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AN OVERVIEW OF CIVIL SERVICE COMPUTERISATION, 1960-1990

Robert Pye

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AN OVERVIEW OF

CIVIL SERVICE COMPUTERISATION,

1960-1990

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Robert Pye is an Assistant Principal with the Department of Finance. In 1986-87 he was the holder of the T. K. Whitaker Research Fellowship at The Economic and Social Research Institute. The ESRI has accepted the paper for publication.

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Notes to Reader

The bulk of this report was prepared while the author was on secondment to the Institute from the Department of Finance as holder of the T K Whitaker Fellowship, 1986-1987. Further research was conducted independently by the author since 1987 and this report represents a synthesis of his findings to June, 1990. The report expresses the views and opinions of the author alone and should not be construed otherwise. Omissions, inaccuracies and other defects, where they occur, are the sole responsibility of the author.

The study was confined to the civil service as it is currently constituted, that is without the former Department of Posts and Telegraphs. However, for the sake of clarity, particularly in the early years, some references to that Department have been included. To complete the picture, a broad summary of developments in Posts and Telegraphs may be found in the Appendices.

Several of the Appendices mentioned in the report are available only in photostat form upon application to the Institute. These have been so indicated in the table of contents.

The terms "data processing" (DP) and "information technology" (IT) appear frequently in the report. The former term is intended to denote the type of computing normally associated with larger-scale processing in a mainframe environment, while the latter is generally understood to denote the conjunction of data processing, telecommunications, and office systems. They are not mutually exclusive and should not be interpreted too rigidly in the text. The term "office automation", which had a vogue in the early 1980s, has generally been superseded by the term Office Information Systems (OIS). However, it has been considered more appropriate to use the former term in certain contexts.

Government Departments and Offices are generally referred to in the text by their shortest appellation, e.g. Revenue for the Office of the Revenue Commissioners, CSO for the Central Statistics Office, and so forth. The organisation being discussed is generally fairly evident from the context in which the reference occurs. The term "department" is generally intended to imply both Departments and Offices.

Certain other abbreviated or acronymic titles appear throughout the report, the main ones being: CDPS (Central Data Processing Services, Department of Finance); CCS (Central Computing Service – the successor to CDPS); IMAS (Information Management Advisory Service, formed on the break-up of CDPS); CITS (Central IT Services – the amalgamation of CITS and IMAS in 1989); CSTC (Civil Service Training Centre). Grading abbreviations may be found in Appendix H.

It should be noted that the Department of Finance spawned the Department of the Public Service in 1973 and re-absorbed it again in 1987. During this period CDPS and its successors, CCS and IMAS, were part of the latter Department.

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** These appendices are available under separate cover in photostat form only upon request to the Institute. Their examination is not critical to an understanding of the main body of the report and they are being made available primarily by way of background information.

Manual filing systems can plausibly be described as a labour intensive way of losing information.

– J Sleigh *et al*
The Manpower Implications of Micro-electronic Technology

The only meaningful definition of a "generalist" is a specialist who can relate his own small area to the universe of knowledge.

– P F Drucker
The Effective Executive

Calculate precisely the time it will take to install the new technology and get it operating effectively, then multiply that time by ten to find out how long it will really take.

– D Buchanan and D Boddy
Organisations in the Computer Age: Technological Imperatives and Strategic Choice

A question generally not asked is what social and political inventions might have been made had the computer not come along when it did. The very posing of this question reveals that computers have been used as a conservative force in our society, that is, as instruments to make it possible to continue to do things as they have been done before, to keep the old institutions intact and, perhaps most importantly, to inhibit even the possibility of critical thinking which might lead to asking questions which go to the roots of real social problems.

– J Weizenbaum

GENERAL SUMMARY

The public service consumes and administers a very significant proportion of GNP. The civil service controls this activity and implements Government policy in relation to a very wide range of schemes and services. The effectiveness of Government policy and the health of the economy depend to a large extent on the efficiency of Government Departments and their capacity to respond flexibly and speedily to the changing demands of modern administration. Computerisation plays a major role in supporting the civil service in the achievement of these objectives. While computers have been in use in Government since 1963, their presence only became pervasive during the 1980s; the number of activities which have become dependent in one way or another on their support has grown significantly. This has resulted from the falling cost/power ratio of computer processors, improved software and usability, and a growing recognition by management that computers have a valuable role to play in addressing certain administrative problems. Their contribution is perceived to comprise, not just efficiency gains, in terms of the volume of transactions processed or cases handled, but effectiveness and value-added gains arising from the improved availability of relevant information, control data, statistical analysis, extended services, and so on.

Despite the increasing level of resources dedicated to the provision of computer services across Government Departments, particularly with the advent of the microcomputer revolution in the early 1980s, there has been a remarkable absence of public analysis and informed commentary on this area of Government administration. It undoubtedly deserves closer attention than it has received to date and a more systematic examination of certain issues. This study was undertaken with a view to addressing the area as a whole, identifying the key factors influencing the continued effective use of information technology (IT) within Government Departments and setting out the parameters for further research.

The study utilised a variety of methods to establish the basic picture and confirm certain findings: interviews with over three dozen key personnel regarding their experience of IT to date, whether in their own departments or in the public service generally, the nature and extent of problems encountered, the factors bearing on success, and so forth; a postal survey of over 400 specialist computer staff to enable an accurate

profile of existing expertise to be compiled, including future career intentions; a postal survey of some 60 managers in both the general service and IT areas to determine broad attitudes to computer technology at a management level and the degree of concordance between the two categories of manager; a survey of some 80 users across ten sites to assess their experiences with information technology; a review of the literature on computerisation in Irish Government Departments and in the public service in several other countries, including the UK, USA and Denmark; a review of a number of reports and other papers made available by Government Departments to facilitate the completion of this study; and a review of the literature on contemporary computerisation. The suitability of the line of questioning adopted at the interviews was determined by reference to the experiences in other countries, while each of the survey questionnaires were scrutinised in advance by IT managers and other researchers familiar with the area under review. In addition to the above research methods, the author has drawn extensively from his own experience in the area of IT strategic planning across the civil service.

The study took as its starting point the postulate that computerisation in Government Departments must have had mixed levels of success and that specific lessons could be drawn from the experiences to date. These lessons could be identified and their implications for future policy explored. There was a significant level of agreement amongst the civil service IT community as to the factors which influenced the evolution of computerisation in Government, the areas which had been most successful and why, the issues which were of greatest importance, and the principles underlying the effective use of IT into the 1990s. There was no significant alternative school of opinion.

Roughly two-thirds of the general service and IT managers surveyed considered that the rate of expansion of computerisation in the civil service over the period 1976-1986 was either very mixed or quite slow. In the opinion of IT managers, the factors which proved to be the greatest obstacles to this expansion were (a) weaknesses in management, co-ordination and central direction; (b) insufficient numbers of skilled computer staff; and (c) insufficient initiative at a Departmental level. In general, IT managers considered that the civil service fell short of realising its full potential in the field of computerisation but that the reasons for this were not technical but managerial. However, technological change has been so rapid that ground lost over that period was to a significant extent recouped in the second half of the 1980s with the arrival of microchip, competitively priced technology. Without an existing computer systems investment to maintain, many areas were able to develop new applications

using leading-edge technology and at a significantly lesser cost than would have been the case using the technology of the 1970s. In addition, the more self-contained and manageable nature of microchip technology, plus the availability of a significantly wider range of suitable software products, made it easier for departments to take greater responsibility for their own computer systems needs.

Thus the greatest change in civil service computing has been the shift in responsibility from a centralised philosophy of delivery and control to a localised philosophy of progressive devolution. Almost every factor of any significance in the evolution and effective use of computer systems in Government Departments has turned on this consideration. When computerisation got going in the 1960s and early 1970s, the policy of central development and delivery seemed an ideal solution, but it had the undesirable effect of marginalising the function and leaving local management, the ultimate consumers, with only limited control. In many instances, this exacerbated a tendency to shed even more responsibility and leave computerisation, including policy formulation, to the technical experts who were neither qualified nor mandated to perform this extended role. Isolated from mainstream management thinking, computerisation, and in particular the formulation of an effective and comprehensive strategy within each Department, was very slow to gather momentum. There were exceptions, such as Defence and Agriculture in the late 1960s, Social Welfare in the 1970s and 1980s, and, over the entire period under review, the Office of the Revenue Commissioners. There was also a significant degree of higher level strategic commitment in both the Meteorological Service and the Central Statistics Office. However, even where a corporate attitude to computing took a foothold, it was, prior to the advent of formalised IT strategic planning, primarily as a result of the commitment of individual managers who were convinced that IT was essential to the improved efficiency and effectiveness of the organisation. Taken collectively, top management could not be regarded as having significantly influenced the penetration of IT in Government Departments.

In addition to the commitment of key senior managers, the expansion of IT in the 1980s owed a lot to the resolve and enthusiasm of those middle managers in a number of departments who saw the potential of microchip technology and secured the resources to implement IT systems locally, under their own supervision and control. This development was matched and supported by a major review in the early 1980s of the organisational arrangements for IT in the public service. On foot of this review, the role of CDPS (Central Data Processing Service) was revised away from the direct provision of computing facilities to the support of departments

having partially or totally devolved responsibility for the provision of their own IT services. On top of this shift came a significant increase in IT expenditure, improved and less expensive technology, a review of organisational arrangements generally in the public service which included the introduction of a formalised IT strategic planning process across all departments, and a continuing contraction in public service staffing which forced managers to find ways of providing the same level of services with restricted manpower. This conjunction of positive factors led to a marked upswing in the use of IT from about 1985 on.

The 1980s witnessed a gradual move away from purely operational systems, performing large-scale routine functions, to the implementation of systems which, to a greater or lesser degree, were providing management with useful status and performance information. There has thus been an increasing recognition of information as a resource in its own right and the need to develop ways to maximise the return on that resource.

In short, Government computing has matured significantly during the period under review but much work still remains to be done before IT is universally regarded as an integral part of modern administration.

Chapter 1

INTRODUCTION

This report arose from a general scarcity of comprehensive published information about computerisation in Government Departments. Its main objective is to describe what has been happening over a span of some thirty years, from the early 1960s, when the first computers were introduced, to the late 1980s. This examination addresses computerisation under a variety of headings: staffing, systems, users, training, expertise, resources, expenditure, management, and organizational change. While every effort has been made to present an integrated picture, identifying the factors which have had a significant influence on the effective use of information technology by Government Departments, it has not been possible to explore every facet in detail or to pursue every line of enquiry to its full conclusion. The area was simply too broad for such an approach. The report is thus an exploratory review of computerisation in the civil service rather than an in-depth or critical analysis of any particular aspect.

Chapter 2 gives an historical overview of computerisation as it has evolved within Government Departments. Given the centralised nature of many elements in Irish public administration, it has been necessary to incorporate some discussion of the wider public service in this overview. Chapter 3 takes a look at the types of systems introduced during the three decades under review, the main infrastructural developments, and the expenditure incurred in promoting and sustaining this activity. The organisational and managerial implications of new technology are examined in Chapter 4, while the sensitive area of staffing and skills retention is examined in Chapter 5. Chapter 6 deals specifically with the user, while Chapter 7 addresses the wide range of issues associated with the training and development of staff in the use of IT. Finally, Chapter 8 examines the patterns which emerged over the review period, the lessons which have been learned, and the likely outlook for the 1990s.

Another objective of the report is to set the parameters for further research and to identify the issues most deserving of in-depth analysis. Independent research to date has been negligible, mainly on account of the breadth of the area under review and the lack of reliable indicators as to which lines of enquiry would prove most productive. Also, it is probably

fair to say that pressures on IT staff across departments and the pace of change in the IT industry as a whole has tended to concentrate attention more on immediate technical or operational concerns and less on wider organisational and related issues.

A fundamental thesis of this review is that computerisation is not specifically the application of technical solutions to administrative problems but an often lengthy activity commencing with the examination of a range of available options, at least one of which entails the use of information technology. Computerisation is a process which goes beyond the installation of a unit of hardware and embraces a range of inter-related issues, only some of which could be regarded as technical in any strict sense. The control and effective use of computerisation is a function of management rather than technical specialists. This report is thus an attempt to sketch out the many strands which together constitute computerisation in Government Departments.

Lastly, it should be mentioned that the report does not, and could not, address an important related issue, namely, whether the computer systems installed to date in Government Departments have been a good investment. This is a highly complex question to which a reliable global answer could hardly be attempted without an extensive analysis of individual systems. However, while the cost effectiveness of particular systems is certainly amenable to some form of analysis (though not always to the satisfaction of everyone concerned), the evaluation of individual systems lay beyond the terms of reference of this report.

Wrapped up in the question of effectiveness is the wider question of whether progressive computerisation as such is a desirable ideal. This is a very broad issue and one which deserves greater attention than it has received to date. It should not be assumed that this report tacitly endorses the view that computerisation is automatically an advance, whether at a corporate level or for society in general. The terms of reference confine our attention to the specific question of *how* computerisation has developed in the civil service and whether there are any lessons to be learned from the experiences to date.

In short, then, the report is an attempt to demystify a complex area of public administration and to establish a framework for further research.

Chapter 2

THE EVOLUTION OF COMPUTERISATION IN THE PUBLIC SERVICE

This chapter takes a look at the general framework within which computerisation developed in the three decades to 1990. It dwells mainly on critical turning points which are then examined in greater depth in subsequent chapters.

1960 – 1969

The first computer-related equipment in the country was installed by the Sugar Company in its premises in Thurles in 1958. By 1964, 8 organisations had followed suit. By 1969, 53 organisations had computers, mostly large mainframes for batch processing. Eighteen of the top 50 companies had their own computer by end-1969, while another 8 were using a computer bureau. There were about 50 or so organisations in total making use of a bureau. Around 1969, total national employment on computer work was around 2,250, compared to 6,130 in Denmark, which had 196 computers, or 2,700 in Norway which had 86 computers.

Computerisation in the civil service took its first official step with the establishment in March, 1962, of an interdepartmental ADP (automatic data processing) committee. The committee drew its representatives from those parts of the civil service most likely to find scope for use of this kind of technology, 11 in all. The officers concerned were primarily from the Organisation and Methods (O & M) section of their respective departments. "The function of the committee is to ensure as far as possible the maximum degree of co-ordination between Government Departments in the utilisation of punch cards and automatic data processing equipment and, in general, the optimum degree of user of such equipment." The establishment of the committee was slightly preceded by the formation of a part-time ADP steering committee in Revenue where examination of computerisation as a strategic option is understood to have begun as early as 1958.

