, and saw problems in his organization arising from the way that hierarchy impeded work or information flows, and the way that processes cut across the functional areas. Both technologies, the OS and the manufacturing systems, were seen as means of achieving the

changes he sought. At Havant, manufacturing had 'become a process'; JIT and computer integrated manufacturing had been applied to integrate the physical processes of supply, manufacture and delivery. Company-wide electronic links had been developed between product development, manufacturing and marketing. R&D had been pulled into product lines, via cross-functional teams with product responsibility. The electronic system enabled all sorts of different data to be brought together and linked to suppliers.

Initiation and Objectives

The office system at Havant was seen as essential to achieve further change. It was initiated in 1982 by IS management, with top management support. Aims were improvements in quality, reduced delivery time and WIP, reduced administrative overheads, increased productivity, simplified communications, and a network infrastructure. There was about the same time a corporate directive to install PROFS, a generic office system, throughout the UK and the Havant plant director was '100% supportive' because he wanted the other managers to be educated in the use of computers.

Implementation

A PROFS pilot was conducted in 1983. At the same time, a study was conducted of how information moved at Havant and how managers used it. This showed that the information used by management was late, not credible, pushed not pulled. There was a need to provide business information, for IT training, help facilities, and that the system had to be available all the time. This led to a formal implementation plan. In 1984, PROFS was installed throughout Havant. An IS team of 10-12 was divided into system maintenance, education and help desk. The latter liaised with 'VM reps' - senior reps in each user function. Implementation started with the senior management group, followed by the business functions. It took 18 months, while they trained 150 per month. Managers had a three day course, secretaries 5, professionals 3 half days. The senior management team had personal tuition of two hours each.

A productivity review took place once everybody was on the system. Each of the 200 managers was interviewed singly about how they used the system, and if they were below a certain standard, they were brought up to it. They were also offered more training, 6 X 1/2 day sessions on different topics, which were optional and open to anyone.

A later study showed that for example in inventory reporting, of thirteen people dealing with the one process, five added no value. Information available Day 1 would not reach the Director until Day 27. 71% of managers' time was spent in meetings, at less than half of which their attendance was actually required; the others they attended just for information. The Havant Management Information System (HMIS) was developed in response to these needs for consistent, timely information. It appeared to managers as an extension of PROFS, with which they were already familiar.

In 1985 a study was done of 20 senior managers, establishing their goals, CSFs, and

measurements required in order to produce a framework for the development of the MIS for the rest (ie. a generic MIS). In the first stage of its implementation, the HMIS 'captured goals, critical success factors, and business measurements for individual managers', providing it in graphic or text form, with red, green and amber exception reporting. The next stage was the creation of an HMIS Information Directory in 1988, which drew data from the plant's operational systems automatically, making it more reliable and timely.

Design

HMIS functions mainly at the operational and planning/control levels, using internal data, rather than at the strategic level. It has no external links, although senior executives could link to external databases through their PS2s. The main gateway to external systems is at Warwick, everything has to go through it for security reasons, even their international internal links. The office system is separate from MVS, the system for processing plant data and controlling the line. Inventory costs are also on MVS. Tools exist to pull operational systems across to HMIS. Personnel, payroll, and finance are at a different site at North Harbour.

The system was based on three 3081 processors, and had 2250 users, 1800 of whom were regular users. 1200 may be logged on at a single time, and 2000 log on each day. Only specialists use PCs, the rest are dumb terminals. The ratio of terminals was 2:1 to start with, is now 1:1. There had been a definite extension of use. Help desk questions were now coming in at 60 per day, which is a reduction from the early days, but the character of queries had changed, from routine things to how to use the extra facilities. Telex but not phone (voice) or fax is on the system.

The Purchasing Department is linked to their 60 suppliers all over the UK. They had a much larger number of suppliers and have been working to reduce them and to improve relationships generally.

Outcomes

The result of the overall IT strategy was a fourfold increase in productivity, and large improvements in quality. The perceived benefits of the OS were productivity gains, more succinct communications, faster product introduction design to delivery, the creation of a base for CIM. Meetings had become shorter and more focussed because people no longer attended just for information. The reporting process had been simplified, and there was a common style. Also the system made it necessary that every bit of data be owned by someone.

The success with MIS was seen as due to active executive sponsorship, an IT strategy, goals/objectives, and the skills of the business analysts who came from the user departments, not IT specialists. There was also a change in the IS department, it had become much more user-friendly and less remote in every way.

Organizational Change

Personnel officers reported minimal structural change as a result of the system, but there

was disagreement as to whether the managers' role had changed and whether there were fewer levels. Most change had occurred in the secretarial role. Only senior management now had personal secretaries. There were now seven managers to a secretary, who set up meetings, organized diaries, and did the larger graphics. The numbers had been reduced from 70 to 40, and many were now contracted through agencies. Apart from the senior managers' full-time 'IBM' secretaries, there were IBM temps drawn from former full-time employees. Secretarial work had become more boring; whereas they had been more of a personal assistant, they were now much less so. The managers became more self-sufficient, and secretaries knew less about what was going on, for example, they saw much less of their mail.

There were culture/process changes at the same time as the introduction of the OS not attributable to it. The major organizational changes at IBM have occurred in response to its strategic situation rather than as a result of the office system. There had for example been a major transfer of administrative support staff into manufacturing or marketing, multiskilling on the shop floor, a pushing of accountability down to lower levels which had reduced the middle tier. The reward system had been altered and career routes for professionals established. There had also been a major drive to change the 'culture', typified by the slogans 'right first time', 'respect for the individual', 'excellence in everything we do', 'the customer is always right'.

Conclusions

The office system at Havant was thus seen as a platform for organizational communications and for management information, a means of increasing productivity and reducing clerical and secretarial staff. A potential for organizational integration was clearly recognised, the office system was originally seen as one means of fundamentally restructuring the organization; this was also being attempted through other means and from the corporate level.

Internationally, IBM was badly affected by the recession and by the downturn in the market for mainframes, resulting in a 92% drop in profits and the loss of 17,000 jobs as of July 1991. Losses were almost $5 billion in 1992, its worst ever year, and another $285 million were lost in the first quarter of 1993 (*The Financial Times*, 21 April 1993). In 1992, IBM UK lost £616 million and 1,000 jobs. As part of an international restructuring programme intended to decentralise decision-making, Havant was designated an industrial business centre with increased control by local management (*The Financial Times*, 2 April 1993).

11. IBM UK and Europe 1990-1991

Initiation and Objectives

IBM UK consists of Marketing and Services, a major UK function with 14,000 employees, manufacturing plants at Havant and Greenock, and a software development lab at Hunsley. In the early 1980s, the organization began developing a national company-wide office system when a nation-wide network was installed linking word processing centres, simultaneously with trials of an office support system for managers and professionals. This was followed by a

pilot with 900 users in the Midlands, and on the basis of this and IBM experience in other countries, the decision was made to extend the system to Marketing and Services throughout the UK. This was cost-justified on an expected productivity benefit of 7% at the end of the three year implementation period. Other objectives were to improve communications across the organization so as to increase effectiveness and efficiency, quality and speed of response. NOSS (National Office Support Service) consisted of notes and messages for communication alone; however the productivity benefit achieved was almost double that anticipated by the end of 1987, and later resulted in a 20% overall productivity improvement.

Implementation

Implementation of NOSS took nearly three years and cost £70m. It was planned location-by location, with two half-days training. Secretaries were trained to be 'support administrators' to give support to users, backed up by a regional support organization and a telephone hot-line. Experience with the trials and pilot had shown that resistance could be expected from secretaries because of fear of job loss, and from managers and executives over fear of being shown up as unable to use the keyboard. However, users moved gradually from competence to confidence over a period of eighteen months. As a result, the network had to be dramatically expanded so as to provide the high availability and response time users expected. Support services such as administration, help desk and training had to be permanently resourced.

Outcomes

As a result of its experience with NOSS, IBM learned that OS involved fundamental change in terms of its cross functional impact, that there were major impacts on the jobs of secretaries and of managers, and that demands on network capacity grew dramatically as users become more confident.

The OS helped IBM to implement its organizational strategy of reducing administrative staff and expanding marketing by shifting employees from one to the other. One member of marketing staff noted that his department is in three locations due to historical accident, and his function had changed twice in the last year without his having to move house. IBM had previously reorganized from an industry-based structure to a geographically-based one because of the problem of communications; they subsequently were able to reorganize back to an industry-based structure, in part because of the OS. In 1993, IBM UK planned to reduce headquarters staff from 2,500 (in 1991) to 100, involving compulsory redundancies if necessary (*The Financial Times*, 30 June 1993). One can only speculate on the extent to which the office system makes such dramatic cuts possible.

Although the OS had been very effective as a communications vehicle, it is not integrated with business applications, so that marketing staff cannot access information from company databases (although this had been a long-term goal). As IBM changes its business to software and services, there is a need for processes to support this, e.g. to evaluate risks, including allowing

salesmen access to own-company information. For example, by making research information available to salesmen, one company turned them into consultants.

Interorganizational systems: agents and dealers can contact IBM databases. IBM makes increasing use of third parties, subcontracting work to business partners. The office system links to them as well as to customers via the Mailexchange service. The UK Marketing Information System 'UMIS' is a database of product information, configuration tools, suppliers and customers, which resulted in a productivity improvement of possibly 60%.

Extension of the OS throughout Europe.

Globally, 350,000 IBM employees already have access to a terminal, many having two or three, so that they can receive mail and messages anywhere in world. In 1991, the office system was being extended by the introduction of Office Vision throughout Europe, which is IBM's largest single market. This was intended to replace the variety of software in use in different countries, and by standardising, to make communication between countries easier, reduce the number of large computer sites, and economise on expensive computer support staff - 'reduce programmers maintaining different environments'. Like NOSS, the European OS would also be used as a marketing example and when developed would be offered externally. Above and beyond the previous facilities, the system would include graphics, executive decision support, integration of fax, expanding electronic forms, and electronic signatures. This could all only be done as a common program. Everything will be distributed through the network, e.g. training will be on the system because unlike the first round, these are computer-literate users who can define their own training needs. The system was seen as having low functionality spread widely, and as a base for more exciting things such as Executive Decision Support and business applications.

Implementation of the European OS

Implementation was being carried out top-down; the project was being driven from Paris by very senior managers - 'God speaks to them'. The need for well-defined standards and business applications required a common IT strategy and was therefore an executive decision. The project extends from Turkey to Iceland and involves 100,000 users. In every case they will have an Office Vision/VM base. As for software, they had standardised by comparing the software in use in different countries, and selecting the best ones. Some packages will be mandatory, others not; locally people will still be able to use their own custom software, but only the standard packages will be supported. The UK had been given the job of implementing the European OS, providing supply and support to each country, which would then support its own centres. The Strategy/Architecture/Requirements were being handled in Holland.

The system had been piloted in Switzerland in September 1990, and approved at the end of November. In 1991 it was being introduced in Switzerland, Spain, Sweden, Austria and Belgium; 85-90% (75-80,000 people) would be on by the end of the year. Australia and New

Zealand, Japan, and South America had agreed to use this platform, but the 200,000 users in the U.S. had their own version.

12. INSURANCE SERVICES GROUP 1988-89

Background

The export insurance organization is a Government Department which, since 1919, has insured UK exporters and financiers against the risk of non-payment by foreign buyers. Its Insurance Services Group (ISG), dealing with short term credit business has always been the market leader in its field, but during 1986-87 business insured by ISG decreased at an alarming rate, which led to the developments discussed here. The Insurance Services Group has its head office at Cardiff and nine regional offices which are the main point of contact with the customers. Internally, IS Group was divided into Underwriting, Claims, Customer Services, Marketing, Planning, Policy and Resource Management. There was only one major competitor in the UK, but as the Group was considering extending business into Europe after 1992, this situation could change. At the time of the research, ISG was running at a profit and either privatisation or agency status was anticipated for the future. In the event, it was privatised in 1991 by being sold to a Dutch export credit insurer.

Initiation and Objectives

A crisis arose when ISG's market share declined from 36% in 1978/9 to 20% in 1986/7 of UK non-oil exports insured. Market research revealed competitive weaknesses including the civil service image, and perceptions of the organization as slow, inflexible, and unresponsive. Other disadvantages included price, administrative overheads, and inability to insure domestic trade as well and thus spread risks. Factors giving competitive edge in the industry were: quality and speed of service so that customers can commit to contracts quickly, data on buyers (which the organization had), and non-bureaucratic documentation. At the same time there was continuing Treasury pressure to increase efficiency and reduce numbers of staff, while servicing a large debt caused by the recession of early 80s.

The response was a marketing strategy of improved quality and speed of service, flexibility on price, tailored cover and facilities, quicker response time to credit limit applications, and (in response to 1992) an expanded database on European buyers. In 1986 ISG's new management viewed investment in IT as crucial to turning around the business. The first priority was to improve the speed of response to customers' credit limit applications (below).

Implementation

The system had been initiated along with a number of cultural changes, intended to make the Department operate more like a business. The objectives were very clear. The Board in conjunction with IT department had direct responsibility for IT strategy. Financial appraisal was rigorous, formalised, and dealt with at Board level.

Implementation took 18 months from initial consideration to first implementation. The

ISG had learned from earlier mistakes to involve users and to use formal methodologies. Participative sociotechnical design was a feature of the process; end users were involved in system development, and there was a Job Design Working Party and an IT agreement with the trades unions which included job satisfaction. The methodologies they used included SSADM, COMPACT, and PROMPT. There was a training road show, HQ trained regional staff, with one hour training on the screens, optional sessions on keyboard skills, and telephone hot lines. The system was also marketed to users, with monthly bulletins focussing on business decisions and performance, and team briefings focussing on business gained/lost/maintained. They reported no real opposition from staff, and observed that their approach helped them to screen out a potential disaster in Claims. The strategy was incremental, to 'implement the grand plan bit by bit', give people something they can use quickly even if it has to be thrown away later. However, the total effect was 'like a big bang', in that it was a move from a totally paper-based system to one which was almost entirely electronic. Overall factors contributing to success were seen as high management commitment and high business relevance.

Design

The new system involved upgrading the mainframe and doubling the number of terminals and printers to 400 dumb terminals and 400 PCs (as of March 1989), at a cost of approximately £10m. over two years. They were also introducing office systems in the OA sense, but were not going for it fully because it was too expensive.

Implementation of CLAM

Before 1985, Credit Limit Applications were all processed manually, with only after-event computer recording. Broad-based buyer information was only available on paper. All credit limit applications were sent by post from the Regional Offices to be dealt with by underwriters in Cardiff. All applications were regarded as similar insofar as they needed professional underwriters to assess risk and set rates. They were dealt with by different levels of underwriter according to the value only.

The underwriting process was computerised in stages over a period of three years. In 1985-86 they undertook a 'Risk Scoring' Pilot Study as a consequence of which there was a change in underwriting philosophy which meant that insurance cover could be authorised by the Regional Office in the 45% of applications where the value was under £20,000 and the buyer was within the OECD. The result was an immediate increase of turnaround within 24 hours from 18% to 42% at the Regional Offices. Later this principle of 'standard limits' was extended, raising 24 hour turnaround to 65% of applications.

The underwriting system was introduced in two phases, CLAM(RO) in October 1987 and CLAM(HQ) in August 1988. The inputs, which are customers' credit limit applications, and buyer and customer records, were all put on-line. The outputs are the decisions on the applications, which are recorded on the databases, and letters to the customers which are printed

automatically. Buyer records are also amended automatically. A clerk at the Regional Office entered application details, and if it fell within the standard limits it would be dealt with immediately at the Regional Office, if not, sent to Cardiff for professional underwriting. In Phase 2 the system was extended to the underwriters, who now dealt with applications as electronic records. This was characterised as a decision support system.

Outcomes

This computerisation of part of the underwriting process increased from 18% to 78% the proportion of credit limit applications on which decisions were despatched by close of the business day following receipt of application, with no deterioration in quality of underwriting decisions. Following this improvement, greater customer satisfaction has been evidenced by market research. In 1987/8 the amount of business ISG handled increased for the first time since 1984, and subsequently increased on an accelerating trend. The initial cost was quickly recovered. There was better use of staff because people could concentrate on the more complicated types of business. There was an increasing focus on the underwriting context of buyer companies, ie. countries, trade sectors, UK exporter, buying country paying history. Underwriters could make regular visits to the markets they underwrote, leading to more informed decisions. Better information was available on buyers. Information was made available for planning by developing a risk portfolio. There was a general perception of success, from top management through middle management, underwriters, to clerical workers.

Organizational Change

The most obvious effect was a change in relations between the Regional Offices and Cardiff, with decentralisation to the regions of 65% or more of underwriting, which they did not do before. There was also centralisation of management control over the regional offices, with better measures of performance. Buyer Sections in ROs had much less contact with Cardiff, but were much closer to customers. At Cardiff, there was a large reorganization of underwriting from six groups to four.

The major effect on work was a shift in the division between routine and nonroutine. A Job Design Working Party found effects to have been mainly on lower-level AO and EO jobs. The regional office clerical staff who now issued guarantees received a change of title, but no promotion or increased pay. They spent up to 70% of their working day on VDUs on-line processing, which is relatively repetitive. The staff accepted the need for this, but didn't want any more of it. As a result, the Job Design Working Party recommended an organizational change to Account Management, which would merge the Buyer, Guarantee Submission and Issue sections so that one person is the contact for the customer, resulting in a composite, diversified and more worthwhile job with less time spent on VDUs, but at the time of the research this had not yet been implemented.

The major effects in Cardiff were on the EO grade. They did not move into more

interesting market and trade sector work to the extent anticipated, but because of the development of risk scoring EOs had some of the underwriting work they had lost restored to them. The underwriters' perceptions were that it was an easy system to use, with no major problems. There was increased job satisfaction, more professionalism and more responsiveness to customer enquiries, more tailoring of business to specific customers. However there were also comments about laborious routing through the screens, some underwriters were still resistant, and increased specialisation was possibly leading to increased differentiation and barriers between underwriting groups.

Conclusions

ISG represents the use of IT to computerise a major business function in order to reverse competitive disadvantage and decline. The computerisation of Credit Limit Applications involved the redesign of a business process, the pulling together of organizational information via computer which made possible a much quicker response to the customer. To do this required the routinisation of part of what had been considered a professional function and its assignment to less skilled workers, and a consequent freeing up of the time of the professionals to devote to the deepening of their knowledge and expertise. Records were also automatically updated, keeping them timely.

13. SHEFFIELD CITY COUNCIL EDUCATION DEPARTMENT 1989

Background

The Sheffield City Council Education Department has been under heavy pressure stemming from decisions of central government to reduce the functions of the LEAs and severely to curtail local government spending. Implementation of the 1988 Education Act, including the National Curriculum, Local Financial Management of Schools, and the encouragement of individual schools to opt out of LEA jurisdiction have come at a time of increasingly severe budget constraints, as well as Council policy to devolve responsibility to departments, and clients' expectations of better service and responsiveness. A departmental office information system, with links to the Council mainframe and to schools, was seen as a key to organizational survival.

The Council already ran major applications such as Housing and the Treasury on ICL mainframes, and had developed two corporate systems for financial accounting and orders, and a personnel system, which could be taken down to department level. Corporate IT strategy allowed departments to decide their own computer applications, within relatively loose constraints of buying British and the ability to be networked. ICL developed a new series called CLAN running Officepower, a generic office package with the same principles across applications, based on Unix but with the ability to incorporate PC compatibles running MS-DOS. The aim was to enable departments to communicate when X.25 came in. Computer Services in 1986 conducted a study of office automation at the instigation of the Council, in response to compulsory competitive tendering and the council policy of decentralisation. They established technical

criteria, surveyed and made presentations to potential users. The Education department 'came onto the system as result of this project.'

The Education Department at the time had about 300 employees at Central Campus and responsibility for over 230 schools and 6 tertiary colleges.

Their previous experience of IT was very limited; they used the Council mainframe mainly for Financial Accounting, and had one word processing team on five pieces of outdated equipment. Of 25 staff users 95% had no WP experience, and secretaries had at best stand-alone word processors which also needed to be upgraded.

Inititation and Objectives

When in September 1988, CLAN became available through the Council, the Head of Schools Branch, who had previous IT experience, presented an OS strategy to senior managers in the department, in which the role of IT was seen as enhancing support and delivery to pupils/students, the community, and the staff. Although the immediate need was to replace obsolete word processing kit and to increase the efficiency of the typing pools, other anticipated benefits were:

1. combat limitations of physical/geographical environment (old buildings, dispersed sites)
2. improve access to information
3. improve communication
4. improve information for decision making, enable managers to monitor and co-ordinate
5. enable forecasting
6. avoid duplication, repetition

Design

The projected plan was to put word processing on CLAN, provide Officepower for the senior management team and their secretaries, link with schools and colleges, and to link with the Council mainframe and other departments via X.25. Departmental databases such as property, and students/pupils, could go on CLAN. The cost, which was estimated at £50,000, could be paid for by staff savings in word processing, and in the event six typing/secretarial posts were lost through natural wastage.

Implementation

The project was approved and a full-time IT team set up, including the Project Manager, his understudy, two people from Computer Services, an IT Trainer based in the Training centre, a Systems Administrator, and an ICL Project Manager. This group met every 10 days to two weeks from start to finish, to oversee all details. There was also a support team for Officepower including a liaison officer from Computer Services. The implementation plan was to:

1. raise awareness
2. enthuse users and non-users
3. give personal support - train and develop
4. managers to create an environment in which people can develop/

contribute.

The project was implemented in phases because of its size and complexity. The choice of word processing for Phase I was determined by the need to increase efficiency and because the largest immediate cost savings could be made there.

Phase II, the senior management team, was dictated by high visibility and the need for decision-making support. Phase III was the department databases and electronic mail to link up schools, a large and complex project, some of which went on concurrently with Phase II.

Phase I had been completed at the time of the research. Word processing was brought in as a 'big bang', because 'the requirements were quite clear' and there was a deadline determined by school holidays. A Systems Administrator, appointed from the staff, was given a deadline of one month to co-ordinate the training of all the secretarial staff in word processing on the system. The secretaries however had wanted a phased introduction because of their lack of experience. At the same time, the opportunity was taken to reorganise the seven existing secretarial/typing teams into four. This was in part a response to a longstanding complaint that two of the teams had all the boring work, and in the reorganization, an attempt was made to get a better balance between the teams. This was done with consultation of team leaders. At the same time the teams were balanced between experienced and less experienced staff, and an attempt was made to create a supportive atmosphere in each team. There was considerable user involvement in the reorganization. in deciding how they would work in future and their requirements of the system. Basic training for staff was conducted by ICL on site: two days basic WP, followed by four days working on the new equipment, followed by 2 days more of training.

Outcomes of Phase I

There were problems, because Team Leaders and the Systems Administrator did not have the opportunity to be trained before the rest of the staff and so could not assist them when they were learning. Also, when teams returned from training, they did not have time to consolidate, but went straight back to a full work load, meanwhile covering for other teams which were away for training. Although it had appeared logical to carry out the reorganization of the typing teams at the time the system was introduced, it resulted in most of the staff having to learn the new system at the same time they were doing unfamiliar work. This added greatly to the pressure they experienced, which was described as 'horrendous'. 'Wasn't fair, we were asked to do too much.' There was opportunity later for more training.

Technical problems, the need to document for ICL's project management, and shortage of terminals (4 for a 6-person team) created additional difficulties. Nevertheless, service levels were back to normal in a month and all the team members were enthusiastic. They felt their skills had increased, and most found their jobs more interesting. Team Leaders received a promotion and a salary increase, as a result of early consultation with the union.

Implementation of Phases II and III

Phase II, the Senior Management Team, was split into two parts, secretaries and managers. Senior management secretaries were introduced more gradually to the system than the typists because their work is more complex, and they had to learn more programs. Senior Managers were supposed to be trained by their secretaries, but after several months they were still using the system the least, partly because of lack of time to learn it, but also because the databases they needed access to were not yet on the system. Also the five members of the SMT were not a working group needing to communicate with each other but a great deal more with their own branches.

Phase III, including the computer link with schools, was in progress at the time of the research, with a network pilot project, so that the users could find out what their requirements were. School heads had already come up with all kinds of ideas.

Conclusions

The great bulk of government work consists of information handling, so it is not surprising that government departments have been major computer users. The Education Department saw IT as enabling the organization to respond better to its customers and therefore as strategic to its survival. It was the recently available integrative capacity of the technology on offer which made this possible. Like BLT, there were problems with implementing rapidly on a tight budget, which put a burden on users, but because of otherwise good relations with them these were overcome.

14. THE TRAINING AGENCY (TEED) 1989

Background

The Training Agency (when research began; formerly the Manpower Services Commission) is now part of the Department of Employment. It has its head office in Sheffield, with 2000 staff in five buildings, and a head office in London. It is organised in divisions, whose names and functions have changed, along with those of the TA itself. Staff described the organization as 'volatile', a 'political football', which needed to be able to adapt quickly to changes imposed by changing economic conditions and government decisions.

The old MSC was not traditionally a big data processor, and had no mainframe at head office. It had isolated word processing and PCs at head office: two word processing pools and 350 PCs, plus 500 micros nation-wide, and some computerised systems within divisions. The Computer Branch of the MSC had a bad reputation in the organization, partly because of slow delivery of promised systems. The existing Information Processing (1983) and Telecommunications (1984) strategies called for adherence to international standards for system interconnection (a Civil Service requirement), single terminal access, that systems should be easy to use and cross-divisional, based on Unix. They were in principle in favour of OA, with the (far-sighted) proviso that local links should be possible between office systems and that in the

long run, OA and DP should be able to communicate.

Initiation

The OS project was initiated in 1985-86 by the then Chairman of the MSC, who had been on the main board of Rank Xerox. He and his chief civil servant were based in London and he wanted to be able to communicate with his Management Committee (the CMC), who were in Sheffield. At the same time, the head of the Computer Branch had just set up an office technology section, which subsequently became MASCOT. Because they recognised their lack of expertise in OA, they chose to work with consultants, and together with PA conducted a requirements study in April 1986 by interviewing the 12 members of the CMC and their secretaries and their support community. A PActel report 'Office Technology Support for the CMC' (July 1986) identified a need for integrated OT. The report noted the large amount of document preparation in the MSC, the limited use of OT which, together with pressure for more, especially word processing, could result in an uncontrolled ad hoc expansion. It noted the need for better access to information both in the CMC and in the MSC generally. However, it found the members of the CMC had very little need (or indeed wish) to communicate with each other; they communicated much more with the divisions they headed and with the Chairman. As communication flows were vertical not horizontal, installing technology for the CMC would not be cost-effective. The report stated there would be no staff savings but there would be productivity and quality improvements, and a reduced need for recruitment in the future. Staff commented later that they tried to identify cost benefits before the initial decision was made, but gave it up because it was 'appallingly difficult', especially in the case of the TA, because it was a moving target. On the other hand, in their view anything which made it easier to produce documents couldn't fail. Officially, they estimated a break-even in the 5th year of the system's life. In any case, the idea was to use the first installation as a prototype, to try to extrapolate effects on organization.

Design

The system which was eventually installed in February 1988 as MASCOT I was based on Q-Office software, tailored in house, running on Olivetti hardware. There were four AT&T minis in Sheffield and one in London, connected by an X.25 network. There were 130 users with 100 terminals, mostly dumb, plus printers, an OCR scanner, etc., using Unix on a network. It was possible to move easily from one facility to another, e.g. from WP to e-mail, back into WP, by means of short-cut commands from within a document. Incoming mail could be read in via OCR. There were three levels of access, individual, group, and everybody.

Implementation

At the request of the CMC, the Computer Branch and PA consultants produced a report in October 1986, which placed the previous OT study in a broader context, including the use of computers throughout the MSC and existing IT strategies in the organization. It noted and

evaluated the following strategic options:

anarchy - let user departments go their own way
evolution - as anarchy, but within framework of policy (standards)
'genetic engineering' -
  pragmatic - build slowly on what is there
  prototype - continuous process of refining requirements to deliver solutions
  centralised - centralised control and planning - steady growth
technology push - Computer Branch looks for niches for new products
'big bang' - as centralised, but faster

The strategy adopted took neither of the extremes, anarchy or centralisation. The idea of introducing OT immediately throughout all of the MSC head office had already been rejected because of the cost and the lack of experience in the organization to implement such a large project. The October report recommended a prototyping strategy for the long term, plus some elements of pragmatic and evolutionary for the short term - especially, setting standards and guidelines for the purchase of new equipment in divisions not participating in the first phase, so that eventually systems would all link up. The target was 'to provide OT facilities for all staff who need them in the head offices of the operational division' by the end of the decade - about 1000 users and 600-800 terminals.

The CMC agreed to a pilot based on the CMC plus a vertical slice consisting of a division (the Special Measures Directorate) which was small and compact, a discrete group, at a separate site from the main headquarters at Moorfoot. It also had its own links to the field. However, soon after the Treasury approved the project and it started, a government decision was made to hive off the Employment Service from the MSC, and with other consequent changes the user base changed, the number of users went down, the majority moved buildings, and many jobs changed.

Implementation began with the top management group, the Director General's Strategy Committee, because there was pressure to get them on first and the need to get management commitment. Terminals were provided to all their secretaries. Later, specialist staff regretted this, because there were problems with the printers which affected these high profile users, who were upset because they couldn't get their work out. Their bosses could not be persuaded that a temporary downturn in production was inevitable. There was conflict between the secretaries and the specialists, and although the latter outranked the secretaries one or two grades, they dared not challenge them because they were protected by their bosses.

Existing IT policy indicated that office automation should have implementation procedures distinct from those for DP, and that due weight should be given to organizational, management and staff problems. There was a high-level OT steering committee, senior managers were reported to be keen, a structured project management methodology (PROMPT) was used, users were involved and job design received attention from in-house psychologists.

User participation

Three user representatives from the SMD were seconded to the MASCOT project implementation team, which also included Computer Branch staff. According to one of the technical staff, this was a key to the success of the project, as user reps told technical people what users would not stand for (e.g. long activity diaries). He saw the user reps' role as communication channels. Eventually they became the local experts.

However, the user reps went through a long period of not knowing what their role was, and felt they hadn't had enough training. Their colleagues asked them questions they couldn't answer, which made them feel inadequate and demoralised them for a time. For example, one aspect of user involvement was to give users demonstrations of the three shortlisted suppliers' products. This was not a lot of use because the selection of a system was based on cost according to Treasury procedures; they could only comment on things like colours of screens, and the user reps didn't know enough to comment on the choice of a system. The user team also engaged in a working practices exercise, asking users how they thought the system would help them with their jobs, and what they would like. This was not a success because it was too early to get useful feedback; even the team didn't know what system would be, the user reps didn't know enough to tell users what the system might do and how, and the users knew nothing. Another example was that user reps believed that all the users' forms would be on the system, and they weren't although they could have been, because the user reps didn't have the knowledge and when they asked 'why can't it do this', they got long technical explanations. One user rep's view was 'we missed it' - getting what users wanted on screen.

However, user reps eventually went away for five days' training in Q-Office at the Olivetti training establishment. A prototype was put in for the team to get experience with, but it kept falling over, which was very frustrating for them. The technical people couldn't see why, but it would have been to users.

Training

User training was organised by a user rep, and was considered a great success. It ran throughout implementation and covered all grades of staff, most of whom had never used a PC. Modules A and B took one to a reasonable level of competence, C was advanced WP for typists and secretaries. Module A took two days and covered word processing, email, diary, and a little about card box (database). When they went back to work they had a box on the desk and could use it right away with support from the team. Initial training was in mixed groups of seven or eight people, but secretaries and typists were trained separately with more emphasis on word processing. They found however that all users needed keyboard familiarity in the first two days, and now do virtually all word processing. After two weeks users had two more days' training for consolidation, more email, etc.

All levels were trained together because they didn't want to take away too many people at

a time from a section. However, this resulted in non-typists being put off by seeing typists at the keyboard. It was also thought later that higher level managers (Grade 7's) should be trained as a peer group so that the enthusiastic ones could influence the less enthusiastic.

In the preimplementation period there were several presentations to users. A newsletter, MASCOT news, was sent out with information as to how things were going. The implementation itself took three and a half months. There was a help desk, which continued long after, and users were 'encouraged to play with it'.

Outcome of the pilot

Because of the reorganization, the pilot group changed; it moved back to Moorfoot, became part of a larger entity, the work itself changed, and it lost its field liaison offices and thus became a less good example. This made it hard to estimate the effects on the organization, and defeated one of the main purposes of the pilot. However, one view was that IT helped users to cope with these changes to their jobs and didn't necessarily lengthen the learning curve.

An evaluation of the effects on human factors and activity was conducted very early, shortly after training was completed and no users had been trained for more than 6 months. Nevertheless, a 9% increase in productivity in document production was found, and a 50-70% decrease in document turn-around time. This gave them the ability to meet tight deadlines. There was much less typing, and job satisfaction and skills had increased. Regrading of secretaries was considered to be too complicated as the grading system was so elaborate anyway. There were not many cost benefits.

It was found that 2% of staff were totally resistant, which compares with HUSAT findings. The uses were mainly word processing and email, while one or two had exploited it more. Six or seven managers used it some, two extensively, the others to send messages. Their secretaries did not like being bypassed in this way.

Specialists found they could have been more 'directive' on some issues, on which users don't really want to be bothered (e.g. file structure and file naming conventions). There could have been more tailoring. They thought they should perhaps have continued parallel working for a time, because the typists and personal secretaries had problems when their old equipment taken away and they had to continue with their workload while learning the new system. A major problem was that they had 80 terminals for more than 100 users, because the Treasury wouldn't let them buy more. This was very inconvenient.

Extension of the project - MASCOT II

A business case was built on MASCOT I for MASCOT II, the extension of the OS to the whole of headquarters. This was authorised in January 1990. While waiting for Treasury approval, the Computer Branch started the procurement process and proceeded with planning implementation. A number of lessons had been learned from MASCOT I and were reflected in the new implementation strategy.

PROMPT was found to be less suitable for OA than for DP, because it does not deal well with non-technical elements, is not user-based, and you have to QA (quality assure) each outcome/document. Evaluating tasks, e.g. activity diaries, was 'a pain'. It was eventually decided to use PRINCE methodology instead, as it was the Employment Department standard, was product-driven and more flexible.

The organization had learned that with OA, since use is discretionary, there was a need for marketing and job design to make sure it was used to the fullest extent, and for commitment from senior and middle managers to deal with the management of change The next phase would be approached with a marketing strategy and more detailed user education. While top management of the projected user branches were keen, partly due to the success of MASCOT I, a need was observed to get the commitment of Grade 7, as the usage and commitment of staff followed the example of the head. It was intended in the next phase to go to Grade 7s two to three months before and get them to discuss how they could implement it, emphasising that it was their system.

MASCOT I showed how important training and the help desk were. Psychologists also carried out a job design project, asking current (MASCOT I) users for their views on what should have been done. From this, a job design pack was developed to assist users in thinking about how to integrate MASCOT into their work a few months before the new system went live. Implementation plans involved consulting users with this pack, when the equipment was available, in workshop groups. These would consist of some horizontal groups such as personal secretaries and managers, as well as branch-based vertical workshop groups. The groups would be assisted by members of the implementation team and reps of the MASCOT I Users' Association.

Implementation plans

The implementation team would be again a mix of technical and mostly non-technical people from the new customer services division of Computer Branch, trainers, and user reps. Implementation would be phased branch by branch, with a MASCOT co-ordinator for each branch, with authority even over managers, and implementation for the branch would be overseen by a co-ordinating committee consisting of branch manager, account manager for IT system, a rep from the implementation team and a rep of the end-users. Phasing in of the branches would be decided by the Director General's Board, according to the degree of importance of the work to the TA as a whole.

Technology and strategy developments

There were related developments in organizational IT strategy and in the technology, which led to a much more ambitious project for MASCOT II than was initially envisaged, but also to delayed introduction. The IT strategy had originally been quite simple; it was for UNIX, Quadratron, and single-screen access. But there was a head office review of IT strategy which

meant that MASCOT would link to all IT in the organization (which had always been an aim). IT data such as budgets and personnel were to become accessible to managers, as well as text storage and retrieval and project management. The technology would be quite different from the pilot, both because there had been a new release of Q-Office, CLIQ, and because they had decided to have PCs with DOS downloaded onto UNIX instead of dumb terminals because there is such a lot of good software on DOS, and many people are used to working with it. Thus, manuals had to be updated and existing users retrained, and they needed at least three months to test the new system because it was technically new. It was new not only for them, it was leading edge. DOS-UNIX links were being developed by Quadratron, and they were held back waiting for this software development. At the same time, a Corporate Communications Network was being installed to provide data communications between 850 locations including all Head Offices, Regional and Area offices.

A Systems Review (Final Report May 90) saw MASCOT now as more of a front-end into applications. The conception of the system had changed; users would turn on and access CLIQ, which had mainly WP, spreadsheet and databases. They could then go into DOS for DTP etc., and access other IT systems such as TARDIS, text retrieval, and the external NOMIS national database for Manpower. Each branch's IT systems would be integrated with MASCOT. Management of information was now seen as a resource, and they were talking much more about effectiveness than efficiency.

Organizational Change

Computer Branch was reorganized into technical and customer oriented sections. The 'customer account managers' and their staff were people with technical backgrounds but it was classified as a non-technical job. A Human Factors Advisor with a non-technical background was appointed to assist in implementation, and saw his role as trying to take the user's point of view, and mediating between what users want and what is technically possible, 'keeping them realistic'. Computer Branch were short-staffed and as a result they were contracting much of their work to consultants, such as marketing, training needs analysis, and evaluation.

The division of the TA into grades and branches would make it very difficult for the workshop groups to discuss the function of the unit as a whole and how work might be reorganized with the introduction of the new system. Such reorganization would raise grading and regrading issues, and as promotion was very important within the organization, unions and middle management might resist. Users were being told it was just a tool, not a radical change, but that they must consider how what they did affected other people's jobs, e.g. if managers spent a lot of time inputting what a typist could do, how would it affect the typists.

Major impacts were expected on infrastructure/support workers. MASCOT I users were moved and reorganized with 20% staff cuts. Staff in the rest of the organization were worried about job cuts; 250 jobs were expected to be lost anyway, without MASCOT, but there would

also be cuts due to MASCOT because the Treasury required saving the cost of the project, £13.3m, and therefore they were looking for a 5% efficiency improvement in the organization as a whole. Posts might be lost but redundancies were not anticipated.

The TA lost some of its functions to the TECs, with whom relations were still being worked out. In London, MASCOT I users were moved to the Department of Employment. The Training Agency was abolished as such and become part of the ED, which raised all sorts of questions about the future of the proposed system. One reason was that the ED was conducting its own pilots with Office Power. It was also not at all clear what the number of users of MASCOT II would be or the number of terminals required. The target at one point was 900 staff in Sheffield on the three sites formerly TA, but a number of ED staff were also now at these sites. If all ED staff in Sheffield got MASCOT, the number of users would be 1500. The tender for the suppliers was for a minimum of 600 terminals, with 3-500 reserves, which could be added on later. In June 1991 the target was 1200 in Sheffield, plus 80 in London where they had a new branch, aiming at a 1:1 ratio including old equipment. At the same time the possibility that the ED might pull out of London was being discussed.

In June 1991, the contract was awarded to ACT. Mini-MASCOT servers were planned to be installed 1 July and tested from July 25. There was time pressure because of the need to spend the money allotted by the Treasury within the 2 year budget period, which ended April 1993 no matter when they started. It looked as though all of Sheffield would be using CLIQ, but they didn't know how much further it would extend in the ED group. The implementation team was to consist of the Project manager, Accommodation, Health and Safety, ergonomic, ACT Liaison, installation, and a data conversion manager (old data to MASCOT), under a Project Board chaired by the senior manager of the organization in Sheffield, also responsible for all staffing.

Conclusions

The Training Agency illustrates the difficulties of planning long-term investment in information technology in an organization which is subject to both constant and sudden change. The careful evolutionary implementation approach seemed to be based on a false assumption of stability. The conception of the system also changed completely within a short period, partly due to advances in technology which enabled more integration. The merger with another Department which had been trialling a different system made it possible that all the effort in the TA would have been wasted. Given Treasury and other Government guidelines, the organization could not have proceeded differently, but if ever there was a case for putting in a basic office system quickly and then finding out what the needs were, this was it. It was also unlikely that the highly bureaucratic structure with its elaboration of grades etc. would allow work to be redesigned in any significant way to take advantage of the technology.

15. DIGITAL EQUIPMENT CORP. - UK and EUROPE, 1991-1992

Background

Digital, a major computer manufacturer, has also been hit by the recession. Average margins are down from 50% to 5%, there have been redundancies and whole units have gone. It has an OS which has enabled some of the major organizational changes required in this situation.

Initiation

In 1981 DEC had achieved world-wide network integration when the three major existing networks (engineering, manufacturing, all the others) merged. Electronic mail had been introduced for 'selected people' such as senior managers. All-in-One was implemented in 1982. The company achieved a 1:1 computer ratio in the UK in the early 1980's, with 20,000 users. Computer conferencing (see below) was added in 1984. In 1985-86 technological improvements including step function changes in computing power and network reliability, enabled email communications between all members. The IS Director Europe and country directors made a commitment to the large investment required to implement All-in-One across Europe. It took two and one-half years to implement. Email is now in its third or fourth generation with 30,000 users across Europe, including the UK.

Design

There are now 100,000 organizational users, 90% of all employees. Even the canteen, which is subcontracted, is on the system. Facilities include messaging, conferencing, arranging meetings, videotext (databases). Documents from files can be appended to messages and sent anywhere. Computer conferencing has been very successful. Anyone can initiate a topic and ask for comments from any and all users of the system. In 1987-88 there were 1000 conferences going, 1500 now, some of which have been going for years. As for integration of media, telex and fax are now on the system, they are working on telephone and looking towards including video. Open Systems standards were making it possible to buy in 'foreign' equipment, e.g. laptops, IBM and Apple. They were in the process of phasing in network-wide shared filing, which any PC can access, so that there would be only one copy of data anywhere in system.

The network service had to be rewritten to allow for the increase in numbers of people on it, plus the upgrade which is going on continually. In the next stage there will be access for staff from any office anywhere in the world. Any employee will be able to work from any Digital office - pick his/her desk for the day, log on and work as though at base.

Implementation

The IS department put in the infrastructure but the implementation approach was described as employee-led, not top-down. The hardware and software have developed over time, and the main products have been discovered, not engineered. For example, All-in-One was a local initiative in a U.S. branch which was diffused throughout the organization by imitation by other branches. The success of this approach is related to the organizational culture, which is described as 'high tech high touch'.

Digital was described as a very communicative organization, even before the widespread adoption of computers. The technology fits easily into this culture. Managers are regarded as facilitators. They tend to recruit the 'naturally curious' person and give them the tools to continue learning. They are trying to move towards a learning organization, a 'voyage of discovery'. The approach to employees is 'you can do anything'. This leads to widespread local development of applications by users and dissemination/adoption by example.

Organizational Change and other Outcomes

The office system has been a major enabler of organizational change. The Directors had this in mind when sanctioning the system; they had a vision to make the organization independent of location or structure. The OS has greatly increased flexibility. For example, one respondent changed from a UK to a European job, was assigned to a group which is based in the UK, Milan and elsewhere in Europe. They all physically stayed where they were, saving at least $200,000 in relocation expenses for each individual. Digital Europe 'changes its organization every year', which would not be possible without the OS both to plan and to implement such changes quickly. Decision-makers no longer think about the technology, they just make decisions about the organization which assume it's there. The OS has enabled organizational change such as more outsourcing and internal markets. Inter-company links with customers and suppliers have been developed in the last several years through X.400. This has resulted in a shakedown in suppliers to a core of those who are most compatible, plus an extended pool. P&O run all their canteens and vending machines; even the security guards are outsourced.