Up to this time the mechanisation of data processing consisted of the use of tabulators and devices to punch, sort and collate data – see Table 2.1. The committee, under the chairmanship of the Director of the Central Statistics Office, identified some 35 areas in around 12 Departments and

Offices where computerised data processing systems could make a significant contribution to efficiency. Some of the other issues considered by the committee included whether to set up a central pay unit for the civil service, a central pool of card punchers, computer appreciation courses involving such organisations as the IPA and the IMI, and the engaging of consultants to examine the potential for computer applications in various departments. It considered that both Post & Telegraphs and Revenue could find sufficient work to justify a computer each, with other departments being catered for through the sharing of an installation or utilising the remaining resources on the other two mainframes.

Table 2.1: *Main Areas of the Civil Service Using Tabulators, 1962*

Department	*Year of Introduction*	*Punch Staff*
CSO	1951	10
Revenue	1953	17
Meteorological Office	1961	5
Social Welfare	1950	16
Lands	1938	n/a
Posts & Telegraphs	1960	30

While internal expertise was almost non-existent, the use of consultants on a wide scale was considered inadvisable for several reasons by the committee: the high expenditure involved; consultants would likely make a wide variety of uncritical recommendations without regard to the special conditions obtaining in each department; the lack of expertise to supervise consultants; the risk that departments would be left without the skills to maintain a critical system; considerations of security and confidentiality; and, lastly, but most significantly, concern that the rate of change in the industry was too fast. These reasons and the thinking behind them were to profoundly influence the growth of computerisation in the civil service for the next two decades. Another committee, led by the IPA, was set up in 1963 to achieve some co-ordination of efforts to exploit ADP among the smaller semi-state bodies. While the committee had a long life, the sharing of facilities which it had envisaged was not pursued.

The trend towards self-reliance was fairly typical at that time. The British civil service preferred to train up their own staff instead of using consultants and had a policy of purchasing a computer where they expected to hold onto it for more than four years. The American Government service, which until the early 1960s hired all their computers, switched to a purchase policy for the same reason. This trend was dictated by the long lead time in developing a fully operational system. With a large centralised mainframe installation, hundreds of man-years were typically needed to adapt systems, prepare programs and codify records.

ADP Unit in Department of Finance

The ADP committee decided that the computing needs of the civil service could only be met through the creation of a central unit. An Assistant Principal and two HEO posts were approved for this purpose within the Department of Finance, the latter being filled by interdepartmental competition in late 1964. There were strong doubts in some quarters about the solution adopted. The capital intensive nature of computerisation at that time was considered to be in conflict with the cost-containing role of that Department. This could lead to unnecessary delays and, possibly, the indefinite postponement of worthwhile projects. On the other hand, that Department was well situated to discern and pursue possible cost-saving uses of computer technology. To aggravate matters, the initial staffing complement of the unit was considered to be inadequate.

Having established a permanent focus for the delivery of data processing (DP) services, the interdepartmental committee dissolved itself. With hindsight, it can be seen that this was a mistake. By surrendering its service-wide perspective, the committee was allowing a central viewpoint alone to determine what was best for the civil service as a whole. With the possible (and temporary) exception of the Review Body in the period 1980-1982, an interdepartmental forum was not restored until the Civil Service IT Group was created in June, 1988, some 25 years later.

Most of the small number of departments which tried to establish part-time ADP committees had their time eaten up by more pressing business. With some exceptions, the notable case being Revenue, top management at that time did not appreciate the importance of ADP. They were inclined to regard new technology as being both organisationally and operationally peripheral to the real needs of public administration. This attitude, which is discussed at greater length elsewhere in this report, was to remain largely intact until the 1980s. Additional considerations – special air-conditioned, dust free accommodation for equipment and specially trained personnel – only reinforced the view in most departments that the expense and risks

involved were not worth the somewhat vague efficiency gains which the computer was supposed to guarantee. The prospects of losing the few skilled staff who could operate the new technology was a further deterrent. Even in those early years, Revenue, who championed the new technology with the introduction of an ICT 1301 in 1963, lost half their cadre of 6 programmers within a couple of years.

Uptake of ADP in the remainder of the 1960s was somewhat sluggish. Education moved part of the way with the introduction of a tabulator with core storage in July, 1964, to handle teachers' salaries. This work was transferred to the Revenue computer in late 1968. The Land Commission installed an IBM 360/20 with a processor having 16K of memory in 1967 to handle the collection of Land Purchase Annuity receipts, etc. In addition they took on a few small jobs for three other departments. This was a positive development, though the Devlin Report (1969) remarked that "in the context of total government work, this computer [was] not a good acquisition when compared to the potentially efficient processing of the work on a more advanced machine shared with other users."

Early Computer Sites

In October of the same year, Defence installed another IBM 360/20 with a smaller processor (8K of memory) to handle Army pay. It is important to note that these three installations (Revenue, Lands, Defence) did *not* develop from central (Department of Finance) initiatives, but only as a direct result of the enterprise and support of individual local managers. Indeed, the subsequent slowing of computerisation in both Defence and Lands (Agriculture) was due almost entirely to the retirement or re-assignment of the two managers concerned and the resulting absence of any sustained commitment to computerisation at top management level.

Of the four sites (if Education is included) only the Revenue one could be considered large scale – see Table 2:2 for staffing details. Once Revenue made the decision to adopt new technology, they pursued its use to the fullest extent. By 1965, the collection and assessing of income tax for the entire country was handled by ADP. The changeover from local to centralised tax collection, which was occurring at that time, added greatly to their difficulties in adapting ADP. A major reassessment of their hardware strategy led to a switch to Honeywell in 1967, when two H-1200 processors were installed (115K total memory).

There was some concern in Revenue that the switch to magnetic tape, which would change auditing procedures, would be delayed by the Comptroller and Auditor General. This was the first indication in the service that the new technology might require a fundamental revision of

long-standing practices in such areas as accounting, security and confidentiality.

Table 2.2: *Staffing of Computer Sites, April 1968*

Revenue:	1 AP, 3 HEO, 6 EO, 3 SO, 94 clerical (including 5 programmers). [There were also 17 staff on tabulator work in the Accountant-General's Office.]
Lands:	2 HEO, 2 EO, 2 SO, 25 clerical (including 3 programmers). [Some of these staff had O&M duties.]
Defence:	1 HEO, 2 EO, 14 clerical (including 1 programmer).
(Education:	1 HEO, 1 EO, 1 SO, 7 clerical.)

Upon the introduction of the new computers, Revenue made the far-sighted decision of adopting a high-level language (COBOL) for all its programming requirements. The increase in memory, from 32K to 115K, assisted this important innovation. On the whole, Revenue were seeking a well tried and relatively simple system which could be easily programmed and enhanced. It was for this reason that they avoided moving to random access storage at that time.

The only other significant development over this period was the temporary rental by the CSO of an IBM 360/20 (8K) for the 1966 Census of Population. This operated from November, 1966, to March, 1968. Given the experience acquired in using it, the surrender of this machine can now be seen as lacking foresight. The rental cost (£11,500 p.a.) was relatively low in comparison with the benefits that could have accrued to the CSO over time.

When compared with their counterparts in N Ireland, progress in the service was rather slow. By 1968, the former had 52 programmers and analysts – over twice the number in Dublin – working on two ICL 1905 machines. Total machine hours over two shifts, about 5400, was more than twice the estimate for Dublin.

1969 – 1985

Efforts by the ADP Unit in Finance during the late 1960s to promote the more widespread use of computers met with very limited success. Only a handful of departments made use of the available computer power in

Revenue/Lands/Defence. The applications concerned were fairly modest and could not be considered serious attempts by the departments concerned to come to grips with ADP. Two of the areas with the greatest scope for the use of computers – Social Welfare and P&T – had still to get off the ground, though the latter had expanded its O&M section to carry out some feasibility studies with a view to full computerisation. The reluctance of Social Welfare stemmed less from any concern about the technical demands posed by ADP than from the departmental upheaval which would necessarily be involved in the installation of a total system. This tendency to plan for ADP on an "all or nothing" basis, usually on the grounds of cost effectiveness, was an important characteristic of management thinking in the early years of ADP. An attitude of conservatism prevailed, especially where the existing mechanical systems gave a satisfactory level of performance, as in P&T.

In addition to these areas, there was considerable scope for introducing computerisation in areas such as Health, Education and the CSO. Around 400,000 chemists' bills had to be calculated and paid each month and general prescriptions controlled to ensure that individual doctors were not extravagant in the issue of expensive drugs. A burgeoning young population would require support systems in the Department of Education, while the CSO would soon be burdened with the 1971 Census of Population. However, the scope for introducing new systems was curtailed, not just by a lack of management awareness of the contribution that could be made by the new technology, but by a more mundane consideration, namely, the limited capacity of the then installed hardware. Two sizeable jobs then in the pipeline – OPW drainage schemes and Garda Siochana pay – had to be deferred on the grounds that the three sites, Revenue, Lands and Defence, were consuming far more machine time on local requirements than was originally expected.

Centralised Solution

Following the Foster Report in 1969 (which is examined in more detail elsewhere in this report) the ADP Unit in Finance eventually blossomed into the Central Data Processing Services (CDPS) in Kilmainham which was officially opened by the Minister for Finance on 18 June, 1973. Before this the Unit had been using the IBM bureau service and, to a lesser extent, the machine time available on other civil service processors, mainly the Revenue night shift, for its processing and systems development work. About 20 public service organisations were using the centre's IBM 370/145, a fairly powerful mainframe equipped with 256K of memory, six disk drives totalling 180 MBs and a capital value of around IR£0.5m. The

ADP Unit had been building up its staff complement for a few years in anticipation of this major development, from 9 at mid-1968 to about 30 at mid-1971 and 75 at mid-1973.

The greatly increased processing power made possible the introduction of the "choice of doctor" scheme inaugurated in 1972, which involved processing about a million items a month. Information from the various user sites was transmitted over dedicated telephone lines to the centre in Kilmainham. Users did their own data preparation, usually onto punched cards, and handled transmission using a remote job entry terminal (RJE) and modem. User processing was in batch mode. The centre had a policy of requiring users, wherever possible, to do all printing, particularly onto special stationery (eg cheques), at their home site.

An important chunk of CDPS commitment was to the Health Boards, which had been established under the Health Act, 1970, and various health agencies – Southern Health Board, Western Health Board, Mid-Western Health Board, St Vincent's Hospital Group, Federated Dublin Voluntary Hospitals Group and the Mater Hospital Group. CDPS also arranged to provide in-house processing services for the General Medical Services (Payments) Board, the Medico-Social Research Board and, in respect of their medical card registration system, the Eastern Health Board. When the latter was established in 1971, it inherited data processing facilities from the Dublin Health Authority and embarked on its own in-house development. The South Eastern Health Board followed its example by acquiring a mainframe. These were the only health boards not to use either CDPS or an outside bureau for their computing needs. Co-ordination of activities between the health boards and CDPS was assisted by a specially established user group, the Health Computer Management Committee.

The high percentage of CDPS resources devoted to the DP needs of organisations outside the civil service should be noted. The main reason for setting up the centre was to meet the computing needs of Government Departments yet the latter had to join the queue. The health sector also had a loud voice when advancing its interests; there was no civil service equivalent of the Health Computer Management Committee.

The establishment of the new centre did not prohibit departments from initiating independent ventures if their overall requirements indicated that local processing was desirable. The Department of Social Welfare had been the subject of a detailed feasibility study as early as 1966 which indicated that computerisation would be practicable and economic. However, in view of the impending change from flat-rate to pay-related benefits, the Government decided to postpone authorisation. With the

increasing volume of work and the growing recognition that computerisation would eventually come to constitute an integral part of the Department's operations, as had already happened in Revenue, Social Welfare elected in the early 1970s to computerise the Disability Benefit Scheme.

At that time Social Welfare had 1.8m individual records (0.8m insured persons) and a weekly intake of some 10,000 new benefit claims of all types. It fell to CDPS to develop and instal the system which, according to some observers, was exceptionally well written, thereby helping to contribute to the high regard in that Department for computerised systems generally. In May, 1973, a contract was signed with Honeywell for the rental of two medium sized computers to handle the weekly Disability Benefit (DB) intake of almost 60,000 medical certificates and the issue of an equivalent number of cheques to claimants. Along with the two Honeywell 316s, Social Welfare could rely on additional processing power from Kilmainham over a direct line. The capital value of the equipment, including 24 VDUs, was IR£250,000.

Some comparison between CDPS and the private sector bureau industry may be useful at this point. The latter began in 1966 with the setting up of the first privately owned non-vendor bureau, Irish Computer Bureau Services Ltd, which was acquired in 1972 by Cara Data Processing, a wholly owned subsidiary of Aer Lingus. There were about 15 bureaux in Ireland in 1975 serving some 250 client companies. Turnover was estimated at around £2m, as against IR£35m in Denmark. Cara, the biggest, with 50 per cent of the bureau market, employed over 100 staff and had equipment valued at over IR£3m.

Developments in the Early 1970s

In addition to the centre at Kilmainham, the Department of Posts and Telegraphs set up a separate installation in Dundrum in 1973 to meet its own data processing needs. (By and large, developments in that area did not impinge strategically on other Government Departments. Given the remit of this report, P&T will not be examined more closely but see Appendix K for additional historical information.) With such an encouragingly high level of computer activity in the civil service in the early 1970s, the future looked fairly promising. CDPS had finally been established. Revenue had successfully overcome a number of technical and related difficulties in the late 1960s and early 1970s and was in command of the new technology. Social Welfare had successfully installed a major system, while three other departments, Lands, Defence and the CSO, had gained valuable computing experience. There were strong indications that

a few other departments would take the plunge. Thus, an observer in 1975 would have been fully justified in believing that the ground lost through the initial delays in computerising the civil service was fast being recovered. As events transpired, however, progress in the latter half of the 1970's was somewhat disappointing. There were four main reasons for this: (a) high staff turnover, (b) the growing maintenance overhead, (c) continuing low awareness amongst managers of the potential uses of new technology, and (d) a shift in the industry from centralised services to a greater use of distributed processing. Each of these factors is explored in greater depth elsewhere in this report.

These four factors did not impinge as hard on Revenue as they did on other departments, including CDPS. Revenue had already geared their operations to cope with a high ongoing maintenance overhead. Since the provision of the service and the areas served were ultimately under the one management, there was a greater degree of top-level support for computerisation. Furthermore, the centralised nature of the schemes being automated was conducive to the optimum use of a mainframe solution. The one really big headache for Revenue was the loss of skilled staff.

The effects of high staff turnover and the growing maintenance overhead in CDPS and, by implication, in the wide area of the public service which it served, were broadly as follows:

(a) A number of projects which had been planned had to be rescheduled. In some instances this amounted to an indefinite postponement since there simply was not sufficient expertise in-house to meet the growing volume of user requirements.