Internally, the company has been broken up into 100 or so entrepreneurial units with a manager who has business responsibility, after approval of a business plan which shows the return on investment. Some units have gone out of business. They are also trying to do away with country boundaries.

There had been major changes in secretarial jobs. As well as reduced numbers, they had become more assistants to a team. An attempt to make the secretary the 'super-user' of WP and adviser to the team ran into trouble because of internal conflict with IS Dept. Efforts had been made to extend the IS group out into organization to become the local experts more in contact with the business and users.

Layers have been stripped out because of direct vertical communication and organizational change. The manager of an entrepreneurial unit reports to a director - three layers. The company had been growing at 1000 employees a year, but slowed down two years ago to reduce costs. Flexible working had been introduced so that 700 people could use a building designed for 400. In one location, people didn't have desks; when they arrived at work they went to their group area and picked a desk for the day - no picture of the children, other personal things. Many worked from home, also significantly reducing real estate. There was an obvious danger of losing group spirit, exchange of ideas, so team meetings become more important.

A mature system has its own problems. It is not a one-off investment, it needs continued commitment and expenditure or you will start to lose the benefits. There is a continued need for the training of new people, and to increase disk space so that response time doesn't get too slow and users are not unduly restricted as to the number of documents they can have.

Conclusions

In Digital, there was a clear perception of an OS as an enabler of organizational flexibility and change, which has been realised. The OS has become a seamless, taken-for-granted part of the organization. Although there are technical (but mainly financial) problems about maintaining the level of service and meeting users' aspirations, the main problems appear to be around maintaining structure, motivation and morale within the very fluid organizational form which the OS supports.

4.3 Conclusions from the case studies.

The case studies show a great diversity of uses of OS co-existing in different organizations within the time span of the research, as well as a diversity of organizational impacts, and of implementation approaches.

4.3.1 Design.

All of the systems studied were at least interdepartmental in scope. This was partly a result of deliberate selection, but I did not come across any systems which were confined to a single department. BAe and GKN were in a sense the most old-fashioned, administrative support systems in the traditional 'office automation' sense, with little or no integration with other systems or between sites. However, both systems provided support for internal process integration in the form of group working on projects which had strategic significance, the putting together of contract proposals and take-over bids. All but two of the cases had or were working towards organization-wide OS, most of which were national and some international or global in scope in at least some respects (communications). KFS and the Education Department provided good examples of the use of OS for various forms of internal and external integration, which were rather easier to see than in enormous companies such as IBM and Digital.

Linkages between the office system and data processing and other existing systems were common. Managers and professionals as well as secretaries and typists were included in all the systems, and compared with earlier research, more of the former were actually using them. The extent to which managers did so varied considerably between cases.

4.3.2 Objectives.

Efficiency and cost-displacement were mentioned as one of the objectives in nearly every case, but in none was it the only one. Effectiveness was also referred to as an objective in nearly every case. In many, investment in office systems had to be cost-justified but that was not seen as the main reason for introducing them. In about half the cases, there was a clear strategic focus. The financial services organizations in particular were heavily engaged in business process

integration and boundary-spanning customer service/delivery, as part of their business strategies. In three others, strategic benefits 'emerged' after the OS was introduced.

4.3.3 Effects on jobs.

Effects on jobs were still greatest at clerical and secretarial level, both in terms of reduction in numbers and changes in work role. In some cases, their jobs had been enhanced, with more variety and satisfaction, in others their situation had worsened in some respects. There was little evidence of equivalent impacts on the jobs of managers and professionals. An exception was IBM and Digital, where managers were using the system to do some of the work formerly done for them by secretaries (which they now did not have), and there was a drive to control or reduce the number of managerial and professional staff as well. OS involve complex alterations in manager/secretary relationships and roles, which are worked out in quite different ways in different contexts. The unionised government departments appear to have paid the most attention to job design issues, but even here the outcomes were not all in the same direction (enhanced jobs).

4.3.4 Effects on organization structure.

Most of the organizations which were using OS strategically were also making major organizational (structural) change. This was clearly the case with the three financial organizations, where the OS was used for business process redesign. In BLT and KFS, organization change both preceded (and assisted) IT implementation, and further changes were resulting from the presence of the technology. In the public sector organizations, organizational change accompanied the introduction of the OS (ie. both were impelled by the same reasons) and some changes were made because of the OS. In the major computer manufacturers, the OS was seen as a means of achieving organizational change. The relationship between OS and organizational change was therefore very complex, and certainly not one of straightforward cause and effect. The entire issue of the effects of IT/OS on jobs and organization structure is discussed in detail in the following chapter, in the context of a theoretical framework for understanding the relationships.

4.3.5 Implementation approaches.

Implementation could be characterised as top-down or at least top-led in every case, which must have to do with the integrated nature of the systems. Within this, the degree to which adoption and use were voluntary or mandatory varied greatly. KFS provides a nice example of leadership and subtle coercion of managers, accompanied by a gradual and experimental approach to user needs which was very successful. The systems which were seen as strategic were mandatory and were also introduced fairly rapidly, while others were much more gradual and laissez-faire. Clear business need and a sense of urgency obviously affected the implementation approach adopted.

Big, organization-wide projects were phased in because of their size, and usually piloted.

Formal methods of user participation were a conspicuous feature in only the government departments, but that is not to say that users had no influence in the other cases, especially where adoption and use were voluntary. Guimares (1993) found that some users have influence without actual formal participation. As OS increasingly include users who are more powerful because of their roles (such as some managers and professionals) we can expect that this will be the case and that we will have to distinguish not only between participation with and without influence, but influence with and without participation. In several organizations, of which IBM and the TA were good examples, there was a clear perception of a need to 'market' the office system to users in general, and in the TA, to coax powerful users on board. These and other implementation issues will be discussed at greater length in Chapter Six.

Chapter Five

The Interaction of Technology and Organization

A Process Model of Implementation

Introduction

So far we have considered developments in office systems technology and its organizational uses, in other words, the what and the why. In this chapter and the next, we consider in more depth how the desired organizational benefits can be achieved. This involves developing first, a conceptual process model of implementation, and second, a prescriptive approach based on it. In so doing, we move away from the exclusively rationalist perspective which underlies technology-strategy analysis towards a more interpretivist and political perspective (Kling, 1980; Reed, 1989). As Brunsson (1985) has shown, the rationality of decision-making differs from the rationality of action.

The interaction between technology and organization during implementation is one of the main determinants of IS success or failure (Mohrman and Lawler, 1984; DeLone and McLean, 1992). By surveying the literature on the effects of IT in organizations, we come to a better understanding of the implementation process and the relationship between technology and organization, on which to base a prescriptive approach. Also, we have seen that the more strategic uses of office systems require concomitant organizational change, such as restructuring of departmental relationships and job redesign, and that one of the strategic uses of IT is to redesign organizations to make them more responsive to the environment. For this reason as well, we need to examine the relationship between information technology and organizational change.

5.1 Perspectives on technology and organizations.

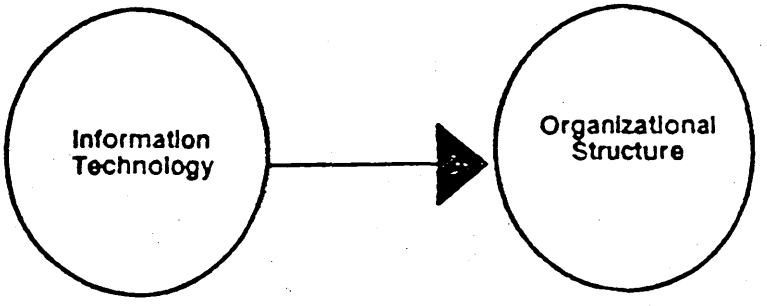
In dealing with this question, we inevitably have to consider how to conceptualise the significant dimensions of technology and of organizations (Payne *et al.*, 1990). Another issue is how to perceive the nature of the link between the two, which tends to determine the kinds of effects which are looked for (Crowston and Malone, 1987). In examining the implications of IT and OS for organizational change, we are concerned with the possible effects on organizational structure and the design of jobs within organizations. Apart from this, the concepts of organization and technology will be deliberately left vague for the moment, and the focus will be on the nature of the link.

The effects of IT on organizations have been discussed from two main perspectives which Markus and Robey (1988) call the technological imperative and the organizational imperative. These refer respectively to the organizational impacts and the organizational uses of technology. The term 'organizational impacts' implies that technology is a causal factor, an external force which produces direct changes in organizations (Figure 5.1a). The organizational imperative on the other hand emphasises the flexibility of technology and the ability of designers and managers to employ it in the service of organizational goals and information-processing needs (Figure

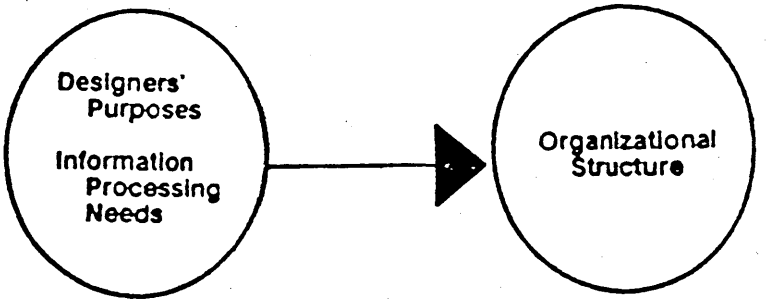
Figure 5.1

Theories of Causal Agency

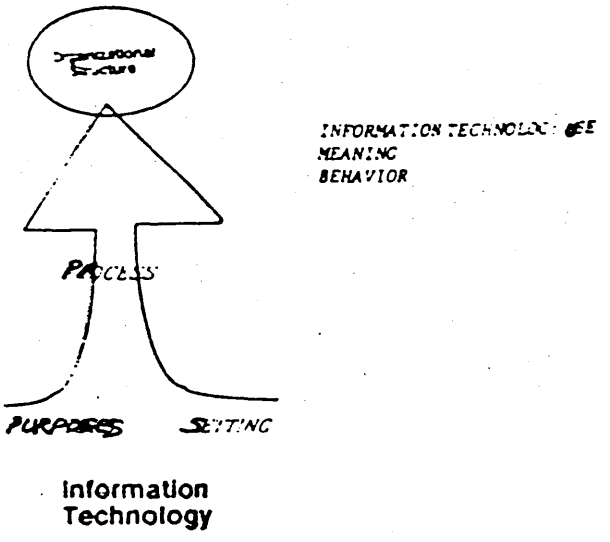
a. Technological Imperative



b. Organizational Imperative



c. Emergent Perspective



Markus and Robey, 1988

5.1b). These assumptions underly all discussion of the strategic use of IT. The third and more novel perspective discussed by Markus and Robey is the 'emergent' or processual perspective, in which outcomes are seen to emerge from a process of interaction between technology and organization (Figure 5.1c). I will argue that this perspective both fits the evidence and provides a framework for developing a model of implementation. The variant of this perspective which I will develop is the introduction of technology as a mutual structuring of technology and organization.

5.2 Technological impacts.

The impact of IT on organization structure is a well-established field of IS research (Culnan, 1986), dating at least from Leavitt and Whisler's influential 1958 Harvard Business Review article, 'Management in the 90s'. Despite a large body of empirical research and the undying fascination of the subject of technological impacts, there is little support for a strictly technological determinist point of view. Impacts have been found to be contingent on a number of different factors, such as organization size, environment, culture, and task routineness (Zeffane, 1989; Robey, 1977; Storey, 1987; Robey, 1981; Klein, 1986; Kling and Iacono, 1989). In a review of research on the effects of information technology use on organizations, Swanson (1987) listed a string of contradictory views and empirical results on each of the different dimensions of departmentalisation, hierarchy, span of control, functional differentiation, centralisation, and routinisation.

Much research on the effects of computers on work has focused on the issues of deskilling and routinisation. Such effects have not been found to be inevitable; nor has job enhancement. Widely different effects on jobs have been observed when the same technology has been introduced into different organizations or different parts of the same organization (Appelbaum and Albin, 1989; Land *et al.*, 1983; LeQuesne, 1988; Barley 1986.) A study by Kraut, Dumais and Koch (1989) for example found that 'identical hardware and software within a single company can have positive effects on one job and negative effects on another, and can even have mixed effects on different aspects of the same job'.

To some extent the problems are methdological. Fry (1982), summarising the research on technology and structure from Woodward through 1980, attributed the confusion in the field to the different conceptualisations of technology and structure, the different levels of analysis and types of measures employed in empirical research. But the methdological problem may be more fundamental. Impact research is very often based on variance analysis, in which some level of technology use is correlated with organizational attributes such as locus of decision-making, use of formal means of control, and departmentalisation (e.g. Zeffane, 1989). Variance theories are concerned with explaining why things happen, in terms of necessary and sufficient conditions (if X then Y). Research based on such theories attempts to measure presumed causal and dependent variables, and to predict levels of outcomes from levels of causal variables. According to Mohr

(1982), research which is variance-theoretic in form is inappropriate in much organization research because it rests ultimately on the notion of efficient causality, and is not concerned with the time ordering and interaction effects among contributing variables. Swanson (1987) also calls for a research methodology which is sensitive to time ordering, the interdependence of variables, and to unique situational and historical context; ie. processual research:

> What may be needed ... are studies imbedded in more general theoretical contexts, which absorb the research artifacts, viz. causal precedence attributions and levels of analysis, with which we routinely work....this suggests that determinants of information system use [managerial choice, strategy - FN] must be integrated with effects, and that individual, organizational and market contexts be jointly incorporated within individual research studies. (p. 199)

Another problem with impact research, especially in its variance form, is that it attempts to isolate the effects of technology on the different structural dimensions of organizations, rather than seeing the latter as holistically related. There is a straining for consistency among the dimensions which results in organizational configurations or a limited number of discrete types (Mintzberg, 1979; Miller and Mintzberg, 1983). Consequently, organizational changes tend to be from one configuration to another rather than along one dimension at a time (Miller and Friesen, 1982).

The third problem with impact research is the way technology and organization are conceptualised. Both technology and organization structure are human artifacts, and the relationship between them is mediated by human beings with views as to their purposes. The role of human volition and meaning, including managerial intention, is often overlooked in impact research (partly because of the difficulty of researching it using survey methods?) Orlikowski and Robey (1991) have criticised the purely 'objectivist' approach to both technology and organization structure:

> By presuming that technology is an object capable of having an impact on social systems, such research treats both technology and organization structures as objects. The metaphor of impact (one object colliding with another) implies objectivist assumptions, and where computers are treated as discrete objects capable of causing impacts, researchers will tend to find such impacts. The objectivist approach thus overstates the importance of technology's material characteristics and ignores the social interpretations that may modify the impact of particular software systems or hardware configurations.

An adequate model of the relationship between technology and structure should not omit the rational choices of designers and decision-makers. Technology involves a plan and knowledge how to use it (Davies, Dawson and Francis, 1973); structural change and system design are both ways in which management and designers attempt to respond to organizational problems or opportunities (Bjorn-Anderson *et al.*, 1986); there were a number of examples in the case studies (BLT, KFS, IBM, DEC).

However, it is important to recognise that the introduction of new technology does not mean no change; technology has impacts at least in the minimal sense that it opens up new

options for management (Storey, 1987), and for the workforce the introduction of new technology can be an occasion for redefinition of work roles (Barley, 1986, 1990). Clark *et al.* (1988) have attempted to rescue the concept of technology and to show that some technologies do have implications for work roles, although even with apparently quite determinate technologies, there is still 'design space' in which organizational participants can influence impacts on jobs (see pp. 83 and 85 below).

5.3 The managerial perspective.

The 'organizational imperative' is closely related to the strategic use of IT discussed in the preceding chapter. This approach is strongly rationalist, prescriptive and emphasises the element of managerial choice. It assumes that the technology itself has few inherent organizational implications, and that impacts, if any, can be controlled. The characteristics of computer technology are seen as a means of achieving managerial goals which are desirable in themselves. If information technology is not deterministic, but can be used to support almost any kind of organizational structure or strategy, the management task is to decide on the appropriate strategy and design the structure and technology to suit it. In the strategic planning view, strategy drives both structure and technology (Figure 5.2). Outcomes, including impacts, thus depend on managerial intention, and the organizational parameters are assumed to be known. Therefore there is an assumption that both the goals of the system and the means-end relationships for achieving them are well understood. In the case of office systems, neither assumption is usually justified.

There is considerable research evidence to support the view that management's intention does have a significant, if not all-powerful, role in shaping the effects of technology at job level. Managerial assumptions and strategic choice help determine the different outcomes which arise from the use of the same technology in different settings (Robey, 1981; Applebaum and Albin, 1989). The nature of the choice presented to managers concerning the effects of technology on work and organization is usually phrased in terms of a polarity of outcomes, such as Zuboff's distinction (1988) between 'automate' and 'informate'. It has been neatly presented in graphic form by Bjorn-Andersen (1986) (Figure 5.3). Friedman (1977) has shown how these job design alternatives are related to the different control strategies which managers may pursue with computerisation: direct control vs. responsible autonomy. These correspond to the choice which Walton (1989) presents, between organizational strategies of compliance and commitment. Empirical evidence supports the existence of these alternatives. Kling and Iacono (1989), for example, found that desk-top computerisation could be used to support either 'flexible' or 'regimented' work groups. Appelbaum and Albin's (1989) study in the insurance industry showed that the technology could be used to support either 'algorithmic' or 'robust' work designs - routinisation, centralisation, and more control versus increased organizational adaptiveness. In the latter cases, the skills and understanding of clerical workers were enhanced and more

Figure 5.2

The Managerial Perspective

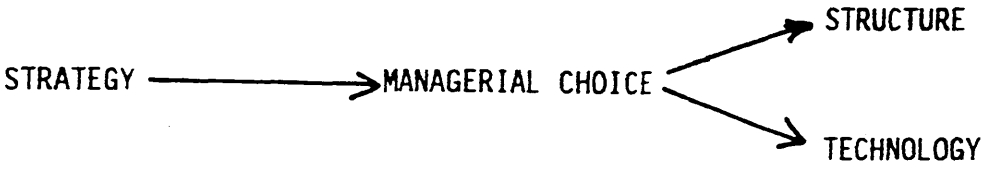
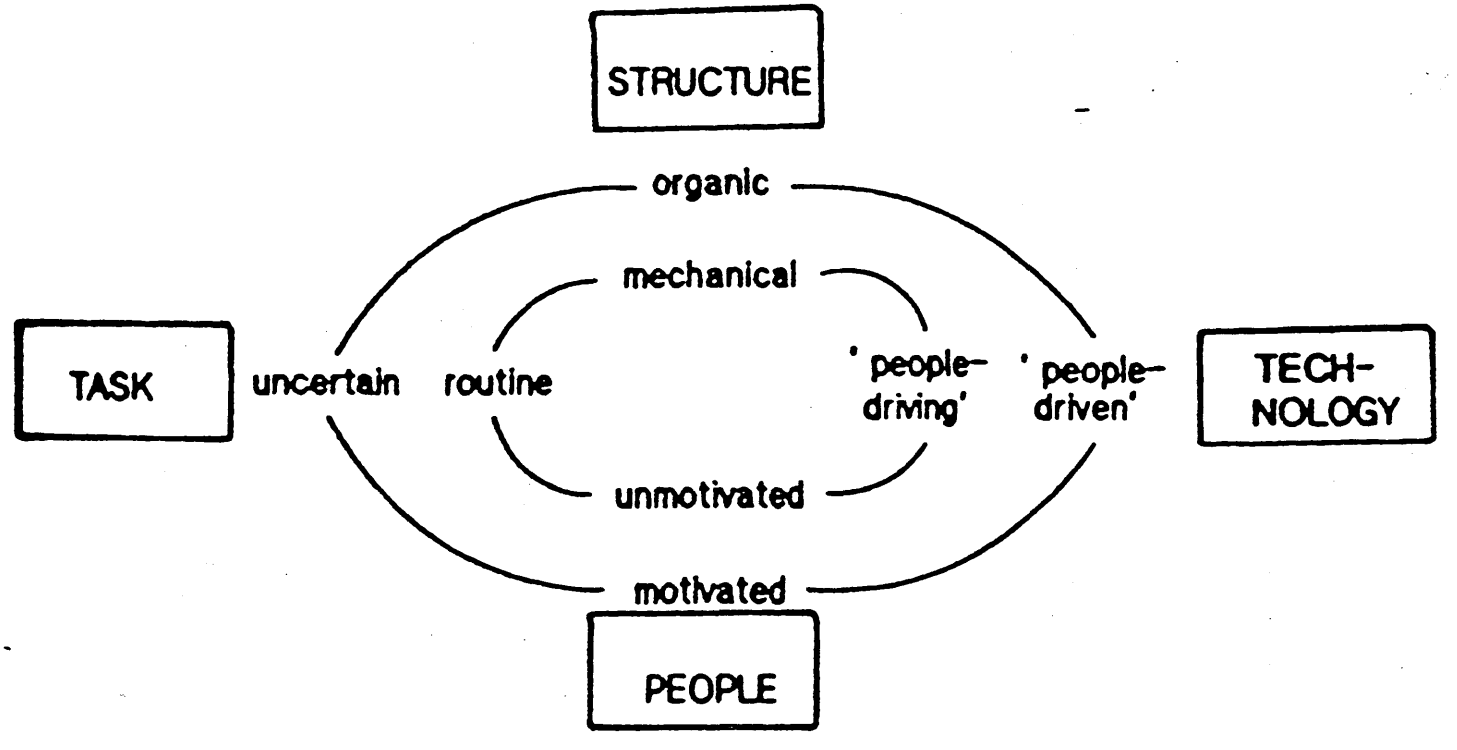


Figure 5.3

The Manager's Choice of Alternatives



Bjorn-Andersen, 1986.

decision-making was delegated to them. We have seen in the export insurance case study that clerical workers, finding that their computerised work had become algorithmic, were seeking job redesign to make it more robust, the Account Manager idea. I represent a rational model of managerial choice including the alternatives in Figure 5.4.