(b) Replacements for the vacancies created, which could be filled immediately, were slow in arriving. The recruitment process generally was a time-consuming one, and when a suitable candidate was eventually selected, s/he was usually inexperienced, unskilled and unfamiliar with the procedures and concerns of a DP environment.

(c) The staff "remaining" had their corporate confidence shaken. It was evident that any project, regardless of how well one worked on its completion, could be seriously delayed, if not postponed indefinitely, by the sudden departure of key staff. Staff departures led to greater frustration amongst those who remained.

(d) In addition to (c), staff remaining suffered a loss of on-the-job training and the benefit of the more developed expert advice of their departed colleagues.

(e) The basic assumption that informed all forward planning up to that time, namely, that CDPS could expand, both in local expertise and computing power, to meet the overall needs of the public service for the foreseeable future, was brought seriously into question.

However, a balanced picture of developments over the period 1976-1979 cannot be had without due regard to the volume of work actually carried out at the centre. A number of former CDPS employees interviewed in the course of this research remarked favourably on the amount actually accomplished despite the high level of staff turnover. Appendices A and B give details of the total work processed regularly at CDPS during 1979 (for systems developed by or with the help of CDPS), the agencies using the centre's facilities, and the new projects undertaken in one year alone (1979). Given that 44 per cent of the staff were trainees, the centre was clearly pushed to the limit of its resources to maintain that level of service and productivity. In some instances, the single entry in Appendix B belies the great expenditure in time and manpower required to develop the system, e.g., the PRSI system in Social Welfare. These appendices are also illustrative of the kind of work being computerised in the public service generally over this period.

The need for a general re-evaluation of the organisation and delivery of DP services was acknowledged in most quarters by about 1976-77. This was prompted not only by the complaints of frustrated users but by the changing nature of the technology. The primacy of remote batch processing on a mainframe was being seriously challenged by the arrival of transaction processing on mini-computers. The difference was not simply one of degree. The arrival of the mini (which had been in existence since the early 1970s but was only attracting general attention in the mid-decade) ushered in a radically different and fundamentally sound alternative to traditional data processing. CDPS had been built up along traditional lines, emulating the large DP sites of the 1960s. The new technology raised some important strategic questions. The mini-computer worked hand-in-glove with the concept of distributed processing, the dispersal of processing power around a number of sites instead of having it concentrated in one all-powerful location. Furthermore, information technology (IT) in the true sense was starting to emerge with the convergence of data processing (DP), telecommunications and microchip technology.

High-Level Review

The factors outlined above led eventually, at the behest of the then Minister for the Public Service, to the setting up of the Review Body on

Computerisation in the Government Services (February, 1980). The Review Body's activities, which were intended to embrace all aspects of computerisation in the public service, are examined in greater detail elsewhere in this report. The inaugural meeting was held on 26 February, 1980; in all it met on 22 occasions and submitted its report in June, 1982. Almost two years elapsed before the Government gave its approval to the Review Body's recommendations. This extraordinary delay is hard to understand but it is not without precedent: almost four years elapsed between the Foster Report (1969) and the opening of CDPS in Kilmainham (1973). The main consequence of the Review Body's report was the division of CDPS into two separate organisations and the devolution of total responsibility for their computing needs to the larger Government Departments. A new advisory body, IMAS (Information Management Advisory Service), which came into existence in February, 1985, was drawn from CDPS, with the task of co-ordinating IT developments across the service and undertaking infrastructural initiatives. Its remit did not extend into the wider public service. The rump of CDPS became the Central Computing Service (CCS) whose task it was to meet the general processing and systems development needs of those departments without dedicated IT support. A small new unit was established within the Department of the Public Service to monitor and authorise all IT-related expenditure, including expenditure by departments with devolved responsibility.

These changes resulted in the distribution of about 50 CDPS staff to some of the departments with devolved responsibility – Social Welfare, Justice and Health. Given that it had always operated on a fairly autonomous basis, Revenue was almost wholly unaffected by the Review Body recommendations or the subsequent organisational changes.

1985 to 1990

The period from 1985 on saw a steady increase in staffing and investment in IT compared with earlier years. Within a few years every department had computer systems of some kind. The following chapters give a more detailed examination of this, and the factors affecting the optimum use of IT in the civil service today. CCS and IMAS were reintegrated in 1989 to improve the co-ordination of strategic policy and the delivery of IT support to departments. The final chapter includes an analysis of the cycles of change within the service in the three decades to 1990.

Summary

In summary, computerisation in Government Departments developed rather unevenly, with cycles of highs and lows which are analysed in greater depth in the following chapters. Apart from a high rate of staff turnover, or, more specifically, the loss of key, experienced staff, the main factor influencing the growth of computerisation in the public service was the relatively low degree of involvement by general managers, notably at the higher levels, and a marked tendency to let the technical experts determine strategic direction.

Chapter 3

SYSTEMS, INFRASTRUCTURE AND EXPENDITURE

This chapter examines the types of computer products purchased and developed within the civil service, the general strategies adopted, and their associated costs. It is mainly concerned with the aggregate picture and the trends which have emerged, notably in the 1980s.

Systems

Workstation-based networks are now the norm for those departments/offices whose main business is policy formulation and regulation rather than the end delivery of mass services. These organisations are mainly small to medium in size. Of the departments which have carried out IT Plans by end-1990, the majority have been of this type. The general IT requirements identified for these organisations relate mainly to facilities like word processing, personal information software, electronic mail, desk-top publishing, decision support systems, text storage and retrieval systems, data management systems, as well as databases whose primary purpose is the organised provision of information. (These requirements, which are largely in the category of Office Information Systems (OIS), are broadly listed in sequence of implementation difficulty.)

The technical architectures drawn up to meet these needs have, in almost all cases, been based on workstations networked to servers, one of the primary reasons being the very significant cost reductions in comparison with competing architectures, the others being flexibility and access to a wide range of software. This type of organisation typically starts off with no dedicated IT staff with the result that, while staff are being trained and gaining experience, the applications tend to be those which need the minimum of skill and knowledge, e.g., word processing (see sequence in last paragraph). It is unlikely, however, that this type of organisation would ever have a long-term need for the most skilled type of IT staff (e.g., database specialists) and probably could not, in any case, hold onto them. For these reasons they are probably the main markets for the services of the departmental support units within CITS.

The other main type of organisation within the civil service is the one whose main business is the delivery of mass services to end users. This

organisation's main need is generally for transaction processing against very large files for which the most common current delivery method is that based on host computers using dumb terminals. Specialised high-performance systems are usually a requirement and these have been built, in the main, by in-house DP staff. Apart from common systems requirements across departments, this organisation has generally got long-term, continuing DP needs, with the most economical delivery mechanism being dedicated in-house development staff.

Applications and User Groups

The majority of computer applications in the civil service are in the financial area: collection, payment, accounting, estimation, reporting, analysis. In terms of sophistication and functionality the vast majority of these perform fairly straightforward operations. Most mainframe applications are quite large and represent, in the cases of Revenue and Social Welfare, a very substantial proportion of the relevant Department's total operations, both computer and non-computer. The Department of Agriculture is also significantly dependent upon DP support. The large payroll centres in Education, Defence and Justice would be unable to function without their computer-based systems. Not surprisingly, payroll is the single most computerised function in the civil service, with most such systems being introduced during the mid- to late 1970s.

As noted, applications in the civil service have evolved along two fronts. The older DP variety, which is driven primarily by mainframes and minicomputers, is very much service-oriented, with the accent on volume and speed. The newer OIS-type systems, based in the main on PC-LANs, centre around the management of relatively small work areas and provide a range of office support functions directed mainly at individual users. The accent here is on flexibility and versatility. Another, rather rough, distinction between the two categories might place the accent on quantity in the former and on quality in the latter.

The main force behind the introduction of DP systems was at the corporate level, with the recognition by senior management of the need to provide the more economic delivery of a bulk service. Such recognition was in many instances sparked by the initiative and backing of one or two key individuals. Being an expensive corporate resource, DP systems have tended, after initial approval to proceed, to be managed by teams of technical specialists working in isolation from the rest of the organisation. OIS-type systems, on the other hand, sprang in the main from middle-management attempts to keep local control of daily activities such as maintaining a register, compiling statistics, handling accounts, financial

analysis, monitoring expenditure, issuing licences, and so forth. In many instances technical support was not available locally and had to be supplied, at least initially, by CITS. Local staff gradually gained proficiency in managing the system. These developments broadly coincided with a directive from the Department of the Public Service (now Department of Finance) in 1986 that all Government Departments prepare strategic IT plans embracing the organisation as a whole. As a result, most departments responded by creating a dedicated IT unit where they did not already possess one. Thus, the IT manager is distinctively the product of IT itself, the synthesis of traditional computing, telecommunications and microcomputer technology, while the DP manager is more closely identified with the older style, mainframe environment. There is also another key difference between the two groups. Data and transaction processing have been primarily concerned with the mass management of numeric data, usually in the form of discrete, long-lived records. IT, on the other hand, has been receiving its strongest impetus in the civil service from areas requiring support with the creation, storage and retrieval of textual information. The former organisations are concerned mainly with service delivery, while the latter are mostly concerned with activity monitoring, resource control and policy formulation.

The respective user groups are also distinct. The DP strain catered mainly for accounts branches, taxation, social welfare and some large national schemes (beef intervention, vehicle licensing, GMS payments, etc). The OIS, microcomputer, strain drew its main support from general service middle-managers in sections with repetitive record-handling tasks. These are usually sections with no previous involvement in computing. While the use of DP systems is generally compulsory for the staff concerned, especially at the clerical and executive levels, the use of OIS has generally been voluntary. Appendix C, which gives a summary of the computer systems to be found across all departments and offices, contains a range of examples of this kind of work. A few departments have been fairly systematic in their attempts to take advantage of integrated computer systems. Appendices D and E show the departments which, at mid-1988, had installed a local area network (LAN), and the number of VDUs in each.

The distinction between the OIS and DP strains is becoming less real as computer managers continue to look for opportunities to knit the two approaches together. Integration is a long-term ideal in some areas, though its importance to the overall success of computerisation within the service should not be over-estimated. Some centres, such as the CSO and the Meteorological Service, have, on account of the comparatively narrow range of their activities, a user base with needs common to both the DP and

the OIS strains. On the other hand, the Department of Agriculture is a good example of an organisation which, as a result of having proceeded into the 1990s without a strategic IT plan, has evolved into two broad user communities.

Penetration of IT

On the whole, the level of introduction of computer facilities across the civil service has been quite high. This is mainly due to a spate of developments over the period 1983 – 1988, following the advent of micro-technology and the great hardware expansion in Social Welfare and Revenue. The total number of communication terminals in 1980 was roughly in the region of 350. Over the succeeding eight years, the average annual increase in VDUs was some 36 per cent – a very high rate of expansion.

Most applications serve either the immediate needs of the section responsible for the system or provide a public-oriented service. Very few applications have been developed to meet the information management needs of an internal section or to provide a decision-support or policy regulation service to senior management. The general emphasis has been on the more efficient performance of a discrete task rather than the more effective use of information *per se*. The degree of integration, whether between systems or between functional areas, has not therefore been significant to date. The guidelines for Departmental IT Plans place a lot of emphasis on information management and systems integration, and CITS – Central IT Services, the central advisory and support unit for IT in the civil service – has been promoting this ideal for several years. Since the Control Section of the Department of Finance examines expenditure proposals in the context of completed IT Plans, one would expect the goal of integration to be kept in view by departments, if only to secure approval for future strategic expenditure (though the advent of devolved administrative budgeting in 1991 has passed even more responsibility to individual departments).

A tidy categorisation of existing applications is not feasible since they reflect the variety of civil service tasks generally and not merely the generic characteristics of the applied technology. The same database package, such as DBase III, can be put to a miscellany of uses in a number of areas, with task and throughput varying considerably between one area and another. Neither is it possible to make any more than a general comparison between the utility of a small office system and the contribution to organisational efficiency by, say, a large batch payment system. A number of criteria are needed to measure the nett benefits accruing from

computerisation, the appropriateness of the technical realisation of a particular system being but one.

The extent of basic computerisation across departments is borne out by the fact that there are few remaining areas where dedicated medium- to large-scale computer support is required for particular tasks. Examples of such potential developments include Customs and Excise, Army stores, and the pupils/schools databases in Education. Detailed plans existed at start-1990 to introduce systems in each of these areas, however. If payroll applications are excluded, then over 90 per cent of sizeable DP-amenable tasks across the civil service have already been computerised. This broad approximation excludes systems of service-wide application, notably personnel/manpower information systems and general ledger/accounting systems, where significant progress has also been made.

Stand-alone workstations have, with one or two exceptions, failed to gain a foothold. Departments such as Energy or Industry and Commerce have pursued a strategy of complete integration almost from the start. CITS have been successful in dissuading users from introducing isolated PCs, while most departments have made a point of introducing only compatible hardware, evidently with a view to greater integration in the longer term.

The main hardware suppliers in the mainframe and minicomputer areas are IBM (CITS and Agriculture), Honeywell/Bull (Revenue), Wang (Justice), Digital (Social Welfare, Meteorological Service, CSO, Environment, Labour, Health, Defence, Ordnance Survey), Nixdorf (Agriculture – local offices) and Hewlett Packard (Education, Defence). At the level of microcomputing, the main manufacturers are IBM, Olivetti, Zenith and Wang, though a long list of IBM clones have been installed across departments. NorthStar were very successful in the mid 1980s but have faded from view with the advent of systems offering greater networking capabilities. The big players are IBM and Honeywell/Bull at the mainframe end and Digital in the middle range. With the increasing emphasis on open systems and integration (on foot of EC Directive 87/95), it is difficult for the manufacturers of purely proprietary products to stay in the running. On the whole, the service is not biased towards Irish manufactured goods, generally opting for the least expensive products which meet the requirements specified. This, of course, is mandatory for all EC member states.

Justification and Infrastructure

The bulk of the investment in computerisation has been in the large DP areas – Revenue, Social Welfare, Agriculture, Justice and Central IT

Services (CITS). If the two main specialist computing areas, the CSO and the Meteorological Service, are included, the bias is even more pronounced. It is generally accepted that neither Social Welfare nor Revenue, which, in overall staffing terms, comprise one-third of the civil service, could continue to maintain the range and level of services currently being provided without their extensive IT infrastructures. Social Welfare contend that, while staffing in those areas of the Department supported by IT – principally HQ – has remained broadly static between June 1981 and December 1987 (despite an increase in the volume of work), staffing in the areas without IT support – principally local offices – has increased by some 40 per cent over the same period. In addition, Social Welfare would argue that IT has facilitated the introduction of greater sophistication into schemes and services than would otherwise have been possible using manual means.