The circumstances which determine how an organization should choose a job design and control strategy have been discussed to some extent in Chapter 3. While it has always been acknowledged that some organizations in some environments (e.g. those providing commodities) require a strategy of cost control and compliance, strategies based on commitment, 'informating', and enhanced jobs are usually regarded as contributing most to the organizational flexibility required by environmental turbulence. There is also a strong implication among a number of academic and management writers that the nature of new technology itself requires flexible work organization. Osterman for example (1991, p. 242) argues that IT has characteristics which 'shift the cost-benefit calculus in favor of a particular configuration of human relations and job design characteristics'. McLoughlin and Clark (1988) quote Buchanan:

> Sophisticated, flexible, expensive equipment needs sophisticated, flexible, expensive people to operate it. The effective and safe operation of these new technologies requires very careful attention to work design.

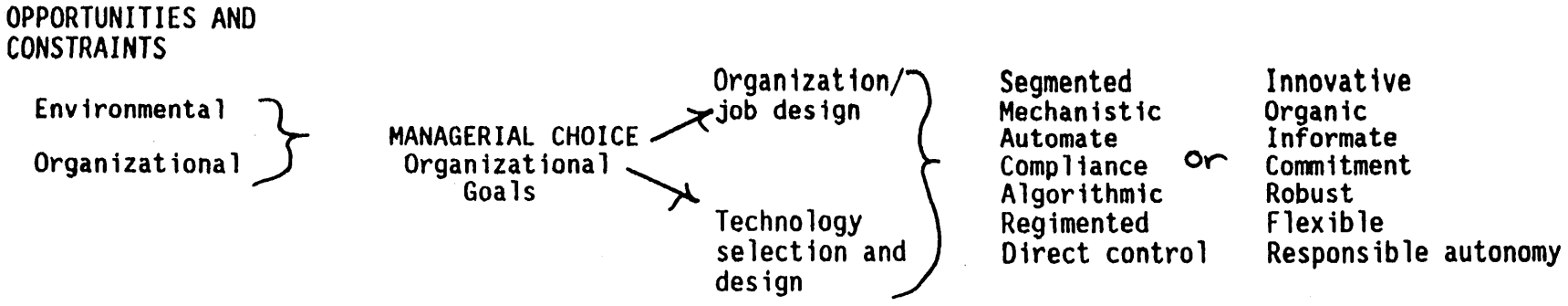
Similarly, a review of studies of CAPM implementation by Tranfield and Smith (1990) concluded that full exploitation of the benefits of the integrative characteristics of the technology requires a shift from co-ordination by bureaucratic rules to co-ordination by ideology. The difference is paradigmatic. But the idea that computer technology demands a particular configuration of work and organization could be a return to technological determinism, and does not fit the available evidence thus far, which is of a great variety of work arrangements (Fleck *et al.*, 1990). Whether this condition is temporary, until the required organizational forms are discovered and disseminated, or more permanent, is impossible to say at this point.

In any case, the managerial perspective concedes to decision-makers a considerable degree of freedom to use technology to achieve their strategic aims. While the objectives of decision-makers are obviously an important influence, it is one which can be overstated. To the extent that they perceive change in straightforwardly technological terms, they relinquish control over the social and organizational aspects. In practice, it is often difficult to discern a coherent overall management strategy in technology implementation; there is rather a series of managerial sub-strategies at different stages of the process which may contradict each other (McLoughlin *et al.*, 1985). Where implementation is delegated to line managers, who are more concerned with control, the tendency is towards deskilling and loose coupling (McLoughlin and Clark, 1988). In no way can 'strategists' afford to underestimate the political and other potential difficulties of implementation.

5.4 The 'impact' of office systems on organization structure.

Figure 5.4

A Model of Managerial Choice



Much of the literature on the impacts of office systems should be seen in the light of the perspectives discussed so far. Some of the impact literature attempts to describe the effects which technology has already had on organizations, but much of it involves speculation about the impact which technology is likely to have if it is used by management to promote particular aims (Huber and McDaniel, 1986; Huber, 1990), but for which there is little evidence so far. These two rather different perspectives are often confused with each other and with a focus on unintended as against intended consequences, or technological impacts from below vs. outcomes consciously chosen by senior management on behalf of the organization. What we find in looking at the organizational impacts of OS is an enormous gap between the empirical findings on what has happened and the theoretical speculation about the potential of the technology to change organizations

5.4.1 The theory.

Basing their work on the organization theory of Thompson, Galbraith, and Perrow, Wainwright and Francis (1984) anticipated very considerable organizational consequences of the use of office automation. They believed that the technology enabled desired structural changes to take place, but the outcome would depend upon managerial intention. The choice followed the automate/informate dichotomy. OS allowed more flexible structures, more skill, discretion and autonomy - or on the other hand, more centralisation of control and less autonomy; more flexible structures - more reciprocal interdependence, co-ordination by mutual adjustment; or centralised structures - more pooled interdependence, co-ordination by standardisation. However, they found very little evidence of such changes in either direction in the four organizations they studied.

According to Olson and Lucas (1982), the critical component of OS in terms of organizational impact was its communications function. Using a mixture of theory and research evidence, they hypothesised that OS would facilitate and increase communications between departments; increase the span of control; make interdepartmental definition of boundaries less rigid; increase the organization's ability to accommodate to structural change, by increasing information processing capabilities. Long (1987) predicted that the second phase of office technology would allow 'dramatic changes in structure and functioning' including smaller and flatter organizations and greater use of matrix forms and adhocracies. The extent of centralisation and decentralisation would depend on the management approach; OS could be used either to increase control or 'create the conditions necessary for self-control by freeing employees from routine and tedious work, and pushing decision-making even further down the organization'.

5.4.2 The evidence.

As referred to above, most of the evidence of impacts has been at the job level and among secretarial and clerical workers. The NCC Survey of the impact of office technology in

the U.K. and U.S. (1986), for example, noted much evidence of change in secretarial duties and responsibilities, but 'a distinct dearth of fundamental changes in organization structure' due to the use of office automation. Those changes that occurred were mostly physical, ie. changes in either the architecture or organization of offices on site, or changes in the location where activities are carried out (e.g. away from the typing pool). The effects on centralisation and decentralisation were contradictory and confused. The European Foundation (1986) similarly found 'preference is given to those systems which do not involve organizational changes in the company'.

In the past, the lack of organizational impact or change could be explained in terms of the immaturity of the technology, its lack of integrative capacity. The case study research carried out for the current project, which covers a more advanced range of systems, also shows that on the whole few of these organizations had a strategy of deliberate organizational change with the introduction of OS, except for reduction in secretarial staff and administrative costs, which has been achieved in most cases. This is supported by the IAM/Touche Ross study and Gunson and Boddy's research (1989) on the use of networks in Scottish organizations, which also indicate that there has been little organizational change. In my research, there was more change in jobs where OS were exploited for strategic ends, as in the financial organizations, where OS have been applied to primary processes with direct effects on customer service, and in the two multinational computer manufacturers, where the office systems are being exploited in order to facilitate organizational redesign or transformation, and have significant intended impacts. The dynamic nature of the industry, the prevalence of computer awareness, and the desire to provide products and a demonstration for customers have all played a role in this. Otherwise, organizational change has often been carried out before or independently of the introduction of OS (as at BLT). The Training Agency illustrates, perhaps in extreme form, some of the institutional obstacles to exploiting the kinds of organizational possiblities the technology permits.

On the whole, management do not appear to pursue any consistent organizational strategies when introducing office systems, even integrated ones. Most of the evidence on the organizational impacts of office systems points to their having been implemented within the existing management paradigm, and so organizational change has occurred more by accident than by design. (Gunson and Boddy do observe however that one of the organizations in their sample had cut out a layer of management after eight years.) I suggest that the reasons that OS have not been exploited more for organizational change involve both the 'what' of change and the 'how' of change. The technologies and organizational designs of the future are too different, too difficult for many managers to grasp. There is lack of understanding of technology on the part of top management, lack of vision, fear of organizational change, pursuit of the wrong objectives including cost-justifying the investment (Keen, 1991). The 'how' of change concerns knowing how to proceed, how to handle the problem of implementation. The two are closely related, as

Mohrman and Lawler have pointed out: third-order feedback means that with the use of technology, you get gamma change, that is a change in the goals and the uses to which technology is put. Technology and organization interact and provide new implications for strategy. Hence the importance of organizational learning, of gaining experience through the use of technology, and of developing an infrastructure and a level of organizational use as a basis for further and unforeseen developments.

The nature of these problems also implies a research strategy. Process theories are likely to provide better models of the relationship between IT and organization structure, and to be able to encompass the critical element of implementation, than variance theories.

5.5 The processual perspective.

Markus and Robey (1988) distinguish a third, 'emergent' perspective, in which outcomes are seen as determined neither by technology nor by the organization (and its management), but emerge from the interaction between the two (Figure 5.1c). Process theories are concerned with how things occur, in terms of necessary but not sufficient conditions and probabilistic processes, ie. how a chain of events leads to an outcome. Markus and Robey, along with Rogers (1984) suggest that process theories are more appropriate than variance theories to impact research, where the nature of the implementation process is known to be even more important to the outcome than the quality of the technology (Mohrmann and Lawler, 1984).

There has been a convergence in recent years on the idea that the outcomes of the introduction of new technology are not determinate but are the result of a process which varies in each situation. IS research has shown that the implementation process is an important factor in determining outcomes, both with regard to system 'success' and impact on jobs. There is also a growing tendency in management studies to think in terms of process: organization (Weick, 1969; Mohr, 1982), structure (Ranson *et al.*, 1980'; Bacharach and Lawler, 1980; Robey, 1991), culture (Riley, 1983), management control (Hopper and Berry, 1982), and management itself (Reed, 1989) have all been seen as emergent - the result (at a given point of time) of an ongoing process. In organization theory there has been a conventional distinction between structure as a system of roles and process as a stream of activities (Robey, 1991), but as John Freeman has said (1978):

> One researcher's structure... is another's process... All structures are the end result, or the chosen moment, of a process. (p. 341)

Studies of the introduction of different technologies, in different contexts, and starting with quite different theoretical assumptions, have found that effects on jobs and organizations are the result of an interaction between organization and technology, and not the direct consequence either of any particular managerial strategy or of the technology itself. In Britain, much empirical work has sprung from attempts to test Braverman's thesis that new technology is used by management primarily in order to deskill, fragment and control the labour force in a Tayloristic fashion. By now Braverman's thesis in its original form has largely been discredited

(Storey, 1985; Friedman, 1987; Hyman, 1987; Reed, 1989), and what has come out of this body of research is a far more sophisticated understanding of the relationship of technology and management to work organization, which stresses the non-deterministic character of the process (Wilkinson, 1983; Storey, 1987; McLoughlin and Clark, 1988; Clark *et al.*, 1988; Fleck *et al.*, 1990). Wilkinson (1983) argued that 'the technical and social organization of work can best be seen as an *outcome* which has been chosen and negotiated'. He showed how at various stages decisions had to be made which provided organizational actors, including workers, engineers and managers, with opportunities to influence outcomes in line with their own objectives (often using the notions of efficiency and 'one best way' as ideological weapons to legitimate their social and political choices). McLoughlin and Clark (1988), reviewing the literature on technological change and work, noted that technology is introduced in a context of existing organizational arrangements, and that in the course of interaction during the implementation process, the original managerial objectives (whatever they may originally have been, to deskill or enhance jobs) in introducing new technology may well be modified, attentuated, or even reversed by the actions at 'critical junctures' of lower level managers pursuing their own sub-strategies, and staff members acting individually or collectively. Clark *et al.* (1988), in their empirical study of the introduction of new telephone exchange equipment, showed that even with a more determinate technology than IS, there was considerable 'design space' after system selection in which significant choices could be made which affected impacts on work and organization. The primary characteristics of technology (which they call the engineering system) and its appearance influenced the choices which could be made; its strongest impact was at the level of work tasks and skills, much less so at the level of the division of labour and supervision. However, because of the behaviour of organizational actors at critical junctures, the outcomes were not necessarily those intended by designers or by senior managers in the early stages of the process. Fleck, Webster and Williams carried the analysis back a step further to the models of work organization underlying the original conception and promotion of various technologies, and also found that no particular work outcomes were implied even by integrated technologies like CAPM (see also Tranfield and Smith, 1990). 'Even where there appear to be clear-cut principles underlying the design of a particular technology, the implementation of these has not conformed to the stereotyped prediction which appeared in the early literature'. CAPM for example did not necessarily bring about organizational integration.

> in all our cases the apparent technological trajectory petered out, failed, became fragmented or was diverted or reversed ... as soon as it is adopted and implemented within industry it becomes subject to a much wider range of forces, all of which operate within the context of constant shifts in economic and political conditions in society at large. These forces in the implementation process act on the offerings of promoters and designers. This interaction serves to reconstitute technologies... which are then again modified in response to the industrial conditions which they meet (p. 637).

They noted that in every case, CAPM systems had to be customised to meet the needs of the organizations into which they were introduced. This is the 'dimensioning' or detailed design to suit the particular workplace or application discussed by McLoughlin and Clark, which provides occasions for structuring. Dorothy Leonard-Barton (1988), examining the implementation of a large number of different technologies, found that 're-invention' is necessary because technology never exactly fits the user environment, it is 'misaligned' in various ways: original specifications, stage of knowledge in production process, the delivery system, performance criteria, cost/benefit at different levels.

> These misalignments can be corrected by altering the technology or changing the environment - or both... Because this mutual adaptation process is interactive and dynamic, technology may determine structure or vice versa, depending upon when the relationship is observed.

Hence 'recursive adaptation' between technology and organization occurs in small or large cycles. The latter involve 'strategic change', e.g. the alteration of performance criteria and reward systems throughout the organization. Such adaptation may be either beneficial or detrimental to the organization as a whole.

In research specifically on information systems, a perspective has also developed in which outcomes or impacts are seen as the result of a complex process of interaction between IT and the organization:

> organizations introducing technology are complex systems slowly changing over time. New technology is but one perturbation around which the system adjusts. Thus both managers modify some of the goals they had in introducing technology when they start to see some of its effects, and users of the technology adapt it to their previous work procedures, as well as adapting their work procedures to it (Kraut *et al.*, 1989, p. 237).

> we view desktop computerization as a complex social and technical intervention since a user of desktop computing interacts with the social dimensions of the computing environment and work arrangements, as well as with the equipment. This appproach is derived from our... model of computerization which views computerization as dependent on mixes of equipment and social practices which develop with a history in a particular social setting' (Kling and Iacono, 1989, p. 342).

There is considerable evidence that the implementation process is highly political, with many parties - specialists and users as well as managers - pursuing their own interests as far as they can (Newman and Rosenberg, 1985; Markus, 1983; Willcocks and Mason, 1987). Technological innovation creates uncertainty and possible new bases of power or sources of conflict (Pettigrew, 1973). The sheer unpredictability of the process of introducing information systems sets limits on managerial choice and leads to all manner of unintended outcomes (Barley, 1986; Kling and Iacono, 1989; Newman and Robey, 1990).

A given IS can thus be seen as the result of a stream of decisions, non-decisions and accidents, a mixture of the conscious goals and strategies of individuals and groups, compromises

resulting from their interactions, and constraints outside their control. The impacts on organization structure are likewise the consequence of a series of decisions and interactions among different interest groups or actors in different roles within the organization, and of chance occurrences including external events (Markus and Robey, 1988). The 'emergent' perspective on the relationship between technology and organization consequently emphasises its interactive, two-way character - both can be changed as a result of the interaction. No consistent 'impacts' can be found because the relationship is non-deterministic, with the outcome both for the organization and the technology emerging from interaction among various stakeholders during system development and implementation. The meanings which they attribute to the situation also affect outcomes. The process of implementation itself is particularly important, and intervenes between managerial intentions and actual outcomes. Figure 5.5 is my model of the mutual structuring of technology and organization as an emergent process.

Another way of looking at the issue is in terms of the impacts which organizations have on information systems (Jones, 1990; LeQuesne, 1988; Noble and Newman, 1993). It has long been recognised that these impacts occur, but they have usually been seen in terms of individual user ignorance, resistance to change, or 'politics', not in terms of a misfit between organization and technology. The concept of 'organizational invalidity' (Ginzberg, 1980; Markus and Robey, 1983) went some way towards recognising organizational impact. Politics does not emerge from nowhere, it is shaped by existing organizational realities.

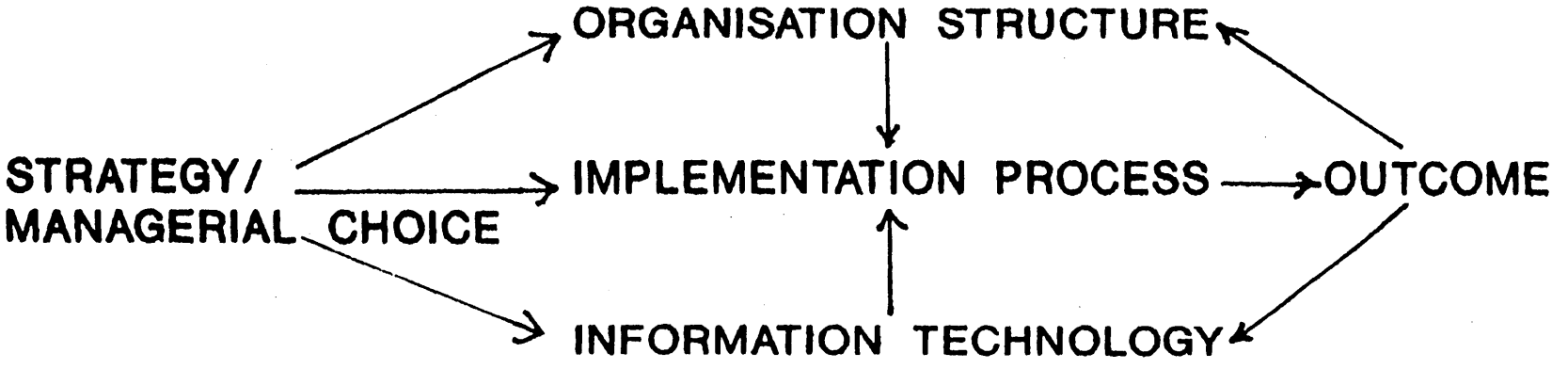
At this point we have to consider what we mean by technology. Clark *et al.* (1988) defined technology as an engineering system having primary and secondary characteristics. The primary characteristics consist of the system principles and their overall configuration, and their physical realisation in hardware and software. Once such a system has been selected, the 'design space' available for modification of the technology is limited. Different technologies obviously vary in the extent to which they can be adapted but most have secondary characteristics which are alterable. The development or customisation of IS software in-house affords far greater opportunity for modification than the telephone exchange technology discussed in detail by Clark. Information systems are a particularly flexible form of technology, and there are many opportunities for the organization to impact on system design, including:

1) the initial decision regarding the choice of which technology to use, which may reflect different managerial motives (Wilkinson, 1983) and political interests (Pettigrew, 1973);

2) the design process itself (LeQuesne, 1988). The systems development process is usually extended, and genuine user involvement is an opportunity for organizational interests to shape design. Users or their representatives are most likely to influence the eventual form of the system in a manner consistent with their perceptions of desirable organizational outcomes (Kraut, Dumais and Koch, 1989).

igure .

Mutual Structuring of Technology and Organisation in Process of Implementation



Noble 1992

3) the responses of users to installed technology (Wilkinson, 1983).
It is just at such critical junctures that individuals, acting in their organizational roles, are able to adapt technology to the existing structure.

In conclusion, both organization structure and technology as embedded in an organization are the outcomes of a process over time which is not deterministic, exclusively rational or exclusively political. The most useful model of the relationship between technology and organization is one of mutual structuring, in which features of the technology, the pre-existing organizational context, managerial choice and action, and the choices and actions of other organizational actors also have a role. Here I build on the previous model to produce a more developed emergent model of implementation. (Figure 5.6), which is explained more fully below.

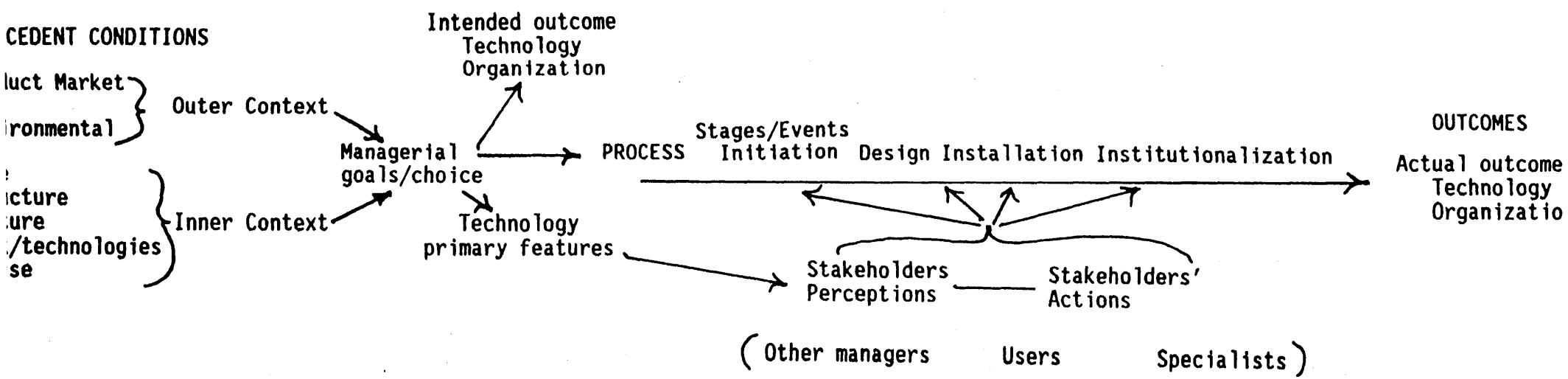
A basic process model includes the following elements; a set of antecedent conditions, a probabilistic process, and outcomes (Mohr, 1982). In the case of IT/OS implementation, the antecedent conditions are the outer (environmental) and the inner (organizational) contexts (Pettigrew, 1988). These explain the why of change, and lead to the content (the what of change) and the process over time (the how of change). The outer context includes both general strategic contingencies (conditions in world markets) and contingencies specific to the product market (Child, 1987). The inner context includes size, structure, culture (Pettigrew, 1988), managers' interests derived from their position in the organization, and managerial meaning systems (Storey, 1987). Another level is that of the existing organization of tasks, the technologies in use, and the existing discretion of users (Kling and Iacono, 1989).

Managerial goals concern the outcomes desired both from the technology and for the organization, including the strategy of control, and the design decisions which more or less follow from those (depending on the uncertain process of communication between managers and specialists). Senior management with specialist advice makes a choice regarding the technology, that is its primary features and the assumptions built into those. Senior management also makes decisions about the implementation strategy to be followed, and the social interventions accompanying technical change, including user involvement and control (Kling and Iacono, 1989). The distance and pace of change are also important features of the implementation process over which there is some choice.

Once the process has been initiated, other stakeholders attempt to influence it according to their perceptions. Orlikowski and Gash (1991) have shown how the technological frames or interpretative schemes regarding IT and its use may differ among these various parties.

Implementation takes place over time through a series of stages. A conventional scheme of stages consists of initiation, design and development, installation, and institutionalisation. This is usually thought of in linear terms, but may in fact be iterative. These stages are a convenient starting point for indicating the critical junctures at which significant decisions affecting the future of the system have to be made.

Figure 5.6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Technology
Organization
Managerial
goals/choice
Technology
primary features
PROCESS
Stages/Events
Initiation
Design
Installation
Institutionalization
OUTCOMES
Actual outcome
Technology
Organizatio
Stakeholders
Perceptions
Stakeholders'
Actions
(Other managers
Users
Specialists)

Finally, actual outcomes can be observed and compared to the intended outcomes. The outcomes of particular interest are the perceptions of success among the various stakeholders, and alterations in work and organization.

5.6 Structuration.

A purely interpretative approach to information systems fails to take sufficiently into account the constraint on actors exercised by institutionalised patterns of behaviour and the distribution of power and resources. While actors create their social world, they never start with a blank slate. Structure is the outcome of a process of interaction at a given point in time, and partly dependent on the interpretations of actors, but it is also a condition for and constraint on further action. In the structuring of technology and organization, outcomes for both emerge from their interaction, but occur within a context of prior understandings, meanings, and constraints. Structuration theory provides an additional layer of depth to our understanding of the interaction between technology and organization.

Giddens' theory of structuration is one of the most recent attempts to overcome the dichotomy in sociology between structural-functionalist and interactionist perspectives, between an emphasis on the structural constraints on action, as exemplified by 'social facts' in Durkheim, and structures as creations of conscious self-reflecting actors. (Note also in sociology Van den Berghe, 1963; Berger and Luckman, 1966; in organization theory Benson, 1977, Astley and Van de Ven, 1983). Giddens attempts to show that existing structures are the conditions for processes to occur, at the same time that they are recreated, sustained or modified by these processes. An analogy is language. Without its pre-existence we cannot speak; it is therefore a condition of action. When we speak a language, we help to perpetuate it, but also, languages change over time through the accumulation of successive small modifications by many actors.

In organization theory and in sociology, organization structure and social structure have usually been conceived as more or less enduring patterns of social relations which carry an implication of external constraint on individuals. Giddens uses the term structure in a different sense from this; what others have defined as structures he calls social systems. He has incorporated the structuralist (in linguistic theory) idea of structure as an underlying code which is evidenced only in conduct and in the mind. Structures are defined as sets of rules and resources and are properties of social systems; structuration is the way a social system is reproduced by the application of rules and resources. He also discusses structural sets, structuring properties and structuring principles but the differences become quite abstruse and are not really necessary for our purposes.

The aspect of structuration theory which has drawn most attention in relation to IT is the duality of structure:

> the essential recursiveness of social life, as constituted in social practices: structure is both medium, and outcome of the reproduction of practices. Structure enters simultaneously into the constitution of the agent and social practices, and 'exists' in the generating

moments of this constitution' (Giddens, 1979, p. 5.)

While Giddens is concerned with the conditions for system reproduction, his theory (unlike Parsons' for example) contains the ever-present possibility of change, because agents 'could always do otherwise'. He criticises the idea that structures only constrain individuals, pointing out that structures also enable and that the persistence of structures is entirely dependent on individuals, because they exist only as memory traces or as instantiated as social practices.

Giddens sees the system level and the level of interaction as linked by interpretative schemes, resources, and norms. These 'modalities' of structuration are 'the central dimensions of the duality of structure in the constitution of interaction'. That means they are drawn on by actors in their interaction but are at the same time the means by which structure is reproduced. Thus modalities operate between two levels of analysis, the institutional and the strategic action of individuals. They can be analytically distinguished but are never found empirically separately from one another and tend to be mutually reinforcing. In any interaction, actors draw on all three modalities (see Figure 5.7). Interpretative schemes are cognitive, relating to the common stock of knowledge, 'the world taken for granted', and concern the communication of meaning at the level of action. At the system level these are structures of signification. Facility can be seen as power, which comprehends both transformative capacity and relations of autonomy and dependence, or as resources, which provide actors with the ability to realise their intentions. However, in so doing they reinforce existing structures of domination. Interaction is also governed by norms, concerning the sanctioning of conduct, rights and obligations. Norms derive from, and through use of moral sanctions based on them, reinforce systems of legitimation. These three modalities constitute the process of structuration.

Structure is therefore an unacknowledged condition of action in Giddens' theory of human agency (Figure 5.8), and is at the same time an unintended consequence of action. This is consistent with functionalist sociology. But Giddens also emphasises the knowledgeablity of actors, who 'know' a great deal about the conditions and consequences of what they do ('practical consciousness'), without necessarily being able to express it ('discursive consciousness'). They are continually engaged in the reflexive monitoring of their own actions. Actors' more or less informed intentions therefore must also be taken into account in the analysis of social conduct. Here Giddens distinguishes between 'intentions', 'rationalisations of conduct' (explanations which actors could give if asked after the fact) and 'wants', recognising these are not always the same.

Before considering how structuration theory has been employed in information systems research to deal with the relation between technology and organization, it is useful to digress somewhat and see how it has been applied to management and organizations. Giddens' own theory of modern organizations sheds light on the relationship between IT and organizations.

5.7 Giddens' theory of modern organizations.

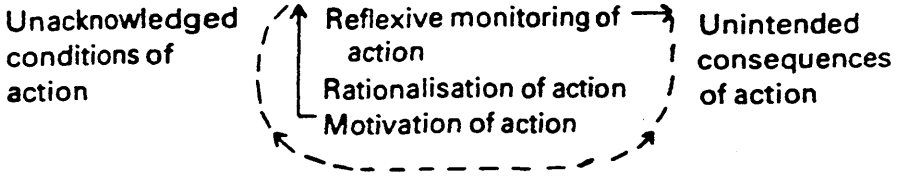
Figure 5.7

Duality of Structure in Interaction
and the Modalities of Structuration

INTERACTION	communication	power	sanction
(MODALITY)	interpretative scheme	facility	norm
STRUCTURE	signification	domination	legitimation

Figure 5.8

A Model of Human Agency



Giddens, 1979.

In Giddens' view, the theory of organizations should be set in the context of a theory of social organization. Modern legal-rational organizations are a special case of social organization, which is the bracketing of time and space by social systems.

> What, then, is an organization? It is a social system which is able to 'bracket time-space', and which does so via the reflexive monitoring of system reproduction and the articulation of discursive 'history'. (Giddens, 1987, p. 153.)

Structuration theory is concerned with social organization as the central problem of sociology, the persistence of social systems over time and space, or how the *duree* of day-to-day life is linked to the *longue* of institutions. Giddens defines social systems as recurrent social practices, or regularised relations of interdependence between individuals or groups. The application of discursive knowledge, including social science, to system reproduction and change is an intrinsic feature of modern societies. This occurs through organizations and social movements, which 'are the two ways in which reflexive appropriation of knowledge about the social life is mobilized in the modern world' (1987, p. 48). Organizations are also characterised by the conscious application of knowledge to their own reproduction.

All organizations involve the mobilisation of allocative resources, which is command over objects, and administrative or authoritative resources, which is command over persons. (These are also the bases of domination, seen as a structural feature of social systems.) But 'no matter how complete the power of one individual or group might be over others, resources are always available whereby subordinates can reciprocally influence power holders', by means of concealment, withdrawal of co-operation, etc. - this is the dialectic of control which is a characteristic of all power relationships.

Information is central to the problem of order. In oral cultures, the past is manifest in the present in the form of tradition, in conditions of co-presence (face-to-face interaction). The invention of writing was a condition for the development of large states in antiquity because the keeping of records systematised social relations across time and space. The invention of printing and literacy were similarly conditions for the modern state and political democracy. 'In organizations, information is systematically gathered, stored and drawn upon in the stabilizing of conditions of social reproduction' (1987, p. 48). 'A modern organization is a social system in which information is regularly used, and its discursive articulation carefully coded, so as to maximize control of system reproduction' (1987, p. 155) Clock time, timetables, the keeping of files, accounting, and impersonal bureaucratic rules are means for the co-ordination of social activities over ever larger distances of time and space - ie. the extension of social systems in space and time. In their turn, the development of electronic media of communication (including television and video) have large but uncertain implications for organization in the contemporary world (1979, p. 204). ('What writing was to traditional states, printing - and later electronic media - are to the modern era' [1987, p. 149]. 'Electronic media separate presemce in time from

presence in space, a phenomenon of decisive significance for contemporary forms of collectivity' [1984, p. 203].)

Giddens' theory of organizations thus provides further theoretical support for the idea that new media of communication may lead to new organizational forms, although he does not indicate what they might be, except that they will be spatially more encompassing. He implies an extension of control; following Foucault he focuses on surveillance by means of the collation and retrieval of information and by architecture. He thus focuses excessively on domination at the expense of legitimation and the symbolic order, resulting in concentration on particularly oppressive forms. Although he notes within organizations the existence of high-trust as well as low-trust positions, he does not concern himself with the extension of high-trust forms of control to lower level positions or the extent to which electronic media might facilitate this.

5.8 Structuration theory applied to management processes.

Ranson, Hinings and Greenwood (1980) in a very influential article drew on early Giddens and Bourdieu in order to explain features of organization structure and how they change over time. They attempted to overcome the usual dualism of formal organization structure and the 'informal organization' by conceiving of organization structure as an emergent, including both the prescribed framework and interaction. They defined organization structure as 'a complex medium of control' which is produced and reproduced in interaction, yet shapes that interaction. 'Realised' organization structures are the product of structuring; 'structuring is a process of generating and recreating meanings' (p. 4).

The aspects of organization on which they focus are provinces of meaning, power, and contextual constraints. Provinces of meaning incorporate interpretative schemes (including evaluative sentiments, stocks of knowledge, and systems of belief), values and interests. At the same time organizations are dependencies of power, which equals the capacity to determine outcomes, grounded in differential access to material and structural resources. Power is most effective when power holders have institutionalised their provinces of meaning in the structuring of interaction. Their analysis is thus far similar to Giddens' except for combining the realms of signification and legitimation in the concept of 'provinces of meaning'. Contextual constraints are those of contingency theory, but the environment is also seen as a source of legitimation for the organization's own structural arrangements. The sources of change in organization structure are: revised provinces of meaning; inconsistencies and contradictions in values and interests; loss of power by the dominant coalition; a major change in context; contradictory contextual constraints.

There are also structurationist analyses of managerial work, like Willmott's (1987), which have attempted to show the connections between the day to day activities of managers (the level of interaction or strategic conduct) and the framework of capitalist work relations (the institutional level). Whittington (1992) criticises Willmott as having still too (economic)

deterministic a view of managerial agency. He attempts to show how managers 'have a choice' because of 1) the complexity of rules and resources internal to the firm, and 2) their participation in other structures outside the firm. Each firm thus can express diverse structural principles, and symbolic and cognitive structures of organizations have to be studied in this broader social context.

Reed (1989) has borrowed from structuration theory in his conception of management as practice - 'a loosely connected set of mechanisms, processes and strategies directed at the assembly of other practices concerned with the production of goods, services and ideas' (p. 25). This concept brings together what he sees as the three prevailing perspectives on management, the technical (systems rationalism), political (negotiated order) and critical (Marxist/economic determinist). Control is central to this practice, and confronts the dilemmas of the dialectic, which is that any strategy of control in some way increases the potential for resistance by subordinates.

5.9 Structuration theory applied to IT.

Although structuration theory has been employed in IS research in a number of different contexts, only Coombs, Knights and Willmott (1992) have so far brought a structurationist perspective on management and organization to bear on the 'effects' of information and communications technology (ICT) in organizations. Their concern is with 'how ICT is both mediated by, and contributes to, the social construction of the reality of organizations'. They analyse this in terms of the concepts of culture, control and competition, which are analogous to Ranson's categories of provinces of meaning, power, and contextual constraints. 'Culture' includes social practices and the meanings which support them, control the exercise of power and the process of negotiation, and competition labour and capital markets. 'I.T. (must) be analyzed as a phenomenon of the political economy that produces unique mechanisms of power within organizations but is itself affected - in terms of its information content and mode of adaptation - by particular cultural, control and competitive contingencies that are both internal and external to their point of intervention'(p. 59).

On the whole, IS research has followed management studies in focusing on the more abstract aspects of structuration theory, largely ignoring institutional context. The focus has been on the duality of structure because of its perceived advantage of overcoming unnecessary and artificial oppositions between structure and process, individual and organization, action and systems perspectives, macro and micro levels of analysis and between qualitative and quantitative research (Orlikowski and Robey, 1991). Walsham and Han (ICIS 90) saw structuration as a promising framework for studies of IS use and of the institutional character of IS, IS development, and IS strategy formation.

Although structuration theory has been applied in rather different ways in empirical research in IS, there is a central concern with the implications of technology for organizational

change. Barley (1986) believed the introduction of new technology could best be seen as an occasion for structuring, that is for modification or maintenance of existing organizational structures/patterns. He found, like others, that technology could have effects at the immediate job level but not necessarily at structural or organizational level. Poole and DeSanctis (1989) looked at the implications of structuration theory for group decision support systems - why there were different structural outcomes with different groups. Lyytinen and Ngwenyama (1992) analysed computer-supported cooperative work from a structurationist perspective. They noted that CSCW has emergent properties which could reshape organizational practices. The goals of CSCW are likely to be negotiated and renegotiated by actors over time. Attempts to mandate use lead to failure; if the work process is dependent on CSCW, it must be legitimated by the meaning negotiated for it in the organizational context.

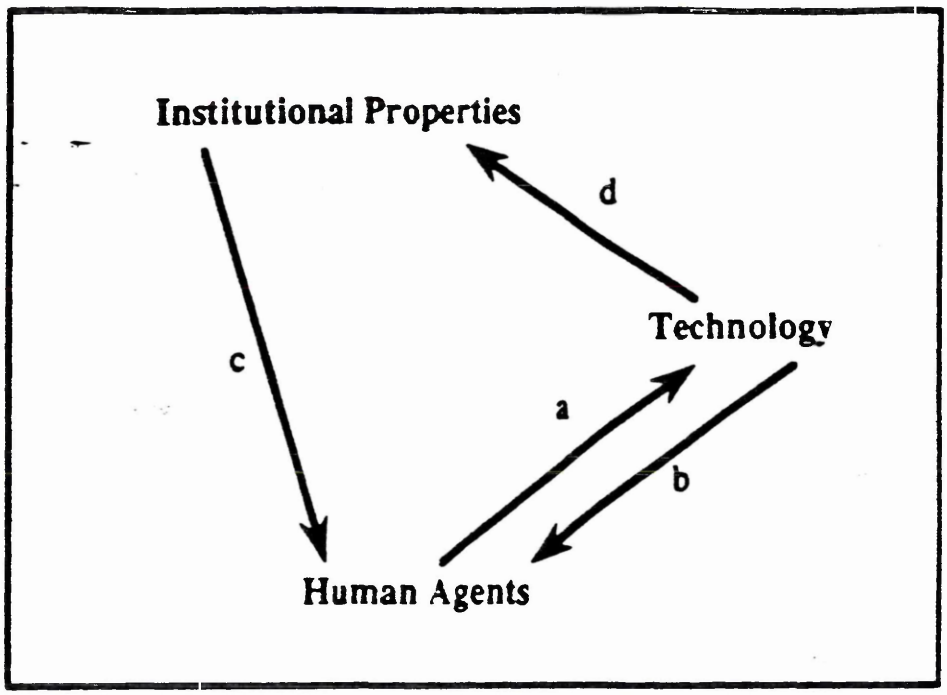
Orlikowski (*Organization Science*, forthcoming) and Orlikowski and Robey have been interested in the role of technology in the structuration process; how technology is constructed by and constrains actors. IT is both constituted and constitutive, a product of human action and a medium of action. Information technology mediates the relationship between the everyday behaviour of organizational actors and the social structure (institutional properties), because it affects each of the modalities which link the two levels: interpretative schemes, resources, and norms. Orlikowski and Robey developed a framework to show how structuration could be used in research on the system development process and on the social consequences of IT use, noting that a more adequate model would integrate the relationship between the two. They thus address the question of organizational change or the structuring of organizations as well as the structuring of technology. (Implementation, in the sense used here, encompasses both system development and much of the social consequences, or interaction of technology and organization.)

The interaction between actors and technology can either reinforce or transform structure (institutional properties) (Figure 5.9), but Orlikowski and Robey do not indicate the conditions under which one or the other outcome is more likely. They are skeptical about claims that the use of IT will have the unintended consequence of altering organizational structure. In the two examples they give of research which integrates system development and social consequences, the effect of organizational use of IT was to reinforce the existing structure. However, they do not consider organizational change as a possible result of managerial intention. Similarly, when Orlikowski (1991) examined the question of whether the use of IT would transform organizations, she found that the use of CASE tools in a software consultancy reinforced the existing system of control. In this case, there was no evidence of managerial intention to do otherwise.

Newman and Robey (1991), applying structuration theory to the process of system development, conceptualised the latter as a series of episodes or encounters between users and analysts which takes place in the context of antecedent conditions, which for them are the prior history of relationships between the parties. The outcome of interest was whether the character

Figure 5.9

A Structurational Model of Technology



Arrow	Type of Influence	Nature of Influence
a	Technology as a Product of Human Action	Technology is an outcome of such human action as design & development, appropriation, and modification
b	Technology as a Medium of Human Action	Technology facilitates and constrains human action through provision of interpretive schemes, facilities, and norms
c	Institutional Conditions of Interaction with Technology	Institutional Properties influence humans in their interaction with technology, e.g. intentions, design standards, professional norms, state of the art in materials and knowledge, and available resources (time, money, skills)
d	Institutional Consequences of Interaction with Technology	Interaction with technology influences institutional properties of an organization, through reinforcing or transforming the structures of signification, domination, and legitimation

Orlikowski, *Organization Science*, forthcoming.

of those relationships would change or stay the same as a result of the development of a particular system.

Structuration theory has therefore been used in the IS/IT literature to a large extent to deepen the emergent model by showing what 'the interaction of technology and organization' means in greater detail, especially the relations between macro and micro level, the level of constraints on actors and their interpretation and modification of the situation. The focus of interest hovers around the issue of whether organizational change will occur as an unintended consequence of the use of the technology, but there is a reluctance or inability to specify the conditions under which this outcome will occur.

This problem derives from a central weakness of structuration theory; in insisting that actors are both always constrained and always 'could do otherwise', Giddens makes it impossible to indicate the conditions under which actors are likely to change or to preserve systems (Archer, 1990). This has to do with the character of structuration theory as meta-theory; it contains no first-order theories, explanatory generalisations or variables (Gregson, 1989; Stinchcombe 1990), nor is it likely that testable propositions can be derived from it. It tends to be used more as a set of organizing concepts. The sources of change must be derived from some other body of theory, as Ranson *et al.* do, for example (p. 90 above), and as the organization development/organizational transformation literature discussed in the next chapter does.

The implementation of information technology can certainly be seen as a process of structuration (there is little in the social world that cannot). But implementation is planned change, and in structuration theory as it has been used so far, there is much more emphasis on unintended consequences than on planned action. The intendedly rational pursuit of their ends by powerful organizational actors (managerial choice) must feature in a structurationist account of implementation, as well as the unintended consequences arising from the interaction of technology, context, and actors. That is why managerial choice is represented in my emergent model (Figure 5.6).

Structuration can provide a framework for understanding the mutual structuring of organizations and technology as well as IS implementation as a dynamic process. It is capable of encompassing both the 'rational actor' perspective and the unintended consequences of interaction between organizational members at all levels and technology or its development. In other words, structuration theory has the potential to integrate successfully the rational-analytic and interpretative-political perspectives, the reasons for information systems use and the effects of information systems in organizations.

To draw together and expand the discussion so far, implementation can be seen as a process in which *actors* of various kinds (any of these may also be *users* of the technology):

senior management and their advisors
IT specialists
middle and junior managers and their assistants

non-managerial staff
operational staff
other stakeholders (customers, etc.)

have *intentions* which they strive to carry out through the reflexive monitoring of their own and others' conduct. The intentions themselves may change as a result. Intentions may be highly rationalised or actors may not be able to express them at all.

The *conditions* of their actions are accessible to actors to varying degrees. Most organizational actors are highly aware of and able to express reasons for their actions, including internal and external constraints. But no actors will be fully conscious of, much less able to articulate, all of the conditions of their actions; these are the unacknowledged conditions of action, which include unconscious motives and unquestioned assumptions derived from prevailing interpretative schemes and normative structures ('culture', 'provinces of meaning'). Nevertheless, these will affect their intentions and the more or less rational interpretations which they give to them.