Between mid-1981, when the staffing embargo was first introduced, and the beginning of 1988, staffing in Revenue had fallen by over 9 per cent, despite a significant increase in workload over the same period. IT is believed to have absorbed some of the strain of this loss. CITS provided data processing services on a more economical basis than many departments, including several public sector bodies, could have provided individually from within their own resources. This has had the advantage, *inter alia*, of reducing the number of staff required by Accounts Branches. Other examples include the Department of Agriculture which administers, with the use of IT, Cattle Headage and Animal Health schemes with significantly fewer staff – unofficial estimates are in the region of 100 – than would otherwise be required using manual methods. The widespread introduction of word processing facilities at middle management level has meant the virtual elimination of sizeable typing pools in most departments.

Technical areas, such as the Meteorological Service, CSO and Ordnance Survey, are providing improved services which it is reckoned, without the extensive penetration of new technology, would either have been impossible or appreciably more demanding on staff resources.

Several Departments and Offices have installed information networks to support their daily administrative activities. For example:

> The Department of Energy has an extensive network supporting the work of all sections. Local staff designed suitable software using proprietary packages (spreadsheet and database) to reduce the staff time needed to produce reports, calculations, models, etc. The network also provides word processing and text storage facilities.
>
> The Revenue Commissioners began the introduction on a phased basis of an extensive network in Dublin Castle around the end of 1987.

At mid-1988 it comprised some 60 PCs serving about 140 users. All senior managers in the areas affected (which included 14 at Assistant Secretary level) had personal workstations.

The Department of Industry and Commerce has an extensive network (being at one time the largest PC-LAN in the country). Due to the location of that department in several buildings, there is an important additional advantage in inter-site linking which takes place across the CITS-built Dublin X.25 Network (see below) and private fibre-optic links. This greatly facilitates the transmission of information between buildings.

The Department of the Taoiseach had over 50 PCs in 1989 on a department-wide network handling a high volume of documentation. The system provides word processing, text storage, file registration, free-text retrieval, electronic mail, spreadsheet and database facilities.

Cost Effectiveness

As noted earlier, an examination of the cost effectiveness of IT across departments lay outside the scope of this study. However, some comments regarding this complex area are warranted. A detailed analysis of the cost effectiveness of computer systems in the civil service – for example, in Social Welfare – would need to take account of many factors, not all of which are easy to quantify. In addition to benefits already achieved, it would need to take into account benefits which are only in the process of being realised. Much of the computer-related expenditure (staff costs, consumables) would have been incurred in any event. The Department states that computerisation has realised staff savings in many areas (See comments above). Account would also need to be taken of the increased complexity and control of existing systems arising from measures such as Equality provisions and increased emphasis on measures to reduce fraud. For example, the Personalised Payable Order system, which is totally dependent on computerised data, is understood to have saved the Exchequer millions of pounds annually by cutting down drastically on fraudulent encashments. The Department would also contend that some changes – many of which were considered essential for a variety of reasons, some political – could not have been brought into operation without computerised systems. The PRSI system is a very significant example. The analysis would also be rendered more complicated by the introduction of several new schemes since 1980 such as Family Income Supplement, Rent Subsidies, PRSI for the Self-Employed, Job Search, Lone Parents Scheme, Pre-Retirement Allowance, National Free Fuel Allowance, etc. In addition to increased productivity resulting in reductions in overtime, and

improved control and service levels, the analysis would need to take account of reduced errors and improved client satisfaction as evidenced, for example, by the fall off in the number of representations. The benefits to management of office automation would also have to be reckoned, including the significant level of support given to the decentralisation of entire scheme sections. Furthermore, any rigorous analysis of cost-benefit would need to take full account of the potentially significant role which computerisation can play in any overhaul or radical innovation within the social security system in the years ahead, as well as the introduction of innovative methods of payment, e.g., smart cards, or direct on-line enquiry facilities for clients. The facilitation of a National Identifier, as proposed by the Government, would also figure in the analysis. The Department's extensive programme of localisation, which involves the introduction of a full client service in local offices, with associated major organisational change, would be impracticable without its highly developed IT infrastructure and extensively automated client-based approach.

Civil Service Telecommunication Networks

Two private telecommunications networks are now in operation in the civil service:

- the Dublin Area X.25 Network; and
- the country-wide Government Telecommunications Network (GTN) (See Appendix F).

These significant infrastructural advances are expected to give rise in the medium to long term to staff savings, new services and a reduction in communication costs. The Dublin Area Network is designed to cater for the delivery of inter-departmental traffic and traffic to/from EC institutions. It is also being used by a number of departments for inter-networking of LANs in different buildings. The Departments of Finance, Energy, Foreign Affairs, Revenue, Social Welfare and Agriculture were already connected at start-1990, with most other Departments being connected in due course. Services will, in the main, be based on international standards for electronic mail and file transfer. An inter-departmental messaging system is already in place using the X.400 protocol.

The country-wide Government Telecommunications Network (GTN) established in 1989 meets the communications requirements of regional public offices and the several departments being re-located under the Government's current decentralisation programme. The GTN will cater for data traffic and a private civil service voice network.

The initial GTN configuration, which accommodated 17 regional

centres, was implemented on a phased basis. The first phase, implemented in 1989, connected Dublin with Ballina, Galway, and Sligo. The remaining centres were connected during 1990/91. The voice component of the GTN enables desk-to-desk dialling between offices without operator intervention. A "break-out" facility enables civil servants to access the public network for long-distance calls at local cost.

It is planned in due course to connect the country-wide GTN with the Dublin Area X.25 network, both of which are managed by CITS. A network of this kind is considered highly desirable by Revenue and Social Welfare, both of which have extensive networks of their own, since it will provide an improved data and voice communications service and a framework over which departmental networks can operate.

Connectivity and communications infrastructures are key considerations for the future and have been receiving a good deal of attention in CITS. This unit has initiated a research programme to assess the strategic implications of a generalised portable operating system. The potential of the UNIX-based POSIX system (for Portable Operating System Interface) has been receiving close scrutiny in this regard. The ultimate aim of the networking and common applications environment initiatives is to provide, within the civil service, an openness and interworking between computer systems based on the portability of applications and the ready interchange of non-confidential information – within the scope of the Data Protection Act.

In mid-1988, CITS issued a detailed set of OSI sub-profiles for procurement purposes. These were necessary in the context of an EC Council of Ministers Decision which came into effect on 7 February, 1988, requiring all public service procurements of hardware and software above a certain value threshold to make reference to international standards. These standards would provide for future inter-operability. Some derogations are possible but even these must include a transitional strategy towards use of the relevant standards.

The further development of the Dublin area network for interdepartmental services will require, *inter alia*, the introduction of standardised document format architectures and file transfer facilities adhering to international standards. This will require on-going monitoring of the OSI standards and the use of conformance tested products. Progress on this front is exemplified by the successful introduction of the X.400 electronic mail protocol on the Dublin X.25 network. The need to provide "gateways" to other networks, particularly those of EC institutions, will inevitably arise. Inter-networking will also require the development and promotion of standardised nomenclatures. An inter-departmental committee, chaired by CITS, was set up during 1989 to examine the

complex question of corporate information management and the common conventions and practices needed to ensure the greater interchange of relevant information between departments.

Expenditure

Trends in computer-related expenditure are an important measure of the real value ascribed by civil service management to the contribution made by IT to the administrative process. Table 3.1 shows that, in real terms, expenditure in the second half of the 1970s was fairly conservative. The job-creation boom in the public service over this period probably deflected expenditure away from computerisation. When account is taken of inflation, expenditure in 1980 was actually *lower* than in any of the previous four years.

The period from 1982 onward shows a dramatic increase. Expenditure during the six-year period 1982-1987 was a remarkable 74 per cent greater in real terms than during the preceding six years. Taking the seven-year period, 1983-1989 (seven years being accepted in many quarters as the standard life expectancy of the majority of computer systems), the total actual investment in IT by the public service was some IR£118m as against some IR£30m in the preceding seven year period. This was a very substantial increase and gives a good indication of the extent to which the civil service has become committed to and dependent upon information technology. If staff costs are included the total actual investment in IT in the period 1983-1989 was about £180m. For the 1980s as a whole, the total investment in IT (equipment and permanent staff) was about IR£213m, of which roughly IR£78m were staff costs. Figures on consultancy costs relating to IT over this period are not available but, if estimates are made based on those years for which reliable figures exist, the total cost of consultancy in the 1980s was roughly IR£9m. This gives a grand IT-related aggregate expenditure in the 1980s of some IR£222m (systems, staffing, consultancy).

If examined on a per capita basis, the contrast between the early and late 1980s is even more stark. IT investment was about IR£135 per employee in 1980 and IR£740 in 1989. In constant price terms, and bearing in mind that the total numbers serving in the civil service fell significantly over this period, this represents a very substantial increase of 180 per cent. Despite the size of this increase, it is doubtful if it is significantly out of line with the increased levels of investment made by many large outside organisations during the 1980s.

It is clear that IT is consuming an increasingly significant proportion of total administrative costs in many Departments. When DP was somewhat

peripheral to the organisation, top management tended to regard the cost as a technical necessity. However, now that the sums are so much larger and the returns less easily quantified, especially in the OIS-type departments, more questions will be asked regarding the effectiveness of IT and the continuing need to pour a significant percentage of the total administrative budget into IT each year. At what point, some may ask, can investment diminish and tangible returns on the initial capital outlay be demonstrated? The advent of devolved budgeting, where departments themselves can decide how precisely to spend their administrative budgets without the need of approval from the Department of Finance, will be an important factor in creating a climate where the real return from IT will be subjected to closer scrutiny, where post-implementation reviews will be undertaken more frequently, and where business criteria alone will determine the success or otherwise of a particular system.

The proportion of staff costs to total IT expenditure (equipment and staff) fell steadily during the 1980s, averaging 46 per cent in the period 1981-83 and only 33 per cent in the three years to 1990 – a drop of almost one-third. While a degree of estimation has been used in compiling these figures, they strongly support the belief held by some IT managers that expenditure on equipment is too high relative to staff costs and that more attention should be placed on developing and retaining a greater number of skilled and experienced IT staff. The real return on investment depends on how well the equipment is used and this is purely a staff or skill-related function. It would be undesirable if this trend were to continue into the 1990s: a more satisfactory balance must be struck between equipment and staff costs. However, where exactly this balance lies is not easy to determine. An important step in this direction has already been taken with the introduction in 1990 of a scheme providing for the payment of annual gratuities to certain skilled IT staff. The purpose of the scheme is to slow the rate of staff turnover and allow greater use to be made of high-level skills which have taken some time to mature.

Table 3.2 gives a breakdown of the main expenditure heads over the three-year period, 1984-1986, for a representative number of departments. These figures should be interpreted with some caution since rental and leasing arrangements can include the cost of maintenance (the table is based on estimated breakdowns supplied by the departments concerned). As is to be expected, processors and peripherals account for a substantial proportion of expenditure – about 70 per cent in the main DP centres and around 50 per cent in other areas. The cost ratio of processors to peripherals in the main DP centres over the seven-year period, 1980-1986, was about 50:50. The ratio for other Departments over the same period was

Table 3.1: *Computer Related Expenditure in the Public Service, 1976-1990 £'000*

		1976	*1977*	*1978*	*1979*	*1980*	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*	*1988*	*1989*	*1990*
A	All Departments (excluding staff and consultancy costs) (i)	2708	3160	3447	3975	4393	5600	6931	8886	11831	13928	16805	24520	22329	19653	23640
B	Main DP centres as % of A (ii)	86%	88%	81%	80%	87%	88%	88%	86%	86%	82%	70%	76%	71%	67%	65%
C	(A) at constant 1976 prices	2708	2782	2818	2870	2683	2840	3107	3483	4271	4768	5543	7839	6991	5911	6882
D	% change in (C) per annum	-	+2.7	+1.3	+1.8	-6.5	+5.9	+9.4	+12.1	+22.6	+11.6	+16.3	+41.4	-10.8	-15.4	+16.4
E	Estimated total IT staff costs (iii)	-	-	-	-	-	5000	6500	7000	7300	7700	8600	9800	10500	10700	11500
F	(A) + (E)	-	-	-	-	-	10600	13431	15886	19131	21628	25405	34320	32829	30353	35140
G	Staff costs as % of (F)	-	-	-	-	-	47%	48%	44%	38%	36%	34%	29%	32%	35%	33%

(i) Includes Army and Gardai

(ii) CCS/CITS, Revenue, Social Welfare, Agriculture, Justice Group

(iii) These figures, which include some estimated components, are based on the total staffing levels detailed in Chapter 5.

Notes: The figures in A above, which are based on the provisional outturns supplied in the published Estimates volumes and replies to a PQ dated 2/5/89, include a degree of estimation. It is understood that some Departments may have met a proportion of their IT expenditure in some years from non-IT subheads. While the extent of this is unknown, and was not reflected in the reply to the PQ of 2/5/89, it is not thought to be significant. "Public service" in this table comprises the Civil Service, Army and Gardai for equipment etc. purposes, and Civil Service staff only for staff cost purposes.

Table 3.2: *Expenditure Breakdown for the Main DP Centres and Some Other Departments Over the Three-Year Period, 1984-1986*

		1984-1986 (3 years)	
		Main DP Centres (i) %	*Sample Depts. (ii)* %
(a)	Expenditure on microcomputer, PC and desk top hardware and software	4.0	10.5
(b)	Expenditure on dedicated *standalone wordprocessing* equipment	0.6	9.9
(c)	Expenditure on mainframe and microcomputer processors and peripherals	69.6	48.2
(d)	Expenditure on hardware maintenance contracts (iii)	15.5	21.7
(e)	Expenditure on software maintenance contracts	3.1	0.7
(f)	Expenditure on computer-related consultancy to advise on the introduction/ expansion of a system	6.2	7.8
(g)	Expenditure on training courses provided by vendors and other outside organisations	1.0	1.2
		100.0	100.0

(i) CCS, Revenue, Social Welfare, Agriculture

(ii) Environment, Labour, Finance, Education, Civil Service Commission, Meteorological Service

(iii) These percentages were inflated to some degree by suppliers who reduced the capital cost of equipment by charging a higher maintenance rate.

Note: A degree of estimation has been used in the compilation of some of the above figures.

closer to 90:10. These figures reflect the fact that computing in the main centres is strongly oriented towards high volume output, with a resulting high requirement for peripheral support. The OIS-type centres, however, have only modest needs in this regard.

Hardware maintenance costs account for a sizeable proportion of total expenditure – roughly 15 per cent in the main DP centres and around 20 per cent in the other areas listed (though maintenance charges on the newer mainframes are reported to be significantly lower). Over the three-year period, 1984-1986, the civil service as a whole spent over IR£5m on hardware maintenance contracts, which represented about 12 per cent of expenditure on equipment. In view of the relatively low capital cost to the supplier of providing a hardware maintenance service and considering that processors and ancillary equipment should perform satisfactorily for a reasonable period under the terms of the purchase contract, it is debatable whether the cost of hardware maintenance need be this high.