Outcomes, for example effects on organizational structure, are a result of the acknowledged and unacknowledged conditions of action and the intentions pursued by the various actors, (as well as accidents) and may confirm or diverge from the status quo or from the intentions of senior management. An unintended consequence may be the reinforcement of the unacknowledged conditions of action.

From the point of view of the management of implementation, structuration theory has two uses: 1) it draws attention to the constraint exercised on all parties by the existing structures of signification, legitimation and domination. The rational perspective emphasises the conditions of which actors can be aware, not the assumptions which prevent other things coming into their awareness. To become aware of these constraints is the beginning of liberation from them; 2) as IT implementation like any organization change is more or less deliberate structuration, what occurs at the level of interaction throughout the process is important because it has ultimate effects at the institutional level, as well as drawing on that level. The attempt to manage the process so as to obtain outcomes which are desirable from the point of view of management, involves continual reflexive monitoring and control of the conduct of self and others; it means awareness of and attention to what is happening with regard to meanings, norms and resources (not just financial, but power as well), all along the way, and the judicial use of authority over resources and people as well as the symbol system, to keep the process consistent with desired ends. The use of resources is usually well recognised in implementation, but less attention is paid to the symbolic and meaning systems.

This account provides the basis for the prescriptive or normative models discussed in the next chapter.

Chapter Six

Implementation Strategies for Integrated Office Systems

Introduction

The purpose of this chapter is to develop a prescriptive model of implementation, or implementation strategy, for integrated office systems, which builds on the descriptive/analytical model of the previous chapter. I first review existing approaches to implementation, and show how some take account of various features of the emergent model. These are then related to the particular problems of implementing integrated office systems.

We have seen that the realisation of strategic goals for OS often depends on changing the organization as well as introducing technology. Some authorities believe that the exploitation of IT requires change on the scale of organizational transformation, while others regard the capabilities of information technology as enabling the kind of major organizational change which organizations need to undergo in any case in order to meet the demands of the contemporary environment. The association of IT/OS with paradigm shift leads to a consideration of the field of organizational transformation, which is concerned with the nature of fundamental organizational change and how to implement it. The relation of OS to first- and second-order change is discussed, followed by an implementation approach for integrated OS.

6.1 Review of existing implementation strategies for office systems.

Prescriptive approaches to the introduction of IT are informed to a greater or lesser degree by awareness of the complex behavioural implications. Much of the research on IS implementation has been concerned with identifying discrete factors leading to success or failure (Meredith, 1981; Kwon and Zmud, 1987). As we have seen, the factor or variance approach has not been very successful. In the prescriptive literature, these become 'Critical Success Factors', intended to meet the needs of practitioners wanting an immediate guide to introducing new technology. Rather than being related coherently, as in a structured approach or methodology, success factors are treated for the most part as 'independent events' (Kwon and Zmud, 1987). Hirschheim (1985b) notes that 'many of the postulated solutions are superficial, obvious, or both... approaches such as these are less than complete or coherent implementation strategies... (they) are a direct consequence of a simplistic notion of organizational change' (p. 158).

There are also more structured approaches, usually consisting of a set of steps and stages, which are intended as practical guides to implementation and are usually addressed to a managerial audience. Often based on a wealth of experience and containing many valuable insights, they may incorporate some discussion of success or risk factors, but usually represent a more coherent view of implementation without necessarily reflecting an underlying theory of technological and organizational change. They are more comprehensive than information system development methodologies (ISDM) in that they pay far more attention to the rationale for investment, the potential and characteristics of technology, and management of the change

process, but less to system design. In the office systems area, examples are Price (1979) for the NCC, the report on the DTI pilots (KMG 1986), Bate, 1987; Johnson and Rice, 1987; Doswell (1990), Meyer and Boone (1987); Keen (1983, 1986, 1991).

It is not possible to discuss all of these approaches; in any case there is a great deal of duplication. The prescriptive implementation approaches (or methodologies) which I will focus on here are those which relate particularly well to the descriptive emergent model of implementation presented in the last chapter (Figure 5.6). An adequate implementation strategy must take into account the features of the processual model developed above, and as well as pursuing organizational goals attempt to control the emergent characteristics, which are:

mutual impacts of technology and organization
uncertainty regarding outcomes, including impacts
resistance/adaptation by users
stakeholder politics
meaning systems and interpretative schemes.

The problems can be paired with the approaches as follows:

Table 6.1

'Emergent' problem	Implementation Strategy
Interaction of technology and organization	Sociotechnical systems/design
Emergence, uncertainty	Incrementalism
Effects of users	User involvement/participative design
Effects of other stakeholders	Soft Systems Methodology, stakeholder analysis and involvement
Politics	Soft Systems Methodology, incrementalism political implementation approach
Behavioural issues generally	Organizational Development
Meaning systems	Management of meaning

The managerial choice perspective discussed in Chapter 5 rests heavily on the rationalist assumption that the goals of the system and the means of achieving those goals can be well understood in advance. But we have also seen that the goals themselves change, and that the process of reaching them is fraught with uncertainty. The implementation strategies which deal with emergence can be characterised as process-oriented rather than goal-oriented. Traditional information system development methodologies and project management techniques are goal-oriented in that they take the goal as given, and the process of getting there as purely rational or technical. While goal-oriented strategies may be most appropriate for limited, technical and well-bounded problems, process-oriented approaches are more suitable for the sorts of change efforts where the consequences have wide but as yet uncertain implications, and where there may

be a number of different interpretations (T244, 1985). The introduction of strategic office systems is more likely to be the latter kind of change.

6.1.1 Sociotechnical design.

Most IT and especially OS implementations have been perceived as a limited technical change, intended to improve the functioning of the organization as it currently exists, and with little strategic focus. Technology-led implementations ignore and therefore are unable to control organizational impact, with the frequent results of resistance, nonuse, system failure, and degradation of jobs. Sociotechnical design can be seen as a response to these failures of dominant practice, and as a way of controlling organizational impacts by anticipating and planning for them (Bjorn-Andersen, Eason, and Robey, 1986), by designing the social system jointly with the technical system (Mumford and Weir, 1979; Eason, 1988). In terms of the perspectives discussed in the last chapter, by explicitly recognising the interaction between technology and organization and the emergent impacts on jobs, and providing a technique for controlling them, sociotechnical design is an attempt to extend the area of managerial choice beyond the technical system to the social system.

6.1.2. Incrementalism.

Incrementalism appears to be a reasonable response to change situations where there is a large amount of uncertainty, both as to ends and to means (Quinn, 1980). The common view is that IS/OS implementation should be incremental and evolutionary, following the typical pattern: pilot, assess, expand (Bair and Nelson, 1985). As we saw in the Training Agency case, an organization in which people do not feel they know enough about the technology, its uses and its effects, will want to allow time for learning. A gradual approach also has the advantages of allowing cohesion to be built, and making it easier to maintain congruence or fit between the technical and social systems (Nadler, 1982; Liker *et al.*, 1987). Participative socio-technical design has typically been incremental because user involvement is very time consuming and because there is a limited 'window' for participation, when users sufficiently understand the potential of technology in order to effectively influence design, and before the final system has completely crystallised (Eason, 1988; McLoughlin and Clark, 1988). Prototyping and evolutionary design allow users to continue to influence the technical system throughout the process.

6.1.3. User involvement/participation.

One way of categorising implementation strategies is according to who participates and where they are located in the organization (Table 6.2) (Wainwright and Francis, 1984; Francis, 1986; Eason, 1988) or who and how they participate (Bjorn-Andersen, 1986) (Table 6.3).

Table 6.2
Possible Design Approaches

		Who participates	
		All design done by computer specialists	Users participate in design of systems
Where located	Centralised		
	Decentralised		

Table 6.3
Design Approaches

	How	
Who	Traditional	Radical - off-the-peg
Expert-driven	*Life-cycle*	*Sower*
Participative	*Socio-technical*	*Grass root/anarchy*

User involvement in information system design has been recommended for a number of reasons, both practical and moral; among them are awareness of the power of users to influence implementation outcomes, and the possibility of different interpretations of IT and its uses. Socio-technical design has been strongly identified historically with user participation, in part because of the democratic job design principles underlying the STS approach. If the implementation process is closely related to the nature of outcomes, and if an 'informated' or empowered workforce is one of the outcomes desired, a participative implementation strategy is far more likely to lead to this end than an exclusively top-down strategy.

6.1.4. Stakeholder involvement.

In IS implementation, there are stakeholders other than direct users who have an interest in the introduction of a new information system and whose attitudes and behaviour toward it can make or break it. These include indirect users, managers, internal and external customers and clients. Soft Systems Methodology recognises the dubious nature of organizational goals and the potential for conflicts of values and interests among stakeholders in all kinds of organizational change. It has been applied to information systems development by Checkland (1981), by the CCTA in the COMPACT office systems methodology (Noble, 1991), and by Avison and Wood-Harper in Multiview (1991), among others. Stakeholder analysis and representation on steering groups and working parties are not exclusive to SSM however and are found widely in the prescriptive literature.

6.1.5. OD approaches.

Recognition of IS implementation as a complex behavioural process led to interest in OD approaches, with the Lewin/Schein stage model being particularly widely used in the literature. Walton (1989), whose approach will be discussed at greater length below, draws on OD, as does Benjamin (1993). Willcocks and Mason (1987) explored the use of OD approaches and concluded that they were limited because they were focused at the level of individual behaviour and attitudes and were consequently unable to deal with power relations and the context in which behavioural change is to occur. However, they viewed OD as a set of tools and techniques such as attitude surveys, group diagnostic meetings, and team-building, rather than as a coherent approach to organizational change. Recent developments in OD make this view rather out of date (see Section 6.3 below).

6.1.6 Political approaches.

SSM, with its emphasis on the definition of the problem from the perspectives of the various parties concerned, provides a means of dealing with the 'politics' of implementation, by getting some of it into the open for discussion and negotiation. In Quinn's view, 'logical incrementalism' provides the space in which to manage the political activities of building support and commitment to a broad strategic goal. Willcocks and Mason's approach to systems implementation is also based on their analysis of the highly political nature of the process. They emphasise the importance of establishing the legitimacy of change and managing meaning, mobilising power, and maintaining flexibility of approach, but they do not attempt to spell out how this can be done.

6.1.7 The management of meaning.

Three recent comprehensive approaches to implementation which stress politics, the management of meaning and legitimation, as well as some of the generic strategies already covered, are discussed below.

Buchanan and Boddy, in two recent works on project management (Buchanan and Boddy, 1992; Boddy and Buchanan, 1992), based in part on their research on IT projects, define three approaches to change management, the rational-linear, which is the classical project management approach, the participative, and the political. The project management approach is concerned with problem-solving, the participative with establishing ownership, and the political with establishing legitimacy. They argue that the change agent must address all of these aspects, and the content, control and process agendas associated with them, but that in certain contexts (e.g. organic organizations, change efforts which are perceived as radical and as central to the organization's core processes), the process agenda becomes more important, especially the political aspects. In these cases, legitimacy is key. They use the literature on strategic change, especially Pettigrew's (1985) analysis of implementing strategic change as a process of legitimisation through the management of meaning, and Johnson's (1990) discussion of the role of symbolic action by

leaders, to analyse the politics of change, and on this basis to suggest the kinds of political and process skills needed by change agents to be effective. These prescriptions are directed to the change agent who is working at the middle levels of the organization and who therefore has to 'manage up' as well as down, and may be highly vulnerable if the project fails. Although they develop the political approach they do not reject either the rational-linear or the participative in its favour, but argue all three are necessary to some degree, the emphasis varying according to context, which they specify. (They also point out how the rational-linear model serves to legitimise a process which behind the scenes may actually be highly political.)

Nutt (1986) carried out empirical research which supports this approach. Nutt found four dominant types of tactics actually used by managers to implement various kinds of planned change in 84 organizations. These were:

> Edict - sponsors of change issue directives requiring adoption
> Persuasion - experts attempt to sell a change they have devised
> Participation - representatives of different interest groups determine the features of change
> Intervention - key executives justify need for change, monitor change processes, define acceptable performance, and demonstrate improvements

Edict and persuasion were the tactics most commonly used, and on the whole the least successful. Participation was more successful (84% of cases as against 43% of edict cases), but intervention was wholly successful. The specific steps of an intervention strategy were:

> Acquire the authority to manage a change process and appraise performance
> Apply new norms to identify performance inadequacies
> Justify the new norms or demonstrate the feasibility of improving practices
> Develop specific proposals for change, involving multiple stakeholders or interest groups
> Demonstrate improvements in performance
> Monitor performance

Robey (1991) implies that intervention as a tactic is successful because, even more than participation, it reflects the emergent process view of organization design; it

> respects the emergent properties of organizations while acknowledging the need to control them. Change is managed through the skillful use of language and symbols to mobilise and focus the efforts of others without yielding control. Power derives from active involvement in the process rather than from arbitrary authority.

Thus, notable aspects of an intervention strategy are the continued active involvement and leadership of the manager in charge, attention to legitimating change, and involving stakeholders without relinquishing the process to them.

Walton (1989) has produced an implementation approach for large, integrated IT systems which directly addresses the interaction of technology and organization and other issues of emergence. He argues the necessity of integrating IT strategy with business and organizational strategy, and indicates that a choice is to be made in the latter between strategies based on centralisation and compliance, decentralisation and commitment. However, throughout the book

he argues the advantages of an HRM strategy based on commitment and continued learning.

The key ingredients of a successful implementation are 1) alignment of business, organization and IT strategies; 2) commitment/support/ownership; 3) competence/mastery of IT. These are developed over three phases, generating the context for IT, system design, and introducing and diffusing the system (Figure 6.1). Each phase has its own tasks or 'action levers', becoming more specific as implementation progresses. The first phase is given unusual attention, and consists of a) creating a strategic vision which matches the business and technology strategies, and aligns the technology and organization strategies; b) promoting commitment and competence among work force and managers through communication and participation; c) developing 'broad and informed political support' by allowing 'all major stakeholder groups ... to assess the IT proposal from their different perspectives' (p. 92).

In the design phase, Walton indicates that while the choice of the primary technology is a strategic and therefore a top management decision, the secondary features of the technology and organization design should be determined using socio-technical design and job design criteria to promote competence and motivation. Participation by users and others with different perspectives in this phase is seen as legitimating the process, contributing to a favourable political environment and a sound design.

Phase Three is the introduction and diffusion of the system. Here the tasks are to ensure continued alignment with the vision, strengthening user support into ownership (substantially by managing meaning), and enabling the users to develop from competence to mastery by providing training, technical and organizational support. For Walton, the key implementation issues are socio-technical design (or 'simultaneous development'), the breadth and depth of participation, and leadership from the top, especially in the first phase but also throughout the life of the project. His implementation strategy is thus comprehensive, structured, and well founded in an understanding of both technology implementation and organizational change.

6.2 Discussion of implementation approaches.

6.2.1 Structuration theory and prescriptive implementation approaches.

These prescriptive implementation approaches deal well with various aspects of the emergent character of the process and reflect an increasing theoretical sophistication about managing the process of organizational change, including its political aspects. From the point of view of structuration theory, implementation of planned change is a 'moment' or episode in a continuing process of management, seen as the structuring of reality for other people within the organization context. Management is continually monitoring the conditions for system reproduction and the achievement of system goals. In initiating change, management determines the need to alter some condition, based on this monitoring, and applies knowledge and control over rules and resources in order to achieve it. One aspect of implementation is the pursuit of their goals by knowledgeable and powerful organizational actors, which is met by the strategic

Figure 6.1

Phase by Phase Development of Key Ingredients for Effective IT Implementation

Key Ingredients	Phase One Generating the Context for IT	Phase Two Designing an IT System	Phase Three Putting the IT System into Practice
Alignment	Vision aligned with business, organization, and technology strategies →	System design aligned with vision →	Operational use of system aligned with vision
Commitment/ Support/ Ownership	High organizational commitment; stakeholder support for IT →	System designed to tap and promote user ownership →	Users feel strong ownership for system
Competence/ Mastery	General task competence and IT literacy →	System designed to use and promote mastery →	Users mastering the system

Walton, 1989

and rational-linear models.

From this point of view, the role of senior management is to create the institutional context within which the appropriate (sanctioned) interactions can occur, which will then reinforce the institutional context. This is the top-down aspect of implementation, and it is necessary but not sufficient. Change is not so straightforward because the 'realised' structure/social system is not entirely the creation of management, but has emerged over time through the continuous interplay between the institutional level and the level of interaction. As Patricia Riley asked at the end of her paper on a structurationist account of political culture (1983):

> If organizational development is conceptualized as planned cultural change, how should the intervention incorporate the existence of mindlessly recreated structures of everyday practices?

Any significant change or disturbance in the system affects the modalities - most obviously the distribution of allocative and authoritative resources (rewards and power), but also the meaning system and norms. Because other organization members are also knowledgeable actors, they will assess the desirability of change for themselves by drawing on available interpretative frameworks to attribute meaning to it, will consider how it affects their own access to resources, and draw on existing norms to justify their conclusions. Their attitudes will be significant because subordinates always have some power to resist. Implementing change therefore means intervening at the micro level of those who are directly involved, understanding and influencing how they perceive it and securing their support. The interpretative frames of organizational actors at this level need to be brought into alignment with those of the initiators of change (Orlikowski and Gash, 1991), which cannot be done by delegating most of the process to others, such as IT specialists.

Organizations are among other things systems of power and domination. Socio-technical design, OD, SSM and participative approaches have not always been successful in dealing with this aspect of organizational change. Buchanan and Boddy, Nutt and Walton directly address the strategic and political context of change, the need to deal with politics and maintain control over the process. The skills of the change agent, as Buchanan and Boddy argue, include the appropriate use of 'manipulation and threat'. However, change must also be legitimated through the management of meaning, involving the realms of signification and legitimation as well as domination. Walton in particular considers that implementation must pay a great deal of attention to the engineering of consent. Participative approaches have an important role to play in legitimating change, because they are consistent with the structural principles of the political order external to the organization.

Domination is the application of allocative and authoritative resources to secure the change. Signification involves drawing on a widely shared symbolic order to demonstrate the

need for change and to interpret it. Naming a project and giving it a high profile leader are obvious symbols of the project's importance. Legitimation of change draws on existing norms either internal or external to the organization (growth, progress, efficiency, productivity, rationality), either directly or to justify new norms (such as quality, customer service/care). Most acts address all three at once.

The political approach supplements but does not replace either traditional project management or participation. The aspects of the change agenda which should be stressed are contingent on the organizational context, the nature of the change proposed, and the stage in the process.

6.2.2 Integrated office systems and prescriptive implementation approaches.

How useful are the implementation strategies discussed above for the implementation of strategic OS? Integrated office information systems are more involved with core processes, are more critical to the organization's success or failure, and are much larger scale projects affecting a large number of users and other stakeholders. Strategic uses of OS have significant implications for organization design, the design of jobs, human resource requirements, and management style and skills. Therefore attention to process - the building of commitment and support and the legitimation of change - are more important than ever in implementation.

The introduction of integrated OS is beset by contradictions. They must be centrally planned and controlled but have local support; they represent radical change but must be implemented incrementally. We will deal with each in turn. Such projects must be led from the top because 1) they must be related to the organization's business strategy 2) they may affect core business processes; 3) the need for standardisation of IT throughout the organization; 4) the impacts on organizational structure; 5) the scale of the investment; 6) the long-term nature and resource requirements of the project. User-led change tends to optimise on individual user needs at the expense of the total system (Boland, 1981); user involvement can provide an opportunity for users to divert projects to suit sectional interests (Noble and Newman, 1993); and where users' interests will not be served, and where the organization structure and balance of power are to be changed, user participation is counter-indicated (Child, 1977; Markus, 1981). There are limitations to the extent to which users can participate in a) strategic change b) rapid response to a crisis c) large, cross-functional integrated systems. Yet as we have seen project success often depends on local knowledge and commitment; 'empowerment' through technology cannot take place if users do not understand the technology.

The problem may be partly resolved by Grindley's distinction between trajectories and projects. The development of an integrated OS can be seen as a technological 'trajectory' (Grindley, 1989); it must be built up gradually within the context of long term objectives and broad policies established at the top, but proceeds by means of short-term, more clearly defined projects. In these there is more scope for bottom-up participation.

The implementation approaches described thus far do not explicitly take account of

paradigm shift (although Walton implies it). As we have seen that OS can be implicated in the use of IT to transform organizations, we now turn to the field of Organizational Transformation for a different perspective on implementing large-scale organizational and technological change.

6.3 Organizational transformation.

Dissatisfaction with OD as practiced in the early 80s led to a greater concern with large system and strategic change, resulting in the new field of Organizational Transformation (Porras and Silvers, 1991). Typical OD interventions had become concerned with obtaining a better fit between different internal elements of an organization, or a better external fit between the organization and the environment (Goodman and Kurke, 1982; Lundberg, 1984), thus drifting away from OD's earlier, more strategic concern with renewal and revitalisation. The focus on 'fixing things' within current frameworks suggested that change needed to be only homeostatic, ie. adaptive to a steady state. OT in contrast concerns paradigmatic change, involving a major shift in the organization's world-view and meaning systems as well as its practice. OT is therefore of particular interest from the point of view of structuration theory, and is highly relevant to the idea of IT-enabled paradigm shift discussed at the end of Chapter 3. The application of OT to IT implementation has only just begun to be explored.

6.3.1. The nature of organizational transformation.

OT involves a reconceptualisation of both the nature of change and the process of change. OT is change in type or state as opposed to change in degree (Schon, 1971). The distinction has been characterised in different ways. Watzlawick, Weakland and Fisch (1974) distinguished between first-order change, which 'occurs within a given system which itself remains unchanged' and second-order change, or a change in the system itself. Smith (1982) contrasted morphostatic change, which occurs according to the 'instructions encoded within the system', with morphogenic change, in which the basic governing rules themselves become altered. Morphogenic change is a change in essence, as in the change of genetic code (Levy, 1984). Tichy (1983) identified strategic change as 'nonroutine, nonincremental, and discontinuous change which alters the overall orientation of the organization.' Golembiewski *et al.* (1976) distinguished alpha change, which is a variation in level along some relatively stable dimension; beta change, which is also along a stable dimension but where the 'measuring rod' has changed due to subjects' altered expectations; and gamma change, which is 'a quantum shift in ways of conceptualizing salient dimensions of reality'. Porras and Silvers noted:

> Gamma change is a radical shift in an individual's assumptions about causal relationships, the values attached to various dimensions of reality, and the interpretive frameworks that describe reality. In other words, gamma change describes a 'paradigm shift' in organizational members' mental constructs.

As gamma change is a change in state as opposed to a change of degree within a given state, alpha-change measurement devices cannot pick up gamma change.

Mohrman and Lawler in 1984 indicated the relevance of these ideas to research on the organizational impact of IT. Such research has usually focused on alpha change, whereas the most important impacts may be the result of gamma change, which often occurs because the cybernetic nature of the technology allows it to be adapted by users to achieve new goals (third-order feedback). This is a major cause of difficulty in evaluating the effects of IT, both the impacts and the benefits.

Bartunek and Moch (1987) introduced the idea of third-order change, in which the alternative paradigm or interpretative scheme is not assumed to be known in advance, but is discovered by organization participants themselves. The aim of an intervention is to help organization members to become aware of the interpretative schemes they already hold, partly by showing them various alternatives, and introducing structures which enable them to see the existing scheme from different perspectives and to choose an alternative paradigm. Although Bartunek and Moch are mainly concerned with third-order change as an intervention strategy, they are also, less explicitly, describing the organizational archetype or paradigm of the learning organization. The idea seems to be more closely related to double-loop learning and gamma change than is second-order change.

Orlikowski and Gash (1991) achieved a partial integration of OT and structuration by applying the ideas of first-, second- and third-order change to the technological frames, or interpretative schemes regarding IT and its uses, of different groups. In first-order change, the managerial intention is to use IT to increase productivity and efficiency, or control costs; second-order change is the use of IT to change the way of doing business, including the strategic and innovative uses of IT discussed in the 80s, such as business process redesign. They argue that IS do not yet embody third-order change, which would involve awareness of the technological frames themselves. 'In the learning organization, groups need to be sensitive to the appropriateness of their current frame to the organizational context and environment' (pp. 20-1). IS do not currently 'support double loop learning by questioning their own premises'.

6.3.1 The process of change.

The concepts of first- and second-order change are inextricably linked with a model of how change occurs, which relates revolutionary to evolutionary change. First-order change is the most common because organizations are strongly self-reinforcing or self-reproducing. '(First-order) internal change may be a way for the system to remain the same' (Levy, 1984, p. 10). 'Consistency develops between various features of the organization - after a point any change of direction may be extremely difficult; the process has generated not just a particular structure, but many of the conditions that appear to justify and require just such a structure' (T244, 1985). Thus, organizations tend to evolve for long periods in the same direction, an extension or logical development of their existing type, which Miller and Friesen (1980) refer to as 'momentum'. The structural change which does occur is most commonly incremental and piecemeal. Revolutionary

or 'quantum', ie. concerted, rapid and dramatic change in structure occurs infrequently and only when absolutely necessary. Change of type is resisted until the need is overwhelming due to long delay. When second- order change comes, it is in response to the crisis caused by the build-up of problems during evolutionary development.

6.3.2 Sources of stability.

Kahn (1982) observed that the obstacles to change are the opposite side of the coin to stability and persistence, and that some resistance to change is essential for organizational survival. Miller (1990), Miller and Friesen (1982) attributed the difficulty of making major structural change to the need to maintain organizational gestalt, or congruence among the elements of structure, strategy and environment. Other writers have identified different sources of resistance to change. Schon (1971) saw the roots of 'dynamic conservatism' as self-interest and the threat that change poses to sense-making. The strategies of dynamic conservatism are selective inattention, repelling, containing and isolating change, co-option, and making the least change possible. Greenwood and Hinings (1988) indicated three kinds of reasons organizations rarely change type: 1) cognitive: structures and processes are designed to filter out critical information; 2) the need may be recognised but the costs appear to exceed the benefits; 3) power: as organizations are also patterns of privilege and disadvantage, 'dominant coalitions maintain their interests by denying structural reorientation.' According to Gersick (1991), there are three barriers to change: cognitive, motivational, and obligation. Cognitive barriers involve interpretative schemes; motivational barriers include fear of loss, uncertainty and failure; in addition there are (normative) constraints of obligation among internal and external stakeholders.

Interest has shifted from organization structures to the underlying interpretative schemes or 'provinces of meaning' which organization structures embody (Greenwood and Hinings, 1988). These sets of ideas, beliefs and values, together with the structures and processes which serve to implement and reinforce them, constitute a design archetype, which 'may have the attribute of a paradigm with its connotation of world view and intractability' (p. 301). Coherence comes from the consistency between interpretative schemes, structures and processes, rather than from congruence between structure, strategy and environment.

Gersick (1991) calls change which is characterised by long evolutionary periods punctuated by short revolutionary ones 'punctuated equilibrium'. The pattern is explained by the existence of an underlying order or 'deep structure', which 'is what persists and limits change during equilibrium periods and.., is what disassembles, reconfigures, and enforces wholesale transformation during revolutionary punctuations.'

> *Deep structure* is the set of fundamental 'choices' a system has made of 1) the basic parts into which its units will be organized and 2) the basic activity patterns that will maintain its existence... (it) may be thought of as the design of the playing field and the rules of the game....The activity patterns of a system's deep structure reinforce the system as a whole, through mutual feedback loops (p. 17).

6.4 OS, first-order and second-order change.

As we have seen in our discussion of the organizational benefits and strategic uses of OS, the introduction of OS has overwhelmingly been perceived as a limited, technical change or first-order, alpha change where the goal sought is a changed level of existing outputs. The reasons relate to the barriers to second-order change discussed above: cognitive (the traditional unawareness of technologists and managers of the organizational implications of new technology; avoiding the need to challenge the existing organizational paradigm), and it also appears to involve less effort (apparent benefit exceeds cost). IT in general has overwhelmingly been perceived as a first- order change at the level which Venkatraman characterises as 'localized exploitation', and has been implemented within the existing organizational paradigm, in which case it will usually reinforce existing systems of control (Orlikowski, 1991) because of managerial inertia, lack of vision and understanding among the dominant coalition, and fear of disturbing the existing distribution of power. Organizational change appears in the form of emergent 'impacts' as, before, during and after implementation, everyone tries to adapt IT a) to what they are already familiar with and b) what is to their advantage.

Orlikowski and Gash (1991) indicated that the strategic use of IT represents second-order change, or the move from one paradigm to another which already exists. In this section, the strategic uses of OS discussed in Chapter 3 - internal process integration, boundary spanning, and organizational infrastructure - are considered in relation to second-order change. The criteria for second-order change are:

- changes required in organization structures and processes
- new approach to HRM, job design, work, commitment
- different style of management required
- change in world view or interpretative scheme.

6.4.1 Internal process integration.

Internal process integration (Business Process Redesign, reengineering) usually involves the application of IT capabilities to redesign key business processes (Davenport and Short, 1990), although in the view of some practitioners the role of IT is secondary and supportive to the main task of reorganizing work so as to obtain greater responsiveness to customer needs. Job redesign is thus intrinsic to internal process integration, and proponents such as Hammer (1990) argue that jobs should be enriched, workers empowered to make decisions, and given the information to enable them to do so. The devolution of responsibility to lower levels is in itself radical in its implications: more diffuse roles, team working and less formal hierarchy require different, more facilitative management roles and skills (Davenport and Short). Most processes also cross existing structural boundaries, which means organizations should really be completely redesigned around processes. However, even those organizations which have successfully carried out reengineering of their major processes have as yet gone only halfway in this direction (Coates-

Walker, 1992).

Business Process Redesign is often carried out in response to a crisis, and may be part of other organizational changes such as TQM. Important features are customer focus, setting performance targets which are 'stretching', and improving speed, quality, and cost all at once. Together with the structural changes, this does seem to represent an alternative paradigm for organizing, which challenges most traditional assumptions (Stalk and Hout, 1990; Hammer, 1990; Davenport and Short, 1990; Coates-Walker, 1992). Because of the cross-functional nature of BPR, managerial ownership and commitment are extremely important. Such projects must have very high level support; the management of some processes is integrated only at the level of the CEO. Consequently, the different versions of BPR (Markus and Turner, 1992) agree that 'vision' at the top is a prerequisite. Davenport and Short for example stress that process objectives must be set in the context of high-level strategic business vision. There appears to be a need for a change in world view.

However, there is not as yet a unified paradigm for BPR. Davenport and Short explicitly locate BPR within the Tayloristic industrial engineering tradition, while Hammer, and Nolan and Norton place more emphasis on job redesign and enrichment. Markus and Turner (1992) have suggested that other approaches which are applicable are sociotechnical design, new organizational forms/organizational architecture, organizational transformation, and task alignment, each with its own implications for implementation. In this field, the experiments are currently underway, the outlines of the new paradigm may be emerging but the conditions for success are not yet completely clear. We have second-order change in the making.

Computer-supported cooperative work is a form of internal process integration which applies to tasks which are mainly reciprocal rather than sequential. It often involves process redesign and success is highly dependent on social factors (Bullen and Bennett, 1990; Lyytinen and Ngwenyama, 1992). Second-order change may be required at the level of the group; the more the organization depends on or is constituted by such groups, the more organizational transformation will be required.

6.4.2 Spanning boundaries/interorganizational systems.

Some uses of OS to span boundaries, such as executive support systems, marketing and strategic analysis, do not require any significant organizational change. However, interorganizational systems are likely to do so.

Internal process integration leads logically to the idea of integration across organizational boundaries; indeed, the customer focus of much business process redesign will ensure this happens anyway. There are different degrees of linkage between organizations, some of which require greater organizational change than others. Three broad levels of integration can be distinguished: EDI, interorganizational systems, and business network redesign (Venkatraman, 1992; Billinge, 1992). EDI requires only a common technology platform for data interchange.

The motive is to eliminate paper and rekeying between organizations. The requirements are: agreed data standards, a standard structure for information, and the software to make the connection. Interorganizational systems (IOS) build on EDI, but require more of a partnership. Integration moves from the level of simple transaction processing, to the transactions which give rise to inventory (JIT), to the sharing of design information, quality control, and forecasts of demand. As integration proceeds, customers become interested in cultivating relationships with fewer, closer suppliers. Business network redesign exploits IOS for business advantage (Venkatraman). Organizations become more tightly coupled in the way their businesses are run; while the early strategic uses of IOS were seen as 'locking in' suppliers and customers, greater benefit is now seen as coming from collaborative advantage, the use of the network to obtain added value for all partners. This may in turn involve totally new products (Level 5). The key issues become: electronic communication, permeability of organizational boundaries, fewer levels, interdependent responsibilties, team v. task focus, organic form, and strategic alliances as against vertical integration (Venkatraman, 1992).

Cash and Konsynski (1985) argued that IOS affect the organization, having first-order impacts on business processes, second-order impacts on the skills required of employees, and eventually, when an IOS is used for a key business function, on organization structure and business strategy . Business network redesign involves major organizational change for all parties. Because the harmonisation of business and IT systems produces even greater interdependence, issues of power and trust can outweigh arguments about efficiency and market benefits in decisions concerning the implementation of such systems (Clemons and Row, 1992; Prekumar *et al.*, 1992). The creation of strategic alliances clearly represents a paradigm shift or second-order change (Stalk and Hout, 1990; Keen, 1991).

6.4.3 Infrastructure/platform.

The development of an IT infrastructure is strategic in its own right because it enables an organization to use the information it has and to act upon it (Venkatraman, 1992); it supports existing strategies (Billinge, 1992), provides the basis for as yet undiscovered strategic applications (Hopper, 1990), and positions the organization for the more radical levels 3-5. It is thus a precondition for organizational transformation, without necessarily requiring organizational transformation for its implementation.

The problems of implementing an IT infrastructure are technical, financial, project management and political. They are more difficult to cost justify because many benefits are qualitative, or spread across different functions; they represent very large projects, with long lead times and large management costs, which affect large numbers of staff; they must be centrally planned and designed but also require local support in order to succeed. They need top management sponsorship because of their political implications and because they are strategic (Keen, 1986, 1991; Hopper; 1990). Platforms which cross functional boundaries, allow access to

corporate databases, the sharing of information, and compression of time and distance will have an impact on organizational structures, either intended or unintended (Gunson and Boddy, 1989; Keen, 1991). However, the implementation of an IT platform is most likely to represent only first-order change unless it is perceived as a means of redesigning the organization.

6.4.4 The use of IT to create new organizations.

This represents second-order change if the new paradigm is already defined, which is often the case. If the object of redesign is a learning organization, and the paradigm has to be discovered, this use of IT represents third-order change.

We can conclude that the implementation of most strategic OS represents at least second-order change. As IT projects get bigger, more central, and more strategic, there is an apparently irresistible tendency for them to become associated with the idea of paradigm shift.

6.5 Implementing organizational transformation.

Among OT experts, it is agreed that first-order methodologies will not produce second-order change. Implementation approaches for second-order change vary depending on the stage to which they are directed. Lundberg (1984) describes these three phases of 'transitioning' as inducement, management, and stabilisation, which correspond to unfreezing, changing, and refreezing. Second-order change involves first of all some crisis, either natural or induced, which reveals the shortcomings of the present paradigm (Bartunek and Moch, 1987). Second, the alternative paradigm must be discovered, diffused, accepted and legitimised (changing). Thirdly comes the institutionalisation of the new paradigm. According to Levy and Merry (1986), the change agent's task at each major stage is to:

facilitate departure from old paradigm
facilitate creation of a shared vision that is a new paradigm
facilitate alignment of members with the new vision and their commitment to change

6.5.1 The crisis.

The driving forces for second- order change may be internal, external, or result from the interaction between the two (Levy and Merry). The existing paradigm may be revealed to be inconsistent with task or environmental contingencies, there may be low commitment to the existing scheme, or power dependencies may be altered (Greenwood and Hinings, 1988). Lundberg distinguishes different aspects of the inducement stage: permitting conditions (surplus of resources; sense of readiness for change; some degree of coupling; agents: managerial strategic awareness and competence), enabling conditions: (degree of domain forgiveness or threat; organizational/domain congruence) precipitating conditions (organizational growth or decline; stakeholders' demands; crises, real and perceived; atypical performance demands) and triggers, which are more specific events, such as the arrival of newcomers or a sense of time running out (Gersick, 1991).

The need for change is perceived only through organizational filters and change

inhibitors. 'Human systems eventually finish their deep structures' agenda, but ... as long as events occur against the backdrop of the same deep structure, they are treated or interpreted in ways that preserve the system's inertia, and therefore, incremental solutions are sought. The handwriting on the wall cannot be read' (Gersick, 1991, pp. 236-7). Levy and Merry note:

> when crises are faced and normal modes of problem solving and management are first seen to be inadequate, calls often arise for going 'back to basics.' Failure here is usually followed by muddling through and massive tinkering with the system... When this does not work, breakthroughs in basic approach are sought.

The implementation tasks of the first stage are to create awareness of need for second-order change and encourage the search for new possibilities, ideas and choices. This may be done by raising awareness of the content of the current paradigm and of the existence of alternative paradigms, encouraging letting go, energising, reframing. Approaches may focus on the paradigm directly, e.g. by creating awareness of the existence and impact of the current paradigm, or indirectly, via the belief system, organization mission and purpose, focussing on myths, symbols and metaphors or on second-order problems and symptoms (Levy and Merry, 1986).

6.5.2 Diffusing the alternative paradigm and managing the transition to the new state.

The focus of creating organizational vision may be on top management as catalyst - or at the individual level (Porras and Silvers). However, both macro and micro levels must eventually change. Revolutionary periods are characterised by uncertainty, generating hope and fear (Gersick). Nadler (1982) has discussed the need to deal with anxiety and to motivate constructive behavior in managing transitions to uncertain future states. This involves creating a vision of the future, preparing people for uncertainty, as well as defining the future state as being made up of transitions. There is also a need to deal with politics and power in this stage, partly via open communication (Levy and Merry), but also according to Nadler, by creating a small and cohesive senior planning group to monitor change regularly, rewarding senior management collaboration/ team performance, increasing leader visibility, and demonstrating confidence and consistency. The transition state must be controlled by defining a series of short, incremental transitions to alternative futures, maintaining tight linkage between those who plan and those who manage the transition, greatly increased two-way communication flows. Beckhard and Harris (1977) have also discussed transition management in organization-wide efforts in considerable detail.

6.5.3 Institutionalisation.

Institutionalisation is defined as the persistence over time of a behavior, performed by two or more individuals (Goodman and Dean, 1982). Once institutionalised, the behaviour exists as a social fact, ie. it is part of social reality external to any individual. 'After stabilization, the transformed social processes and actualities take on a rulelike status in social thought and action' (Lundberg, 1984, p. 66). One of the necessary conditions for institutionalisation is normative

consensus and awareness, and consensus on values relevant to the behaviour. 'Reinforcement, reward allocation, procedure formalization, and similar processes are devices commonly used...' (Lundberg, 67).

6.6 Discussion of OT implementation.

6.6.1 OT and OD.

Levy and Merry (p. 33) contrast typical OD and OT interventions as follows:

Table 6.4

Organizational Development Intervention	Paradigmatic Change Intervention
Does not challenge the current paradigm	Challenges and changes the current paradigm
Starts with diagnosing problems and searching for solutions	Starts with a new vision or a crisis in the old vision
Goal setting	Looking for a new purpose, core mission
Emphasis on cultural dimensions: values, attitudes, and norms	Emphasis on ideology, cultural, political and technical dimensions
Agreement on solutions	Alignment of people and systems with a new purpose
Present orientation	Future orientation
Continuity with past	Starting a new future

OT implementation prescriptions draw to a great extent on traditional OD, but address a larger framework. One of the most obvious differences is of course the focus on changing the paradigm as the object of intervention and the creation of vision as the means of achieving it. To facilitate second-order change, 'one has to change the "metarules" (the rules of the rules) of the system' (Levy, 1984, p. 18). According to Gersick, articulation of a new vision around which deep structure can reform is central. As Davis (1982) puts it, transformation is a change of context, ie. of the unquestioned assumptions which filter experience and create reality. The major strategic shift is the questioning of context, moving from not knowing to knowing you don't know. Paradigm change is so profound that it will pervade all other aspects of the organization: it 'will entail changes in the organizational philosophy, mission and purpose, culture and core processes' (Levy, 1984, p. 17).

6.6.2 OT and structuration theory.

OT represents the application of psychology, social science, systems theory and natural science models to major organizational change. It is therefore a specific example of the reflexive use of discursive knowledge in modern organizations.

The perception in OT of the way that macro and micro levels interact to produce stability corresponds to the duality of structure in structuration theory. The analysis of the conditions of system reproduction in OT in terms of cognitive, emotional, and normative barriers and self-interest is entirely consistent with structuration theory. Giddens would argue that social systems also tend to persist because of the habit and routine, derived from the need for ontological security. The latter is closely related to the concept of identity, stressed by Boland (1992) as well as Coombs, Knights and Willmott (1992). In modern societies people derive their identities to a great extent from the organizations in which they participate, particularly their work organizations, which should help us understand the depth of resistance to change sometimes encountered.

Within OT there is some difference of view in whether the focus of interest and therefore the target of change is structures in the sense of systems, interpretative frames/meaning systems, or underlying codes. A change in the latter will obviously be most profound. Interpretative schemes are important but are only one dimension of social systems. Smith's 'basic governing rules' and Gersick's 'deep structure', however, closely approximate Giddens' idea of structure as an underlying code or system of rules which is only manifested in action. The problem is first, how to identify it, and second, how to get at it in order to change it.

OT addresses meaning systems/interpretative schemes, but does it also adequately address power and legitimacy, that is, systems of domination and legitimation? OT recognises differential access to power as part of the explanation of system stability, but does it take account of this in explaining change? OT appears to assume the benign practitioner/consultant assisting benevolent leaders to design wholly beneficent organizations. There seems to be an implicit

unitary view of the organization, an assumption that the interests of the organization as a whole in change are consistent with those of its members. Also, even accounts of second-order change are largely oriented to description of the process, and say little about what the content of the new paradigm or interpretative scheme might be. Fascism was a new paradigm once.

6.6.3 OT and emergent implementation approaches.

The process-oriented implementation strategies discussed earlier in this chapter have ostensibly been addressed to first-order change. However, STD has at least some of its origins in an ambition to democratise industrial organizations, a second- or even third-order change (Porras and Silvers). Organizing around semi-autonomous workgroups is a second-order change at the lower levels of the organization which has large, if largely unrecognised, implications for higher levels of management (Child, 1977). In the past, when such experiments failed, it was often because they were perceived as threatening management control and the existing management paradigm (Kelly, 1978; Blackler and Brown, 1978). These and other earlier initiatives such as QWL have more recently become legitimated (to senior management) in strategic terms. Buchanan and McCalman (1989) have shown how a paradigm such as high-performance work systems, with its associated notions of empowerment and flattening the hierarchy, creates and legitimates a broader management context in which lower level STD can occur. Similarly with Walton's concept of an organizational strategy based on commitment rather than control.

There is a continuity then between strategic organizational transformation and process-oriented approaches and other management ideas which have been around for some time. OT does not make these redundant but on the contrary focuses them and breathes new life into them. They can usefully be combined with new insights derived from the notion of implementing second-order change. This informs the next section where I develop an implementation strategy.