However one looks at it, though, hardware maintenance is one of the inescapable costs of computerisation. Another inevitable cost is the technological treadmill, that is, the pressure on departments to upgrade their equipment every five to seven years. When one takes these two costs into account, one can see that the real costs of computerisation run well ahead of the initial capital outlay and the very significant cost of maintaining a cadre of skilled and experienced staff.

Summary

In conclusion, it can be seen that computerisation has affected all levels of the civil service and every department and office. While progress has tended to be along two fronts, large transaction processing centres and smaller office-type systems, this gap is narrowing and a trend towards greater integration, both in terms of hardware and applications, looks likely to continue. The types of systems installed vary from fairly straightforward packages to many of a very sophisticated nature. It is unlikely that any other similar organisation in the country is solving technical problems of greater complexity. The technology in use is of the most modern variety. An extensive IT infrastructure has evolved, mainly in the 1980s and looks likely to expand, though at a slower rate, in the 1990s. Expenditure has been significant in the mid- to late-1980s, with almost all departments/offices investing in new or improved systems. The statistics confirm that computerised systems have become a major component of Government administration.

Chapter 4

ORGANISATION AND MANAGEMENT

This chapter examines the broad organisational changes which came about as a result of information technology, both to facilitate its introduction and to ensure that it was used to best effect. The response of management, being a strong determinant of whether IT achieves its potential, is also examined.

As we have already seen, the rate of adoption of new technology in the 1960s was fairly slow. Only Revenue committed themselves to any extent. Defence and Lands introduced a small computer for some of their processing needs. In all of these cases, the introduction of computerisation was almost solely as a result of the initiative taken by one or more key managers. Without local champions, IT would not have taken a foothold in the service. Top management were almost completely unaware of its utility and potential. However, this was very probably the situation in most large organisations in this country around that time. Central direction was not conspicuous: the ADP unit in Finance was set up in 1964 but did not acquire a machine of its own until 1973.

To help stimulate interest at a political level and to provide further confirmation of its intended policies, the Minister for Finance contracted the newly appointed Professor of Statistics at TCD, Dr F.G.Foster, in June, 1968, to carry out a study with the following terms of reference: "To review the development of automatic data processing and computers in the civil service and to recommend such measures as are desirable and practicable towards ensuring that automation in this field (including the field of scientific applications) is utilised to the optimum extent and is developed in the most efficient and co-ordinated manner." A report was presented to the Minister in December, 1969.

Merits and Drawbacks of a Centralised Approach

Dr Foster's overall impressions of the growth of computerisation in the civil service during the 1960s were: "...unplanned and rather haphazard – retarded by a lack of knowledge of what computers can do...the critical problem is the shortage of personnel resources – both in numbers and expertise... considerable initial difficulties had been encountered in each

of the computer installations...certain Departments are reluctant to accept the disruption they might suffer from the introduction of a computer." The principal concern for the future was to determine whether a large centralised civil service (or public service) computing bureau should be established and, if so, how broadly it should be constituted. The merits, from a hardware standpoint, were seen to be:

(i) reduced capital equipment and facility investment;
(ii) a better balance between user needs and costs;
(iii) better utilisation of computer power;
(iv) reduced user maintenance and operating costs;
(v) more flexible system augmentation and modernisation.

As well as requiring fewer staff at all levels and less aggregate accommodation, a centralised system would offer users a more comprehensive range of software and access to common records stored on site.

The proposed merits of a centralised service seemed overwhelming but the drawbacks, though apparently of little moment at that time, were to assume a greater prominence over the succeeding years: (i) Departments would not have control over the resources being employed to do their own work and would be slow to commit systems to a centralised computer; (ii) the most economic use of equipment is not the only factor to be taken into account in determining the optimum use of computers in the service. It was recognised that systems developed should be directed towards fully integrated data handling, with comprehensive control information as an end-product; centralised ADP facilities would probably result in the transfer of compact or isolated applications to a computerised environment rather than the development of integrated management systems within departments. In addition, given the state of software technology at that time, there may have been a tendency to expect too much from a central site by way of management information, involving the extraction of key data across a number of systems.

These considerations notwithstanding, Finance opted for a centralised solution. They had intended to go down this road in any event; the Foster Report simply gave weight to their convictions. The Report recommended that a special civil service computing centre be established with responsibility for support services, technical services, education and training, O&M, bureau operations and policy. The possibility of using an installation in P&T was considered for civil service bureau work but was dropped on the grounds that, over time, the use made of the computer by P&T would greatly increase, thereby curtailing the service to other users. The experience in Revenue bore this out. Also, the P&T installation, in

doing both P&T work and civil service bureau work, would be both complex and unusually large in comparison with other ADP sites in the public service at that time: there was a strong possibility that the experience and expertise needed to manage such a system would not be available. In all probability, another factor influencing the creation of a separate installation for P&T was the state of staff relations in that Department: an industrial dispute, ostensibly affecting P&T alone, could have shut down the bureau to all public service users.

An important option at that time was to re-direct all civil service bureau needs to an outside company. The strongest contender was the University Computing Company, a US organisation possessing a powerful UNIVAC 1108. This could have provided processing capacity on a much larger scale than was being envisaged for P&T and the Finance ADP unit combined. Excess capacity could have been bought back by UCC for sale to other users. This option had the important attraction of side-stepping all the difficulties which would have to be faced in setting up a civil service bureau; on the other hand, it would leave many crucial applications dependent on an organisation over which no special control could be exercised. Confidentiality of information was a matter of concern to most departments; given a choice, they would be unlikely to commit themselves to an outside company. Besides, to date, they had taken no particular initiative in that respect. Resorting to an outside bureau service would also have the significant drawback of reducing the impetus – such as it was – across departments to foster a skilled cadre of DP staff. Reliance on outside bureaux was undoubtedly something that would change with improvements in technology and it would have been inadvisable to be without the internal expertise to exploit those changes when they came.

The expense involved in setting up a central bureau was not inconsiderable. The annual rental of the type of computer envisaged would alone be of the order of IR£100,000 at that time. A special building would need to be suitably equipped, with back-up and other security arrangements set in place. Staffing accommodation, storage facilities, print rooms, etc., would need to be provided. Having finally recognised the need for a central civil service bureau, Finance officials sought and obtained Ministerial approval in 1969 to go ahead. There does not appear to have been any particular difficulty initially in securing the necessary financial commitment from Government. However, as the full capital implications became more apparent, there were some doubts around 1972/73 as to whether both buildings in Kilmainham would even be completed. Some measure of the cost constraints influencing events at that time may be inferred from the fact that the mainframe had only half the required core storage when the centre

was first opened. This meant that, until processing power was increased later in the year, all jobs had to queue and execute sequentially. This also reflects an attitude which prevailed in the 1970s, namely, that technical considerations, particularly that of optimum utilisation of resources, tended to outweigh the immediate needs of the user.

Devlin Report

The Devlin Report (1969) stated that "the present situation with regard to information systems in the public service is so fragmented and, with some notable exceptions, so far behind international business methods that it is difficult to go beyond recognising the urgent need for a central enquiry to undertake a comprehensive examination of the present and future requirements of the service as a whole." Regarding Dr Foster's interim report, it states: "We do not wish to comment on it except to say that it agrees generally with the conclusions we had reached."

On the whole, the Foster Report concentrated attention where it was most required. The decision to set up a central computing service was, broadly, a sound one, given the batch-oriented technology in operation in the late 1960s and the likelihood that this kind of data processing would remain workable for at least another decade. The two important areas on which the Report could not, perhaps, have been expected to make fundamental recommendations were (a) the significant restrictions on forward planning imposed by departmental autonomy and (b) the absence of a separate career and remuneration structure for computer staff in the civil service. These issues deserved to be addressed at an official level at that time and their implications fully explored. Instead it was assumed that the prevailing arrangements could safely continue, without regard being had to the changes that had occurred since the Revenue installation was opened in 1963 – a full decade before Kilmainham.

Though it may seem a minor consideration, the choice of Kilmainhan as the central bureau for all departments was not auspicious. The conviction that IT was peripheral to the real management needs of the Department was strongly reinforced by the choice of a geographically remote location. Thus, the "centre" was isolated in every sense during the 1970s.

An Important Alternative

An important option which does not appear to have been given the fullest consideration at this time was the establishment of a semi-state body to provide some or all of the same services as CDPS. Such a body could have provided the dedicated services of the kind required, while enjoying

greater latitude in relation to organisational, staffing and remuneration arrangements. If it operated on a commercial basis, and there was no reason why this could not be so, it would remain almost completely outside the restrictions on civil service policy in relation to pay and staffing, while still having to meet the standards set by the Minister in relation to confidentiality and security. If necessary, such safeguards could have been enshrined in legislation. Given the well developed philosophy by the late 1960s of establishing semi-state bodies, both commercial and non-commercial, to carry out particular functions and provide dedicated services, it is very surprising that this option was not seriously examined.

The call for DP services began to accelerate with the creation of CDPS; departments and public service bodies could see the advantages of a central bureau with a corps of skilled experts to advise and direct them. Freed of the hardware, staffing and managerial overheads, not to mention the *responsibility*, Departments were content to put their demands.

Remit of CDPS

The remit of CDPS was very comprehensive:

- Formulation of policy for ADP within the civil service and related public agencies;
- Public service aspects of national policy issues regarding overall computer development;
- Co-ordination, determination and sanctioning of the overall computer hardware requirements of the civil service and related public service agencies;
- Development of computer systems for Government Departments and certain related public service agencies;
- Operation and development of the Public Service Computer Bureau;
- Development of overall management information systems.

The centre drew a lot of enthusiastic support from its initial cadre of staff. They were stimulated by the wide range of novel problems posed by their broad remit. Progress over the first two to three years was encouraging. However, having gained valuable experience, many of these highly marketable staff began to depart. The implications of this are examined elsewhere in this report. Another key factor at this time was the arrival of the minicomputer which heralded a shift in the centre of gravity from the supplier of DP services to the user of those services. This phenomenon recurred in the 1980s, when the arrival of the microcomputer reduced the focus from the user as a group to the user as an identifiable individual. The managerial, administrative and corporate

implications of technical advances are not always easily traced to their source. The three hardware milestones in administrative data processing are probably the IBM 360 series, developed in the early 1960s, the Digital PDP 11/34 in the early 1970s, and the Apple/IBM microcomputers in the early 1980s. Each signalled a major shift away from reliance on a third party for the provision of one's computer needs, and each required a fundamental revision of what exactly constituted good computing practice.

Distributed Processing

The advent of distributed processing had major implications for CDPS. These were not envisaged at the time of the Foster Report. To what extent should it continue on its assigned course and just how much processing power should be distributed to other locations around the civil service? The policy of concentrating data processing in Kilmainham was not an inflexible one: in addition to P&T, Revenue, Social Welfare and Lands, a few other locations had acquired local processing power, the principal ones being the Meteorological Service, which acquired two PDP 11/40s in 1975, and Defence, which advanced to an ICL 2903 mainframe in 1979 (though this latter development was not successful). However, a jump from limited local devolution to a settled policy of distributed processing was an important one and would have major long-term implications for information management in the civil and public service for decades to come.

In addition to a very attractive cost-for-power ratio, the minicomputer had three very significant advantages:

- minimal requirements for special accommodation and environmental controls;
- no requirements for specialist operators where the equipment was dedicated to a single system;
- the highly prized convenience of on-line data entry and retrieval, enabling processing stages to be carried out with greater flexibility.

Given these advantages, one might wonder why distributed processing using minicomputers did not gain a rapid foothold across the service. There were several reasons for the general delay in recognising their important potential:

(a) Most DP experts were reared in a mainframe environment where the practically limitless power of a number-crunching general purpose computer directed attention primarily towards questions of a technical nature and not towards any reconsideration of the appropriateness of a mainframe architecture and a centralist, batch-oriented strategy. The simple fact was that there was practically nothing that could not be

done faster and more efficiently on a mainframe;
(b) Very few Irish organisations, whether in the public or private sector, had any experience with minis up to about 1978 and so there was an understandable reluctance to experiment with a new technology when experience with the older one caused quite enough headaches;
(c) The then available literature and advice on minis was not always as encouraging and as supportive as it might have been;
(d) The problems of back-up and security of data were posed afresh by distributed processing;
(e) Totally dispersed systems might remove one of the supposed major advantages of centralised processing, namely, that systems could be integrated and combined into more sophisticated management tools (which never happened);
(f) Supplier support was deemed to be somewhat uncertain. Each wave of technology sees a sudden increase in the number of suppliers, which gradually contracts as the less competitive players are squeezed out of the market. A user dependent on such a company for software support, utilities, training etc, could be badly caught;
(g) The need to re-train mainframe-oriented staff in the skills required to use mini technology effectively.

Several of these factors re-surfaced with the advent of microcomputer technology in the 1980s.

Departmental Responsibility

As important as they are, reasons (a)-(g) above are very nearly counter-balanced by one outstanding, non-technical consideration: most departments did not want the *responsibility* of having to install, maintain and update their own computer facilities. It was far simpler for management to depend on CDPS than to take the matter in hand themselves, however dissatisfied some of them may have been with the service received. There were even instances where it was preferable to do without one or more potentially valuable systems than to take the bold step and assume full responsibility at a local level. Around the end of the 1970s and the start of the 1980s, only three Departments, apart from Revenue (and P&T), were conspicuous in having taken on a great measure of the responsibility themselves – Social Welfare, the Meteorological Service and the CSO.

Thus, the need to re-examine the continued advantages of a centralised service was not just a technical matter but dug deeply into organisational issues. The devolution implied by the greater penetration of distributed, minicomputer systems would re-draw the boundaries between

CDPS and user departments. Most DP managers around the service in the late 1970s recognised that, at the end of the day, the question of who ultimately should have responsibility for service delivery would decide the key organisational issues. One could even say that responsibility was inversely proportional to centralisation. It gradually became clear that the question of whether to promote a policy of distributed processing should really be preceded by a more fundamental question: could departments be relied upon to take full responsibility, both in the short term and in the long term, for their data processing and management information needs?

With computing costs falling, individual departmental managers could look to extend their control over resources, both equipment and staff. Given the tendency in a bureaucracy to increase one's power and influence by increasing the total resources under one's command, managers could be expected to resist continued centralisation. This, in the main, is a characteristic of the bureaucratic process and should not be regarded as a negative attitude to change *per se* on the part of management. Decentralisation of operations (equipment) would increase local control. If development staff were also assigned locally, the constraints imposed by a centralised service would be removed, while the arguments in favour of even greater local expansion would be easier to sustain.

Pressures for a General Review

The pressures for a major review were proving irresistible, especially as certain users were growing increasingly dissatisfied with the level of service which CDPS was in a position to provide. While it is easy to be wise after the event, the Review Body was probably needed as early as 1977/78. In fact, in its Report No.4 (1977), the Public Service Advisory Council stated that "... the Department [of the Public Service] has commenced a central policy review in relation to the overall computerisation programme for the public service and the organisational strategy best suited for its further advancement having regard to all relevant considerations including technology developments, efficiency and effectiveness, levels of service, security, cost, and personnel implications." Further allusions in Reports Nos. 5 and 6 only underscored the official recognition of the need to proceed. The general awareness amongst IT staff and departmental managers that a major review was pending served in many quarters to promote a "wait and see" attitude. Instead of investigating opportunities for advancing the introduction of computerised systems, senior management in most departments were content to await the outcome of the review and the implications of its recommendations for their own areas of concern. This attitude was fairly understandable given the major

strategic changes that could have been expected from a review, including a possible requirement for standardisation of systems and hardware. However, the elapsed time between the general recognition that a review would be required (1977) and the eventual approval of its recommendations by Government (1984), was inordinate, providing many departments with an excuse for suspending their deliberations and plans on the IT front.

However, had the Review Body been established as early as 1977 and reported in say, 1978, with the immediate endorsement of its findings, there is a strong possibility that a strategy would have been adopted which was ill suited to the emerging shape of an industry on the threshold of a major revolution. The microcomputer, which was to change the shape of civil service computing in the 1980s, was only coming on the scene at the time the Review Body was actually set up. If the minicomputer was an important factor in the creation of the Review Body, the microcomputer had a major influence on its ultimate findings.

Terms of Reference of the Review Body

The terms of reference for the Review Body were:

(i) In the Government services, to review
  (a) present organisational, technological and personnel arrangements for the development and operation of computerised systems; and
  (b) the broad range and scope for further computerisation of systems and operations.

(ii) In the light of the review referred to at (i) above and of current developments in computer and tele-communications technologies, to make recommendations as to the organisational arrangements best suited to the operation and further development of computerised systems having regard in particular to
  - organisational efficiency and effectiveness
  - level of service to users and recipients of the service
  - security needs
  - cost considerations
  - personnel considerations (including career structures and recruitment and training procedures).

(iii) To estimate and comment on the likely effects of computerisation on future employment levels in Government services.

The Review Body engaged a well-known firm of consultants to advise them, one which had already acquired international experience in the field of computing in public administration. The Review Body was also

advised by a Technical Group whose task it was to interpret and advise on technical issues and to liaise between the Review Body proper and the consultants. This group consisted of representatives at Principal Officer level from the three main computer centres – Revenue, CDPS and P&T. The Review Body itself comprised fifteen members at Assistant Secretary level, representing all the large Departments, with two representatives from the private sector.

The Broad Situation in 1980

At that time (1980) use of computerisation across the public service fell into five broad categories:

(a) Departments/Agencies which were self-sufficient in relation to computer processing:
Revenue; P&T; Public Service; Meteorological Service; Ordnance Survey; Eastern Health Board; South Eastern Health Board.

(b) Departments/Agencies which were using a combination of local computers and processing services provided by CDPS:
Agriculture (which had absorbed Lands); Social Welfare; Justice (including the Garda Siochana); Defence; Industry & Energy; Public Service; Labour; OPW; Federated Dublin Voluntary Hospitals; North Dublin Voluntary Hospitals; South Dublin Voluntary Hospitals; North Western Health Board.

(c) Departments/Agencies equipped with terminal links to CDPS for all processing:
Foreign Affairs; Finance; Education; Fisheries & Forestry; CSO; Southern Health Board; Western Health Board; Mid-Western Health Board.

(d) Departments/Agencies with no local computer equipment, but who used processing facilities provided by CDPS and, in some cases, by other parties:
Transport; Health; Trade, Commerce and Tourism; Environment; Civil Service Commission; Stationery Office; Office of the C&AG; General Medical Services (Payments) Board; Medico-Social Research Board.

(e) Agencies using commercial bureaux:
Midlands Health Board; North Eastern Health Board; and various hospitals.

Some idea of the volume and loading on these respective systems can be gathered from the number of operations staff employed, that is staff engaged on the operation of the equipment and data preparation:

CDPS	32	Education	2	Eastern H.B.	3
Revenue	49	Finance	1	Mid-Western H.B.	2
P&T	23	Social Welfare	9	South-Eastern H.B.	2
Agriculture	6	CSO	3	Southern H.B.	2
Defence	5	Met Service	20	Mater Hospital	2
				St Vincents Hosp.	2

(Note: The above figures are exclusive of data control and keying personnel.)

The location of systems development staff is separate from that of computer equipment and operations. An organisation can operate a large computer facility, and make extensive use of computer systems, without necessarily developing the software itself. This was characteristic of most public service organisations at that time. If we exclude the Health Sector and CDPS, a profile of systems development capacity at that time would be broadly as follows:

(a) Departments/Agencies which were self-sufficient in terms of systems development:

P&T; Revenue; Defence; CSO; Met. Service; Ordnance Survey.

(b) Departments/Agencies which employed a combination of internal and external(CDPS) systems development:

Finance; Fisheries & Forestry; Agriculture.

(c) Departments/Agencies which had no internal systems development capability, and who relied on CDPS or other external parties:

Health; Social Welfare; Justice (including the Garda Siochana); Foreign Affairs; Labour; Trade, Commerce & Tourism; Transport; Industry & Energy; Environment; OPW; Civil Service Commission; Stationery Office; Office of the Comptroller and Auditor General (C&AG).

In the Health Sector, only the Eastern Health Board and the South Eastern Health Board had an established internal systems development capability. A clearer picture of the relative weighting of the respective systems development unit in the public service can be gathered from Table 4.1 which sets out the numbers and distribution of staff engaged on the development or maintenance of computer systems at mid-1980.

The encroachment of minicomputers was already in evidence. P&T had installed some 14 minicomputers in stand-alone applications throughout the country using centrally developed software. It was also operating a minicomputer-based telephone directory enquiry service. CDPS had also developed minicomputer-based systems in the Department

of Justice (Dublin Metropolitan Court and the Land Registry), the Western Health Board, Social Welfare and OPW. In line with the growing trend towards interactive processing, CDPS had also introduced a limited time-sharing service on their mainframe. Another important DP trend of the late 1970s, namely, the increased introduction of off-the-shelf software application packages, was less in evidence. Excluding the popular payroll package, Unipay, less than 8 per cent of the total installed public service systems were based on packages. This was due in the main to the fact that suitable packages were seldom available, and when they were significant modifications were usually required to adapt them to local conditions.

Table 4.1: *Numbers and Distribution of Staff Engaged on the Development or Maintenance of Computer Systems (1980)*

	Systems Analysts	*Analyst/ Programmers*	*Senior Programmers*	*Programmers*	*Total*
CDPS	43	20	10	25	98
Revenue	19	27	11	32	89
P & T	15	11	4	12	42
Agriculture	3	2	2	6	13
Defence	1	2	1	3	7
Education	2	2	1	2	7
Finance	1	–	1	–	2
CSO	3	2	1	5	11
Meteorological Service	2	3	–	–	5
Eastern Health Board	1	1	–	4	6
South-Eastern Health Board	–	–	–	3	3
Total	90	70	31	92	283

NB The above figures are exclusive of the management grades AP and upwards.

Potential for Greater Computerisation

As well as having to assess the then existing position, the Review Body would need to know the potential for making greater effective use of computerisation. Their support team categorised administrative systems as follows:

(a) *Logistic Systems*, which were concerned with primary functions such as tax collection, benefit payments, etc.;
(b) *Control, Reporting and Service Systems*, which were concerned with measuring and controlling the internal operations of departments in areas such as finance, payroll, etc.;
(c) *Planning and Research Systems*, which were concerned with such matters as traffic analysis, economic modelling, etc.

On the basis of this categorisation, it was estimated that the potential for computerisation in the public service was broadly as follows:

Control, reporting and service systems	55%
Logistic systems	38%
Planning and research systems	7%

The unrealised potential for the computerisation of control, reporting and service systems (55%) was indicative of the relatively early stage of development in the public service.

An attempt to categorise Departments on the basis of their information needs would give the following rough groupings:
(a) *Natural resources-related*: Agriculture; Fisheries & Forestry; Communications; Land Registry; Environment; Valuation & Ordnance Survey; Energy.
(b) *Person-related*: Education; Labour (including the NMS); Social Welfare; Revenue; Justice group; Health; CSO.
(c) *Financial/Economic*: Finance; Industry & Commerce; Taoiseach; plus CSO, Energy and Revenue.

This information-related categorisation underlined the need to ensure that all systems introduced subsequently were amenable to higher levels of integration. One of the most important long-term and least quantifiable benefits of widescale computerisation was the easy access it provided to information of common interest to a wide variety of dispersed user groups. The value-added benefits arising from the inter-connectivity of data banks is a bonus which only well-planned computerisation strategies can provide.

Some examples of the long-term integration of person-related information in the civil service included the interaction between labour and manpower planning, curriculum development in schools and the provision of educational establishments; the co-ordination of data between Revenue, Social Welfare and Health on income deductions and benefit payments; the co-ordination of information between Labour and Social Welfare regarding employment schemes and the payment of welfare

benefits. Similar examples in the financial-economic category included the co-ordination of data on registered companies and tax returns; the co-ordination of population census data with regional industrial development statistics; the integration of national capital investment programmes with trade statistics and skills/income distribution profiles.

As we have already seen, Ireland was slow to adopt new technology during the 1960s. Comparisons at the end of the 1970s revealed that much ground still remained to be covered. While a strict comparison between the level of expenditure on computerisation in the public service in Ireland and that of other countries with a similar population may not be too reliable, the following table gives a fairly good indication of the relative positions:

Country	*Period Covered*	*Total Annual Expenditure on Computerisation per Head of Population (IR£)*
Denmark	1978	14.5
Finland	1978	6.5
New Zealand	1980	6.0
Ireland	1980	2.9 (est.)

Recommendations by the Review Body

This, broadly, was the position at the time that the Review Body began its deliberations. After almost two and half years, it came up with a set of, mainly organisational, recommendations which took no one by surprise:

(1) That every Department/Office should be assigned primary responsibility for the management of its own information management services (i.e. computer-based systems);
(2) That a total of 10 Departments/Offices should be equipped with a full internal computer system development and operation capability;
(3) That a smaller central computing service (Central Computing Service) should be retained to provide computer services which cannot effectively and efficiently be provided locally;
(4) That a separate information management advisory service (IMAS) should be established in the Department of the Public Service to secure increasing efficiency and effectiveness in information management services throughout the public service. This role included IT policy and strategy formulation for the service as a whole;

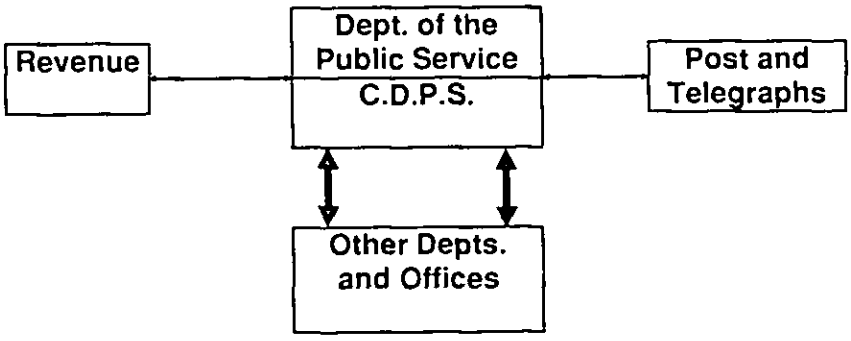
(5) That a control function in relation to computer expenditure should be established as an integral part of the Structures Directorate of the Department (Table 4.2 charts the organisational changes arising from these recommendations);
(6) That there be a substantial increase – at least 80 per cent – in the skilled computing staff of the civil service over a five-year period;
(7) That the Department of Health should be responsible for overall policy, co-ordination, control and development of information management services in the health sector, and should establish a small computer unit to undertake this task and to issue standards, guidelines and procedures to be applied throughout the health sector;
(8) That standardised systems and procedures should be applied throughout the health sector, with a health agency nominated as the centre of responsibility for each common system, that centre assuming complete responsibility for the initial installation of the system and for support to those agencies subsequently implementing the system.

The Government took two years before giving its approval to these recommendations. The Public Service Advisory Council were "appalled". Given their major influence on the future growth of IT in the public service, the delay in approving the recommendations was inexplicable and served only to underscore the markedly low level of political interest in new technology up to that time. The aggregate delays were only amplified by the passage of almost another year before certain key recommendations, the setting up of IMAS and the distribution of CDPS staff, were given effect.

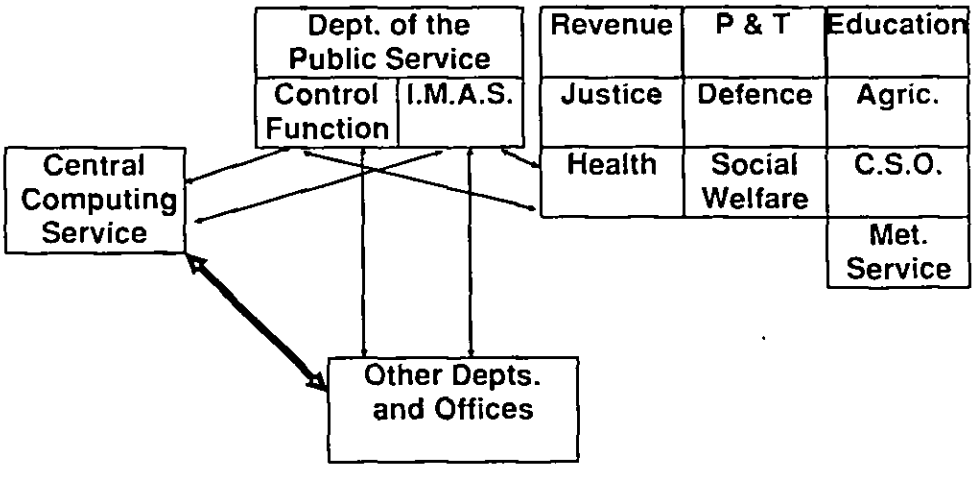
The overall success of the Review Body can only be measured in the context of later developments, with due regard being had to the negative effect of the aggregate delays already discussed. It would appear to have given a low priority to the clause in its terms of reference requiring an examination of personnel issues. This is discussed in more detail elsewhere in this Report. The organisational changes recommended for the civil service were broadly as expected. As we have already seen, the question of *responsibility* for the provision of services was always a major issue in public service computing. The report made it quite clear that ultimate responsibility rested with each department, regardless of its size. By giving more departments responsibility for the total provision of their own services, that is, without assured CCS support, a lot of the pressure on the centre was removed. The creation of IMAS was based on the perceived

Table 4.2: *Organisation Chart of the IT Function*

Before Review Body



Recommended (by Review Body)



need to separate policy and strategic considerations from the delivery of specific services or the development of applications. This approach was very much along the same lines as that of the Devlin Report (1969) which advocated the separation of the policy formulation and executive functions of all departments. Subsequent events, and the lack of political will, showed that the Devlin approach may have been fundamentally flawed. The creation of IMAS along "Aireacht" (policy) lines in February, 1985, with CCS playing the executive role, seemed to be a vindication of the Devlin strategy. However, a subsequent study of CCS, carried out at the end of 1988 by a UK consultancy, recommended that CCS and IMAS be *reintegrated*. This major reversal of the Review Body's recommendation was accepted by top management within the Department and the merger took place almost immediately (February, 1989). (At least one commentator has rightly noted that the option of privatising CCS still presented itself. This is a matter which later researchers may, with hindsight, be in a better position to explore.)