6.7 Implementing integrated office systems.

I have argued from the outset that an implementation strategy for integrated OS must take account of both rational and political perspectives. The approach outlined below therefore takes account of the main insights developed in the first and latter halves of this dissertation. Also, the emergent perspective analysed in Chapter 5 enables one to make a choice among existing normative approaches to implementation. Structuration theory points to the need for a holistic approach to change, and to the importance of legitimation and the management of meaning. Both structuration theory and the analysis of strategic uses of OS indicate the relevance of organizational transformation. The implementation strategy therefore has to combine the strengths of the emergent prescriptive approaches and the insights derived from the management of major organizational change.

6.7.1 Audit

The historical framework I presented in Chapter 2 can be used to help an organization assess where its office systems currently are: data processing and MIS only, isolated applications,

generic OA, or integrated/integrating systems, together with Venkatraman's five levels which are for IT in general.

6.7.2 Initiation

As the case studies have indicated, initiation of an OS can come from a variety of different sources and for a variety of reasons, including external pressure/events, crisis, evolution of internal systems, other organizational changes, and a sense of inevitability ('it will come anyway; why not be first?') However and wherever this occurs, senior management must be involved at an early stage, for the reasons discussed in Section 6.2.2. above, including the need for central and long-term planning and resourcing, and the size and scope of the project.

Senior management must identify the business need, how an integrated OS can meet it, and the likely organizational implications. Where there is no explicit overall business strategy, consideration of the strategic use of IT can be an occasion for developing one, using approaches such as SSM and Critical Success Factors. The information-processing framework I developed in Chapters 2 and 3 (Fig. 3.1) can be used as a guide to strategic applications for OS, and the model of managerial choice presented in Chapter 5 (Figure 5.4) used to consider the technology and organization selection and design criteria.

At the same time, the order of organizational change required should be considered. I have discussed in full which types/uses of OS imply which orders of change in Section 6.4 above. Some important aspects of implementation strategy depend on this decision.

6.7.2.1 First-order change

First-order change will seek to fit the OS into the existing organizational structure with the least possible disturbance. An implementation strategy of localised incrementalism will deal adequately with the introduction of OS where:

1) the proposed system is not central to core processes
2) it does not represent radical change in technology or work practices
3) it can be introduced gradually
4) it is intended for one unit or area, or can be introduced one unit at a time.

A strategy of shared responsibility between managers, specialists and users, incrementalism, and attention to job design criteria will enable some emergent impacts to be dealt with. However even such limited change projects should be managed with attention to maintaining authority and control. Project risk needs to be assessed. The greater the uncertainty, (e.g. the greater the distance between the technology being implemented and that with which the organization is already familiar, the more interdependencies, external and internal change, the greater the pace of change and the more radical it is, and the more central to the organization's primary task), the riskier the project and the more political the process will be.

Most organizations have passed this phase of localised exploitation of IT and are now

attempting to use OS as part of an integrated IT platform, to redesign internal processes, for interorganizational systems, or all three. The implementation of an integrated IT platform differs from localised exploitation mainly in that:

1) cost justification must be on a different basis
2) it represents a major long-term investment
3) the need for common standards of hardware and software
4) it crosses organizational boundaries
5) it may touch on or include core processes.

It is thus technically and politically complex, involving more of the uncertainty factors discussed above, but is not usually associated with major organizational change efforts (see Section 6.2.2 above); a combination of the process-oriented approaches discussed earlier (stakeholder analysis and involvement, incrementalism, the management of meaning) will be relevant.

6.7.2.2 Second-order change

The critical thing in second- order change is that the alternative paradigm be known or discovered before it can be moved to, that the vision be created. Therefore, an implementation approach for the first phase of second-order change will focus on creating awareness of the nature and influence of the old paradigm, showing how it is associated with the perceived crisis and with second-order problems. That is, it will be concerned with changing interpretative frames.

One of the main issues is whether to attack the existing paradigm directly or indirectly. If a direct attack on the existing paradigm is too threatening, two alternatives are 'leading from where you want to be', that is, assuming that the appropriate culture and organization are already there, waiting to be discovered (Davis, 1982), or stimulating change by amplifying changes in the environment instead of dampening them down, which can be done by adding information, especially about the system itself. The change agent can surface and compare different internal views, and contrast the organization's survival mechanisms with its 'real' purpose (Goldstein, 1988).

The other main issue is where to start, with top management or a small group on the periphery. In either case, change begins in a nucleus, and must become well established there before diffusing.

6.7.3 'Transitioning'

Certain features of the control agenda in the transitional phase apply to both first-order and second-order change:

Establish long-term objectives for the OS and make resources available for them.
Develop an IT strategy for the OS or relate it to existing IT strategy: hardware, software, scope, policies, standards.
Break implementation plan down into a series of projects.
Establish a steering committee representing major stakeholders, reporting to senior management;
Appoint a high profile project manager/leader with authority; not an IT specialist.

Establish clear lines of authority and decision-making process.
Appoint a multidisciplinary project team.
Involve users in each project in design of jobs and secondary features of technology.
Monitor and evaluate at regular intervals.

In second-order change the transition phase also involves the diffusion of the new paradigm throughout the organization. It is necessary to assess the obstacles to change: as we have seen these are: the congruence or fit among existing elements; cognitive barriers: sense-making, interpretative schemes; emotional barriers: fear, uncertainty; self-interest: vested interests in the existing distribution of resources, cost of changing appears to exceed benefit. A change in social system means change across a wide front (in the structures of signification, domination, and legitimation). This is partly accomplished by providing alternative interpretative schemes and establishing new norms, but these must be backed up by a consistent allocation of facilities/resources (power/control). Legitimation and communication are the key tasks of this stage. The management of meaning and legitimation are aided by pointing out the deficiencies of the existing paradigm, by contrasting it with the organization's own purposes/mission, or an external standard (e.g. bench-marking), establishing new performance criteria and demonstrating their feasibility.

6.7.4 Institutionalisation

The third phase, institutionalisation or persistence of the change, involves monitoring, evaluating and maintaining change, using various feedback mechanisms and continuing to support it through the reward system (Beckhard and Harris, 1977; Goodman and Dean, 1982).

6.7.5 Third-order change

There are real questions over how far senior management can or should attempt to change organizational culture from the top down. The overall terms of organizational culture may be defined by top management, as mission or strategy, but structuration theory shows us that a real culture is also an organic growth and in a sense the property of all organizational members. The dominant model of second- order change is that senior management acquires the new paradigm first and then instills it in subordinates. This does not seem to be a good model for implementing a 'learning organization', whose aim is to increase the system's ability to analyse and change current paradigms and to envision future ones. The development of a learning organization must involve first of all enabling all organization members to understand the existing paradigm and then to discover what paradigm they wish to move to.

Such interventions should be designed to help employees increase their ability to develop their own solutions, by showing alternatives, in order to increase awareness of the present schemata, and introducing structures which enable members to see from different perspectives. Participation can become gamma change.

1. Summary and overview.

The problem set out in the first chapter was the need for an implementation strategy for OS which would address both business and user requirements, and take account of the organizational impacts of technology.

1. We have seen that office information technology has been steadily advancing in its integrative capacity. This means that it involves potentially all workers who produce or handle information in an organization, and that systems are designed which provide communication across functional and organizational boundaries, and which enable individuals and groups to connect with other (e.g. data processing) systems. A technology such as OS, which crosses vertical and horizontal boundaries in and between organizations, must have great potential for organizational change.

2. Integrated office technology can consequently support strategic as well as the efficiency/effectiveness goals of earlier computerised office systems. I have suggested that OS can be used strategically in order to reduce uncertainty in three major areas: task/production, co-ordination, and the environment, by means of respectively: internal process integration, organizational infrastructure, and boundary-spanning systems.

3. The achievement of strategic goals in each of these areas depends to a great extent on making changes in organization design at the same time as changing the technology. Whether requiring or enabling, office information systems can be seen to be moving away from their rather humble role as administrative support to a key role in shift of management paradigm.

4. At the same time, there is increased awareness of the difficulty of implementing strategic systems, and the important role which the implementation process plays in producing the kinds of changes desired (or not desired) by those who initiate it, the uncertainty of outcomes, and the influence of many different actors. Structuration theory improves the model because it takes account of structure and process, micro and macro levels, and comprehends actors' intentions and goals as well as contextual constraints and the unintended consequences of their actions.

5. A number of prescriptive implementation strategies and approaches take account of the emergent nature of the implementation process. There is increasing awareness of the necessity to legitimate change and to manage meaning. Implementation strategy is contingent on a number of factors, one of which is the nature and magnitude of change involved, especially whether it is change within the existing management and organizational paradigm or to a new one. Many of the uses of integrated OS involve second-order change, to which the theories and prescriptions of organizational transformation are applicable. This kind of change is an explicit process of structuration. The problem of implementing it is how to ensure the integration of the institutional/macro and interaction/micro levels. Ideology and processes of legitimation are

crucial to this endeavour.

2. Contribution.

As I said in my introduction, because of the nature of the topic, the research and consequently this dissertation covers a wide front and part of the contribution to knowledge must lie in the synthesis of a number of perspectives, which have not been brought together previously, to bear on the problem.

There is also an empirical contribution, in the bringing together of available data together with the results of the MD survey, and the case studies in fifteen organizations, which have shown how integration of office systems is proceeding, how they are being used, the benefits sought, the impacts at job and organizational level, and the implementation approaches being employed. Office systems are coming to be perceived as strategic in some contexts, in high-performing organizations and where information-processing is a primary task, and it is in these situations they are likely to be involved in major organizational change.

At the level of theoretical synthesis, I have shown how the rational-analytic perspective can be combined with the interpretative-political, especially in Chapter 5 (Fig. 5.6). I have related the analysis provided by largely descriptive studies of implementing new technology to the prescriptive literature. I have applied structuration theory to implementation and shown its strengths and weaknesses. I have shown how OS are involved in organizational transformation/the design of new organizations, and considered how to apply OT theory and practice to implementing OS.

Also, my analysis of each area has carried it a step further. I developed a functional classification of offices based on an information-processing perspective, related it to the IT-strategy literature, thus producing a scheme for assessing strategic applications for OS, which I later included in the implementation approach. In Chapter 2, I also produced a historical survey of the development of office systems, showing how the theme of integration had emerged, and providing a framework which organizations can use to audit their own position. In Chapter 3, I showed how OS are involved in the new organizational/management paradigm. In Chapter 5, I developed a model of managerial choice from the 'organizational' perspective, a model of implementation as an emergent process, and combined them in a descriptive model of implementation taking into account context, rational choice, technology, and process factors. I critiqued the use of structuration theory in IS research and showed how structuration can provide a framework to unite the rational-actor and interpretative perspectives on organizations. In Chapter 6, I showed the relevance of structuration theory to prescriptive implementation approaches. I showed how the main uses of integrated OS relate to first-, second-, and third-order change. I applied OT to the implementation of IT, and integrated earlier 'emergent' implementation approaches with OT insights and implementation strategies to suggest an implementation strategy for integrated OS.

3. Reflections on learning and avenues for further research.

This project began as what seemed like a straightforward study of implementing office automation, with the aim of informing managerial practice. There were few prior assumptions except that a) from my background knowledge of organizational theory/behaviour and b) my interests in job redesign, sociotechnical systems, and the relations between technology and organization structure, and c) my previous research on the organizational and social consequences of information systems, I anticipated that organizational change would be an important issue.

What has happened along the way? Two broad areas stand out. The first significant developments concerned the technology and its uses, which were changing rapidly under my feet, so to speak, while I was studying them. I soon discovered the trend in office systems towards integration, and I became convinced that such systems potentially yielded far more benefit to organizations than 'generic office automation'. Consequently, I produced for myself a working model of integrated office systems based on reading and live examples. While adequate descriptively, it did not seem to answer how OS could best be addressed to really urgent, possibly strategic business needs. This led to a survey of the IT/strategy literature and the information-processing model, which seemed to provide a high-level general framework for relating OS to business strategy.

Meanwhile, events gallop ahead. The functionality-for-cost ratio of IT continues to rise and technological means of integration have proceeded apace. New uses (or at least new fashions) for IT/OS emerged during the period of my study, notably business process redesign, inter-organizational systems, networks/organizational platforms/infrastructure, and computer-supported cooperative work. I could accommodate these ideas in my information-processing model, but in the IT world the focus has certainly shifted away from OS as such to these concepts, which are perceived as strategically significant, and have become research industries in their own right. The difference between OS and other forms of IT, which was never very clear, has become, in my opinion, hopelessly blurred.

This is related to the concept of 'the office', as a definite work institution. For analytical purposes it was never very useful and is becoming less so all the time. Although teleworking (on the 'electronic cottage' model) has not taken off and I do not believe it will, the physical and temporal boundaries of the office have certainly altered beyond all recognition in some organizations, and this trend will increase. With the greater availability and use of computers linked with telecommunications, more people such as salespeople and professionals work from their cars, from their homes, from customers' offices, and so forth. In parts of DEC, the notion that the office worker has one fixed place of work with his/her own desk has already been broken down.

Also, there is a phenomenal amount of information-processing in and around the production of goods and services (retail trade is a notable example) which does not necessarily

take place in an identifiable 'office'. Yet the problems in using and implementing IT do not seem to be very different from the emerging significant areas of OS. The focus should be on similar information-processing needs, or similar business processes, rather than on whether they occur in an 'office' or not.

During the course of the research, the issue of using IT to redesign/transform organizations emerged as particularly significant for OS. While the idea fascinates researchers, actual examples seemed thin on the ground. Part way through my study, I attempted to include some by visiting large computer companies. They confirmed what was happening 'at the leading edge' but I was not able to collect enough information from these very large organizations, either to feel that I had a good comprehension of how they implemented change, or to judge whether their was an example many other organizations would wish to follow.

The topic of 'the new management paradigm', the radical organizational implications of business process redesign, inter-organizational systems, etc., as well as structuration theory, indicated that approaches to major organizational change/transformation could be relevant to implementing OS. OT is an enormous and interesting field in itself, which I have only been able to survey superficially, and of which I had no direct experience or case study examples. Consequently I felt there were gaps in my understanding of implementing such change, and I wonder whether the consequences for the people who work in such 'transformed' organizations will be as advantageous for them as they are supposed to be, particularly in a world recession and a fiercely competitive cost-cutting climate.

The entire area of IT/new organizations/organizational transformation is a candidate for future research; it could not be dealt with adequately in the project I had set myself. If large-scale social experiments of this kind are underway, there is a great need to observe and study them closely and longitudinally.

The second broad area of learning is theoretical. I was already familiar with the emergent perspective on implementation, and structuration theory was a logical extension of it. Also, there are close correspondences between OT and structuration theory, which I have indicated, especially in the analysis of system stability, persistence and conservatism, and the role of underlying codes/assumptions/interpretative frames in maintaining systems/structures. A fuller comparison of OT and structuration theory than I have been able to do in the context of this dissertation could be interesting.

However, I came to believe that structuration theory, somewhat ironically, has a great weakness in not being able to explain change - ie. <u>when</u> and under what conditions actors alter their frames of reference and modify the institutional 'givens'/world-taken-for-granted. Because of the very high level at which the theory is framed, Giddens tells us that novel behaviour can originate <u>at any time</u>, but under what conditions does it, and when does it persist and become institutionalised? OT has drawn on natural science, group behaviour and psychotherapy for

concepts to explain change, but there are other areas (outside organization theory) which could be relevant such as the study of creativity, innovation, the diffusion of innovation, and (of particular interest to me) social movements.

Structuration theory provides a demonstrably useful conceptual framework for studying management, organizations and IT, particularly the idea that organizations are continually going through a structuring process even when 'no change' seems to be the order of the day, and that implementing organizational change is a deliberate process of structuring, involving a shift both at the institutional level and at the level of interaction. Using structuration theory prescriptively is quite a different matter because the usual focus on unintended consequences gets in the way. I suspect Giddens not only has no interest in assisting this project but is deeply suspicious of attempts at social engineering (see his comments on systems theory as a potent ideology [1979, pp. 74-5]). Ideas about how to implement system change also have to come from some other body of theory.

There are also a number of methodological problems about studying or applying structuration empirically (Robey, 1992; Gregson, 1989). I believe that one can only get beyond the level of application already achieved (Orlikowski and Robey, Newman and Robey, etc.) by deep immersion in case material (such as Barley's), with the risk of coming out with nothing that was not well known before. Certainly the methodology which I chose to study office automation, a series of visits to several organizations, was not appropriate to making any empirical contribution to applying structuration theory to IT.

Another large, problematical theoretical area is technological determinism. I must say that for a long time I found it a powerful tool for understanding social evolution and history as well as organization structure and workers' experience of their jobs (Blauner, 1964; Woodward, 1965). However, the literature on implementing technological change indicates otherwise: what we have observed so far is no specific, necessary impacts of IT, alternative job designs and organizational implications of the same/similar technology, and all sorts of unexpected, uncontrolled 'emergent' impacts depending on context. At the same time, I am drawn to the case put by Freeman and others that IT represents a shift in techno-economic paradigm and that as with other technology change of the same magnitude, major managerial, organizational and institutional changes will eventually follow. The problem may be one of time scale; technology is determining only in the long run.

But at present we can only hypothesise that this is the case; we cannot prove it. In addition, I am not at all sure that we can specify the parameters of any new organizational paradigm in advance, or that they will be benign or desirable from a social or humanistic perspective. This issue is obviously a major area for research and is closely linked with the question of IT, OT and new organizations.

APPENDIX I

Office Automation Survey

The survey on the use of office systems was carried out in 1989 in order to establish 1) the extent of use of office automation, 2) the purposes for which companies were investing in office systems, and the relation to business objectives as they saw it, 3) problems which they were having in implementing such systems or in realising the benefits which they sought. Questionnaires were addressed by name to the managing directors/chief executive officers of the 250 leading companies by growth and profit listed in Management Today, June 1989. We received 55 replies, including 41 completed questionnaires. Because of the very high level to which we had addressed our questionnaire, we felt that 41/250 (16%) was a satisfactory response rate. While it does not enable us to answer with any conviction the first of our questions, about the extent of OA use, there were enough replies to deal with the other questions, providing we are careful not to generalise too much either to the larger population of successful companies, or to British industry as a whole.

As well as the problem of getting replies from chief executives of major businesses, another reason for the relatively low rate of response could be the difficulty which senior managers have in understanding the nature of office systems. We asked whether the organization used 'office systems/office automation either as a formal "OA" system or as a combination of personal and central computing and communications'. It was evident from the replies that, in spite of our careful phrasing of the question, there was still a lot of scope for uncertainty as to what office systems are.

Those who replied that investment in OS was important to strategic objectives were asked to which objectives they were important. The results are shown in the first column of Table 3.1. The same respondents were also asked how office systems were important to their strategic objectives. A number of respondents did not make a clear distinction between means and ends in the case of some kinds of objectives, and so there is a degree of overlap, as shown in the second column of Table 3.1. Further, all respondents who said their organization used or was planning to introduce an OS in the next two years were asked what were or would be their objectives in investing in OS, and to rank them. The objectives and their rank order are shown in Table 3.2.

There is obviously considerable overlap in the replies to these questions, with strategic objectives for the organization not being distinguished clearly from the means of realising them. Therefore, the replies for all three questions are shown together in Table 3.3 below.

Table 3.1
STRATEGIC OBJECTIVES FOR OS

(Any mentions)	WHICH	HOW	TOTAL
1. Improved communications	9	7	16
2. Improved customer service, meet market demand	9	0	9
3. Management control	5	2	7
4. Reduce overheads, costs	5	0	5
5. Functional co-ordination	2	3	5
6. International & divisional co-ordination	2	3	5
7. Growth, development	4	0	4
8. Organization change	3	0	3
9. Management aids	1	3	4
10. Quality	3	0	3
11. Effectiveness, performance	2	0	2
12. Responsiveness	2	0	2
13. Improved management	2	0	2
14. Efficiency, productivity	2	0	2
15. Competitive edge	1	0	1

Table 3.2
OA OBJECTIVES

	Rank Order					
OA OBJECTIVES	1	2	3	4	5	Total
Communication	10	3	3	0	0	16
Access to information	4	1	2	2	2	11
Cost reduction	2	6	1	1	1	11
Efficiency, productivity	5	3	2	0	0	10
Speed, response	3	1	3	0	0	7
Service, customers	2	2	2	0	0	6
Effectiveness, value added	3	3	0	0	0	6
Across-co. co-ordination, communication	3	1	2	0	0	6
Improve existing systems	4	0	0	0	0	4
Management, exec. info.	0	2	1	0	0	3
Common, sharing info.	0	2	0	1	0	3
Better, more accurate info.	2	0	0	0	0	2

Table 3.3

STRATEGIC OBJECTIVES, MEANS, AND OA OBJECTIVES COMBINED

Objective	Strategic	Means	OA	Total
1. Communications	8	5	16	29
2. Cost reduction	5	2	11	18
3. Economy, productivity, efficiency	2	6	10	18
4. Internal coordination, communication	4	6	6	16
5. Customer service	9	0	6	15
6. Responsiveness, speed, timeliness	2	6	7	15
7. Access to info.	0	2	11	13
8. Effectiveness	6	0	3	9
9. Mgmt. control	5	2	0	7
10. Mgmt. aid, exec. info.	1	2	3	6
11. Better, more accurate information	0	4	2	6

Description of sample

Size - number of employees

>10,000	= 20
5001-10,000	= 7
1001-5000	= 10
1000 or less	= 1
No answer	= 2

Turnover

£2 bn. +	= 7
=>£1 bn.<2 bn.	= 6
=>.5 bn.<1 bn.	= 6
=>250 m.<500m.	= 5
=>100 m.<250m.	= 7
=>50 m.<100m.	= 3
=>10 m.< 50m.	= 0
=>1m.<10m.	= 2
No answer	= 5

Ownership

PLC = 32

Part of group = 4

Number of Sites

1-10	= 6
11-50	= 13
51-100	= 3
101-150	= 3
151-200	= 2
201-250	= 0
251-500	= 5
501-1000	= 1
1001 +	= 2

Range = 1 - 3000

Sector

Manufacturing	17
Oil, gas, chemicals	7
Retail and distribution	4
Service	4
Transport and telecommunications	3
Holding company, head office	3
Construction	2
Trading	1

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