The recommendation that the Health Sector carry greater responsibility for the provision of its own computing services was also expected. As we have already observed, a substantial proportion of CDPS resources were devoted to the Health Boards and certain hospital groups at the expense of civil service departments. Also, Health Sector users were probably the most vociferous in their complaints at the level of service provided by CDPS. It was clearly too easy for Health Sector managers to call the tune without having to shoulder very much of the burden. The Review Body rightly re-assigned the responsibility. During the period of the review, 1980-1982, plus the delay period (1982-1984) when the Report was in limbo, the Department of Health embarked upon a gravely misconceived computing policy for the Health Sector which had ultimately to be aborted around 1986 at an unknown cost to the taxpayer. There is every reason to believe that this error would not have occurred had the Health Sector, in the broad, representative sense, been more active in the creation of its own IT strategy, with responsibility devolved along the lines of the Review Body's recommendations. The long delays only gave time for mistaken strategies to incubate. (Appendix L contains a more detailed examination of developments in the Health Sector.)

White Paper on the Public Service.

On the whole, it can be seen that the Review Body had mixed success. Its recommendations were supplemented by the timely arrival of the White Paper on the Public Service, *Serving the Country Better* (September, 1985). For the first time ever, IT initiatives were receiving palpable Ministerial support. The most important recommendations in relation to IT were:

- That departments were required to prepare an IT strategic plan for the introduction, development and support of office automation, including the integration of such computerised systems into the revised management accounting and information arrangements proposed in the White Paper;
- That a special fund be set up (in the Vote of the sponsoring Department of the Public Service) "to enable major new directions in the application of information technology to be explored and developed";
- That consultants be engaged to examine the feasibility of establishing a Government Telecommunications Network.

The White Paper dove-tailed quite satisfactorily with the recommendations and sentiments of the Review Body's report. IT strategic planning, which was now mandatory for all departments, became the backbone for all future developments. This was a major step forward for several reasons:

(a) It would provide a basis for the civil service as a whole to set about co-ordinating its strategic efforts with regard to the use and exploitation of new technology;
(b) Management would be required to examine information as a resource and not merely as a by-product of the administrative process;
(c) It would enable common and interdepartmental needs to be systematically identified and appropriate technical solutions developed;
(d) It shifted the locus of responsibility from middle managers, who were principally concerned with single applications, to senior management who had to direct the organisation as a whole, reconciling conflicting demands and allocating resources along a wide front, with a view to meeting the *business* needs of the organisation and not merely the technical needs;
(e) It provided an improved basis for dialogue, a common language, between technical and non-technical managers;
(f) It aided long-term planning in relation to such issues as staff retention, training, development of skills, organisational revisions, etc.

In the absence of an established planning methodology, IMAS prepared a methodology appropriate to the civil service based on such recognised techniques as "critical success factors" (CSFs) and "information modelling". Industry & Commerce was one of the first Departments to adopt this new approach. Using extensive interviewing and workshops at management level, plans were developed in a number of Departments,

including Environment, Justice, Defence, Finance, Education, Foreign Affairs, Energy, and Tourism & Transport (Revenue, Social Welfare and CSO already possessed long-term technical and organisational strategies). In some departments the IT planning process provided a valuable stimulus for top management in assessing its objectives and identifying its critical information needs for the years ahead.

The usefulness of IT planning should not be exaggerated. It would be a mistake to view it as a panacea for all ills. While it has the keen advantage of clarifying a range of complex issues and marshalling input from across a department, it cannot bear fruit without concerted top management support. Not all departments who developed plans have progressed at the same rate. The key ingredient, without exception, is the interest and support which senior managers are prepared to give to the realisation of the goals identified in their respective plans.

Management Attitudes

Management attitudes are not easy to measure. They are influenced by a range of factors: individual education, career path, training, exposure to IT, good or bad experiences with technology, and so forth. The type of manager which the civil service tends to foster is also a factor, where an entrepreneurial approach is not encouraged and individual initiatives depend on a consistent line of support up the management hierarchy.

In order to more accurately gauge the attitude of managers generally to IT and the extent to which their perceptions accorded with those of IT managers, the author conducted a survey in 1987 of 32 IT managers at AP level and fifty at AP, PO and Assistant Secretary level. The response rate was good (75 per cent for IT, 78 per cent for non-IT management). From the formal responses and other comments received, a number of useful conclusions could be drawn.

The random sample proved to be well educated: 56 per cent of the administrative group and 25 per cent of the IT group had a third-level degree. Roughly half in each category were under age 40. The experience or formal training of the administrative category in using computing systems was as follows:

36% No experience or training;

23% Have used a computer system at work or helped to introduce one;

21% Have attended a computer-related course of between one and five days duration;

13% Have had a great deal of experience with computer systems;

5% Use a home computer;

2% Have received technical training as part of another course.

It is notable that such a high percentage (64%) had some exposure to computer systems. This gives a fair indication of the level of penetration of IT by 1987 and of the interest taken by individual managers in new technology. A sizeable 44 per cent stated that they made a special effort in the previous twelve months to increase their understanding of computerisation and that they genuinely considered that their awareness had been raised as a result.

Some of the principal attitudes and opinions of the administrative category, as measured in the survey, are set out in Appendix G, Table A (figures in parentheses refer to DP/IT managers). These results reveal that, by and large, managers in the civil service have a positive attitude to IT and positive expectations as to the benefits it will produce. They also reveal that non-IT managers are not too far removed from IT managers in either their attitudes or their expectations. Analysis showed no significant variations within the administrative group on grounds of either age or grade. The relative position between the two categories as regards the specific factors justifying the introduction of a computerised system was even more notable – see Appendix G, Table B. It is significant that the classical reason for automating manual procedures – staff reductions – is rated last by both categories. There was also a high correlation between the two categories as regards their ranking of the key factors influencing the successful introduction of a computerised system – see Appendix G, Table C. Given that the IT category would be much more familiar with these considerations, the ranking chosen by the administrative category is very discerning.

The survey gives no grounds for concern that, on an individual level, senior managers are averse to the introduction of computerisation or lacking in a broad understanding of what this implies in the longer term. One could even interpret the findings as evidence that senior managers accept the increased penetration of IT as a positive development. However, it cannot be assumed that individual attitudes will translate into corresponding collective attitudes. The hierarchical structure of management, the concept of the Minister as corporation sole, the mobility of staff at management level where long-term commitment is difficult to assure, restrictive budgetary cycles, and a penchant for conservatism, all conspire to blunt the positive edge of the attitudes expressed.

The survey was primarily concerned with attitude and understanding; how well this converts into action and commitment can depend on a variety of local factors, not least of which is the prevailing attitude by top management to change generally. Those departments which have had the greatest success in the use of IT are frequently the ones who perform best on other fronts. The attitude of one or two key people at the top of the organisation can also have an enduring effect on corporate attitudes to information technology.

Progress and Main Obstacles

The significance of these factors was highlighted in a survey of managers relating to IT uptake and progress. Both DP and general service managers were asked for their view on the rate of expansion of computerisation in the civil service over the period 1976-1986. The results, which showed a high level of agreement, were as follows:

Administrative	*DP*	
8%	–	Exceptionally slow;
33%	26%	Quite slow;
17%	22%	Normal, especially for a public service administration;
17%	13%	Fairly progressive, especially in recent years;
25%	39%	Very mixed.

Between 58 per cent and 65 per cent of each group considered the rate of expansion to be either very mixed or quite slow. For purposes of comparison, Appendix M contains a summary of the main developments in the Danish public service. While Denmark is very similar to Ireland in many respects, its overall approach to data processing in the public service appears to have been more effective, mainly due to greater management control, planning and general awareness.

Data processing managers were asked to specify the factors which, in their opinion, had been the main obstacles to the greater expansion of computerisation in the civil service over the period 1976-1986. The results, which were quite revealing, were as follows:

Position	*% Weighting*	*Factor*
1	24.8	Indifferent management, particularly at the higher levels;
2	21.5	Inadequate staff resources for computer development;
3	12.2	A lack of central direction;
4	11.8	Insufficient awareness and user training amongst general service managers;
5	9.5	High staff turnover;
6	7.6	Lack of a focal point of responsibility for computer development within departments;
7	7.3	Political factors, including the lack of political will in the area of public service reform;
8	5.2	The high percentage of DP staff required to maintain existing systems.

The four factors outside the top eight which analysis indicates were most important were, in random order:

- the slow introduction of software development tools;
- the high rate of technological change which created a climate of "wait and see";
- the semi-autonomous way in which departments can govern their own affairs, sometimes without due regard to service-wide considerations;
- the high cost of DP equipment until recently.

For the sake of comparison the other seven options listed in the questionnaire were, in random order:

- insufficient technical training for DP staff;

- the grading of DP staff in the general service stream rather than as a distinct professional group;
- inadequate documentation of older systems;
- undue reliance on batch and off-line processing in preference to on-line, real-time solutions;
- indifferent sharing of knowledge and experience between DP centres in the civil service;
- insufficient communication with outside organisations;
- undue reliance on consultants.

The results show that technical, knowledge-related and direct cost factors were rated significantly below staffing, managerial and policy factors. Of the eight principal factors identified, only the last ("the high percentage of DP staff required to maintain existing systems") could be regarded as a technical issue. The fourth factor ("insufficient awareness and user training amongst general service managers") is an educational, not a technical matter. It should be noted that the grading of DP staff in the general service stream, rather than as a distinct professional group, was not *in itself* considered an obstacle. However, the exact causal relationship between this factor and the more general problems of retaining skilled staff, which *was* considered a serious obstacle, cannot be inferred from the results.

In all, the seven top factors can be resolved into three more general factors:

- weaknesses in management, co-ordination and central direction {1,3,7}
- insufficient numbers of skilled DP staff {2,5}
- insufficient initiative at a Departmental level {4,6}.

Outlook for the 1990s

IT managers were asked what improvements they would firmly suggest for accelerating the growth of computerisation in the civil service:

Position	*% Weighting*	*Suggested Improvement*
1	28.3	The establishment of a dedicated IT Support Unit in each Department.
2	22.4	A tiered programme of IT courses for all general service managers.
3	17.2	A greater emphasis on end-user computing.
4	15.3	More competitive levels of remuneration for DP staff.
5	7.3	Greater investment in computer hardware.
6	5.2	The setting up of an inter-departmental IT committee to monitor and co-ordinate the introduction and use of new technology across the civil service.
7	4.3	The introduction of a policy requiring all IT staff to contractually give a certain minimum length of service following civil service-sponsored training or else to refund the true cost of the IT training received.

The leading suggestion, the establishment of a dedicated IT support unit in each department, has been realised in most departments, though there are still a significant few who are weak or disorganised on this score. The reintegration of CCS and IMAS to form CITS (Central IT Services) reinforced the mandate of the Department of Finance in addressing the strategic needs of the civil service in the years ahead. A detailed development programme for non-IT managers is currently being prepared by the inter-departmental working group on IT training and should be operational by 1991. The IT plan which every department is required to prepare makes provision for the identification of applications which can be developed locally, thereby advancing the ideal of end-user computing. Progress has been made in improving the remuneration of IT staff with the introduction of gratuities for the majority of EOs and HEOs on IT duties, subject to certain conditions. Investment on hardware is significantly better now than it was in the late 1970s and early 1980s. The sixth suggestion, re the setting up of an inter-departmental committee, has already been acted on with the creation of the Civil Service IT Group, a forum of top managers from all departments and offices which convenes twice yearly. The only suggested improvement remaining is the introduction of a formal training

contract for all IT specialists which would ensure that the civil service got a minimum level of return on its training investment. This idea is not new, having been tried on a small scale in other areas, but it has met with little support in the past because of the practical difficulties that arise in pursuing former staff who default. It is considered that this suggestion could prove effective if a more stringent contractual requirement were in place. Of course, this could only apply to new entrants to the IT area and, possibly, existing IT staff embarking upon a significantly new training regime.

The first four suggested improvements stand well clear of the rest and form a fairly emphatic consensus. Three of them point squarely at an IT philosophy based on far greater involvement by the end-user, while the fourth tries to ensure that the requisite minimum level of technical expertise is available to support that philosophy. Improvements 5-7 could be interpreted as ancillary to this purpose, and not merely as discrete suggestions selected on individual merit alone.

Development Programme for Managers

The survey would suggest that the general outlook for IT in the civil service is good but that it will be necessary to build on existing levels of management awareness if real commitment is to materialise. An IT development programme for senior managers would form an important element in any strategy to strengthen this commitment. Many IT managers interviewed in the course of this study cited top management commitment as the key component in the successful introduction and use of new technology. Where this support was lacking, progress was slow and sporadic. Many IT managers tried to enlist the support of at least one top manager to promote the cause of IT and elicit senior commitment. While no IT manager spoke of obstruction at senior level, a few were concerned at the indifference and diffidence of the most powerful managers in the department. This reflected itself, not just in the minimal or token initiatives taken by some, but in their general level of knowledge and awareness of IT and its potential.

There was also a structural aspect. In the old DP days, there generally existed an identification of computing with some administrative function, usually financial accounting. Structures which continued to reinforce this assumption were detrimental to the growth and proper use of information technology. The IT planning exercises highlighted the need to create suitable structures for the promotion of IT. It would no longer be appropriate to treat IT as just another set of technical options available to the Organisation Unit but as a management science in its own right, and as such requiring an appropriate organisational framework. It would be

impossible to keep the issues and problems of computing before the eyes of top management without a viable IT Unit within each department. These organisational arrangements would be of little use unless the Unit was adequately staffed; the IT plans set out the minimum staffing and skills levels in each case. However, the priority given to IT in many areas was such that these minimum staffing levels were not always being achieved. It should be borne in mind, however, that staffing in particular areas had been constrained during the 1980s by wider Government policy in relation to public service staffing as a whole.

Summary

A consistent and fully formulated central approach to computerisation in the public service was slow to evolve. When it did, it was not pursued with the vigour necessary to make up lost ground. Computers were seen as a technical adjunct to public administration, not as an integral tool conferring many advantages not previously attainable. The organisational changes necessary to underpin the greater penetration of IT were difficult to effect and many Departments were content to leave the formulation of strategic direction to CDPS. The Foster Report (1969) confirmed the decision by the Department of Finance to place the responsibility for advancing the use of computers on a new body, CDPS (whose working remit did not extend to Revenue or P&T). Only with the Review Body's Report in 1982 did responsibility for the effective use of IT return to local management who, in many instances, were not unduly keen to assume it. The White Paper on the Public Service (1985) gave a valuable boost to the more systematic exploitation of IT by placing the onus on local management for the creation and implementation of departmental strategic IT plans. Progress was aided by the microcomputer revolution in the 1980s which significantly reduced the cost of computing and greatly extended the range of delivery options.

Management attitudes have been and will continue to be a major determinant of how effectively IT is used in Government. Research findings would tend to support the view that general managers do not lack the necessary aptitude to utilise IT effectively and that there is a broad level of agreement between general and technical managers on the direction and potential of IT in Government. How well this has translated into concerted commitment at a corporate level, however, is less certain.

Chapter 5

STAFFING AND THE RETENTION OF SKILLS

This chapter examines the question of staffing in the computer area in the 1970s and 1980s as well as the projected position into the 1990s, the type of career structure which applies, and the difficulties experienced in developing and retaining skilled personnel.

The Foster Report (1969) looked at staff grading. It stated that the grading of data processing staff in the general service category had the advantage of ensuring that officers with computer experience would find their way into the higher ranks of the civil service via the normal process of outward promotion: "This will result in a greater awareness at all levels of the benefits of computers and a greater readiness to exploit their full potential." Subsequent developments cast some doubt over this assumption; a significant proportion of influential and experienced staff went out of the organisation. With a few notable exceptions (e.g., Social Welfare), the expected stimulation of top management thinking never fully materialised. Furthermore, the absence of any meaningful manpower planning policy in the service as a whole resulted in little significant use being made of former DP staff in the promotion of greater computer awareness. The main career barrier identified in the Report was the absence of direct promotion outlets within the computer field for clerk-typists (CAs) and CO/Programmers. As events transpired, this barrier remained in place into the late 1980s until direct internal promotion from CO/SO to EO was introduced in some areas.

Staff losses during the 1970s were high and, as we have noted elsewhere, did much to restrict the proper and most effective use of computer technology during that decade. On average, in the ten years from 1969 CDPS (or the ADP unit in Finance) – which, apart from Revenue, comprised the bulk of computing personnel in the civil service – was losing systems and programming staff at a rate of 17 per cent per annum. The nett result cannot be properly evaluated in terms of numbers serving but only in terms of the ratio of experienced to inexperienced staff which resulted. If "experienced" or "trained" can be defined as having a minimum of one year's experience on DP work – which is not a great deal in practice – 44 per cent of the systems/programming staff in CDPS at end-1978 were

trainees. For CO/Programmer alone, the turnover rate in 1978 was 60 per cent (a proportion were lost on promotion to Senior Programmer and so were not lost to the programming function as such, but turnover at *that* level was 70 per cent). The turnover for total programming staff (CO/SO/EO) exceeded 30 per cent in the years 1976 to 1978. The majority of these were losses to other parts of the civil service, not to outside organisations. The ratio of internal to external losses of systems and programming staff over the period 1976-79 was approximately 3:1. (Appendix H contains a summary of IT grades in the civil service.)

Maintenance Overhead

The maintenance overhead had also grown significantly during the 1970s. Each new system developed required some systems and programming time subsequently to maintain it. Coming under this broad rubric were:

- mandatory updating of systems arising from changes in legislation;
- enhancements to systems to provide additional facilities;
- implementation of existing systems in new areas;
- periodic re-development of systems which had been considerably amended over several years;
- support, advice, assistance, etc., to users, operators;
- investigation of and remedial work on "bugs".

Maintenance is the price that must be paid for all newly developed computer systems. The subsequent support and enhancement of an application is an intrinsic aspect of the business. The DP manager cannot sidestep this. In many instances his/her staff will need an ongoing familiarity with the application. For example, the Income Tax Assessing system in Revenue requires a minimum of two years' experience before a qualified programmer can be entrusted with the task of making modifications. Continuity of staff is, therefore, very important. As a rule maintenance work takes precedence over new developments.

Calculations show that for every man year put into development work in the period 1968-1979, 0.19 man years were then required annually for the resultant maintenance (as defined above). If the years 1974-1979 are considered separately, the ratio was 1 year to 0.25 years. In staffing terms

the maintenance overhead was increasing at a serious rate. If one assumes that the proportion of staff on maintenance work in 1969 was nil, then in 1979 it had jumped to 76 per cent. Towards the end of 1974, a firm of consultants who reviewed CDPS found the maintenance level in that year was 33 per cent, a figure they considered excessive. Within a few years it had doubled.

Continuing staff losses compelled CDPS to have increasing recourse to contract programmers and analysts. In 1979 they were employing 15 persons in this capacity, 11 of whom were on maintenance work. If these are taken into account the percentage of total staff in CDPS on maintenance work in 1979 jumps from 76 per cent to 88 per cent – comprising both experienced and inexperienced staff. If the former alone are considered and contract (consultancy) staff excluded, the total maintenance level in 1978 equalled the total number of experienced staff available.

The long lead-time in recruiting suitable replacement staff made it impossible for the civil service as a whole to maintain its authorised DP establishment at 100 per cent. The training overhead further reduced the practical effectiveness of the surviving complement. The high level of staff turnover in the middle and late 1970s ensured that the average length of service in each DP grade was quite low. For example, in mid-1980, in the group CDPS/Revenue/P&T/Agriculture –

- 65 per cent of all systems analysts (HEO & EO) were less than two years in the function;

- 70 per cent of all programming staff (EO, SO & CO) were less that two years in the function, which also represented their total experience with computers, other than operating equipment;

- 33 per cent of analyst staff had less than two years total experience with computers, other than operating equipment.

Without the commitment of DP managers, the stability and continuity of the services provided would have been almost impossible to maintain. Personnel in these grades (AP and upward), who represented the hard core of computing expertise, were much more committed to a career in the civil service, with over 70 per cent having in excess of seven years computing experience. To some extent, however, this "commitment" was stimulated by the improved promotion prospects arising from the high levels of staff turnover. It is also worth reflecting on whether this process of Darwinian selection had the effect of advancing the computing ideals of

the DP staff remaining, who were, presumably, more comfortable within a mainframe/batch environment.

The Department of the Public Service (DPS) responded fairly positively to the staffing problem. Between 1977 and 1981, it increased the staffing of CDPS in the grades above CA from 112 to 189 – a substantial 69 per cent increase. This helped considerably to stabilise the position. This annual staffing increase of 14 per cent was matched by a recommendation from the Review Body (1982) that skilled DP staffing be increased by at least 80 per cent over the five-year period, 1983-1987. However, this latter proposal was badly mauled by the Government staffing embargo. As events transpired, staffing in the grades CO-PO increased on average by 5 per cent annually over this period instead of 12 per cent as recommended by the Review Body.

Unfortunately, the Review Body, which included computer personnel issues among its terms of reference, made no other material recommendation in relation to staffing policy, and arrangements which had been established as early as 1962 in Revenue remained substantially unchanged within the civil service as a whole over twenty years later. Many were disappointed by this omission. Even if the Review Body had considered its reasons well founded (and it is unclear whether it actually did), the rationale behind its position was not properly conveyed to the civil service IT community.

Internal Recruitment Only

Up to the start of 1990, the civil service did not recruit IT staff from outside; all were home-grown (1990 saw the introduction of an open competition to recruit Administrative Officers to the IT area). This is a major consideration and one which has had a very significant bearing on the way computerisation has evolved over the past three decades. Even if the service could recruit IT staff externally, it would not be in a position to pay competitive rates. Therefore, it would not actually attract the calibre of staff required. Thus, two important factors are closely related – recruiting policy and pay policy.

There is another, again closely related, factor. All computer staff in the civil service are graded in the general service stream. This means that the pay arrangements for all IT staff are totally constrained by the pay policy applying to general service staff as a whole. Any change in IT pay policy could impinge fairly strongly on wider pay policy. There is also a very significant and somewhat paradoxical factor at work here. The unions representing general service grades are, naturally enough, inclined only to advance the cause of the majority of their members. An important minority, the IT community, have not, until recently, received much

attention from the civil service unions. Specialist IT claims, which could work against the better longer-term interests of the unions' total membership, were not advanced until late 1989.

Hence, IT staff in the civil service are constrained on two fronts: (a) the need to implement policies likely to maintain the greatest overall economies, particularly in relation to pay, and (b) the hitherto traditional reluctance of the unions to argue any claim for IT staff based on the uniqueness or special character of their work. (The only exception to this was the introduction in the early 1970s of an allowance for CO/Programmers.)

High staff turnover has been the bane of civil service computing. Managers state that they have had great difficulties as a result in maintaining the required level of expertise. Extended development times and continued re-scheduling of systems development and implementation have been a feature of computing in most departments. All IT managers interviewed were concerned that the continuing high level of staff turnover will impede the successful introduction of office information systems as seriously as it impeded the effective expansion of electronic data processing. Given the existing staffing constraints, they find it difficult to plan for this contingency. Even IT managers themselves are often lacking in extensive IT experience and the turnover rate at that level outside the mainline DP areas, while not as high as that obtaining in the lower grades, is not insignificant. This hampers the successful pursuit of a consistent strategy and weakens the confidence of non-IT management in the capacity of IT to fulfill its promises. Managerial continuity is needed since systems implementation takes place over a long period and across a wide front: an IT manager has a great deal to learn about the organisation and his/her client base, and will be faced with many problems which the application of text-book techniques will not resolve.

Every data processing manager could relate instances of staff receiving substantial pay increases upon transfer to outside employment. Instances of increases upon transfer of some 30 per cent to 40 per cent were not uncommon. In the mid- to late-1980s the typical pay increase was believed to be somewhere in the region of IR£2000 to IR£4000, not including fringe benefits. The Career Break scheme encouraged a number of staff to leave who might not otherwise have done so. Some managers were of the opinion that an arrangement better designed to accelerate the departure of skilled and experienced staff could not have been introduced (the option was withdrawn from IT staff in 1989).

Loss of staff from the smaller sites has been no less serious, even though they should in theory enjoy a greater degree of autonomy and

self-determination than their counterparts in the large installations such as CITS, Social Welfare and Revenue. This may be due, in part, to the possibly less challenging nature of the work in some of the smaller centres and, in part, to the greater overview of systems management in all its aspects which is attainable in a smaller installation. Officers with such an overview are attractive to outside employers.

Remuneration

Many IT managers are of the view that the only way to curtail the high rate of staff turnover, especially amongst experienced officers, would be to introduce more competitive rates of remuneration. Many expressed their disappointment that the Review Body on Computerisation, which reported in 1982, did not grasp this nettle. While it was acknowledged that the civil service could not hope to match private sector pay rates, the differential should, if possible, be reduced so as to diminish the incentive to go outside. Several senior managers were of the opinion that a separate grading structure for IT staff was required. Such a structure, which could include the facility to pass across into the general service stream under certain circumstances, would make it easier for computer staff to represent their interests, pursue special claims, and match job definitions with vocational skills. It would also facilitate the introduction of a separate technical stream within the IT area to cater for specialists who chose to advance their careers in a technical area without having to take on managerial and policy related responsibilities. By giving computer staff the right to compete for vacancies in the general service stream, a separate grading structure need not necessarily curtail one's longer-term career options – this was the reason for linking computer staff with general service grades in the first instance.

The loss of IT skills from the civil service has a spin-off for the rest of the economy, a benefit which has long been recognised by the computer industry at large. The service is effectively a training ground for the development of native skills and the provision of a steady supply of experienced personnel to a sector which has traditionally been chronically short of such individuals. Figures are not available on the numbers leaving to serve within the national economy though, regrettably, a significant proportion emigrate to the UK and other foreign locations where the nett remuneration and career opportunities have been appreciably better. There are few indications that these emigrants see their long-term career other than in a foreign location. Furthermore, there are no known sectoral initiatives to entice these individuals back into the economy. The recent recession in the UK and elsewhere, however, will reduce opportunities

abroad and possibly encourage a higher proportion of emigrants to return to the Irish job scene. This should in turn narrow the pay disparity between the public and the private sectors.

Turnover

Table 5.1 shows the staffing in the main DP centres (CITS, Revenue, Social Welfare, Health, Justice and Agriculture) over the period 1979 to 1990. This table also includes an estimate of aggregate staffing in corresponding grades in all other Departments, and an estimated total for Key Punch Operators (KPOs) and CAs on computer-related duties for the civil service as a whole over the period 1981-1990. In the twelve years 1979 to 1990, staffing in the main DP centres (in grades CO-PO inclusive) grew from 367 to 537, an increase of 46 per cent (a cumulative increase of 3.3 per cent per annum). The increase in 1986 is attributable in the main to staff expansion in the Department of Social Welfare. It is significant that the public service embargo (which was introduced in mid-1981 and required, with effect from end-1981, that two vacancies in every three be left unfilled) did not succeed in reducing staffing (CO – PO) in the main DP centres at any time during the 1980s. This is indicative of the value placed by management in the departments concerned on computer activities relative to other activities and their resolve to protect DP from staffing cutbacks, even during a period when civil service staffing as a whole fell significantly (by 15 per cent-20 per cent in many areas). IT staffing in other departments, 1981 to 1990, increased by 70 per cent, reflecting the increased use of IT by areas formerly without technological support.

Table 5.2 shows the rate of staff turnover in three of the main DP centres (CITS, Revenue and Agriculture) over the seven year period, 1980 – 1986. The average annual rate of turnover was 11 per cent. Though lower than the rate during the second half of the 1970s, it still proved to be a major problem for DP managers in the areas affected: staff turnover erodes accumulated experience, not just staff numbers. At 348, total staff losses amounted to 75 per cent of the annual average complement (461) of these three centres over the seven-year period.

The number of staff who transferred out of these areas, other than through promotion, over the seven year period was just under 20 per cent of the total. This could be taken as a measure of the degree of job satisfaction experienced by IT staff in general. As a proportion of annual average staffing in computing in these three areas, it represents a very modest turnover rate – around 2 per cent. This reinforces the findings elsewhere in this Report that the degree of job satisfaction in computing *per se* is quite high.

Table 5.1: *Staffing in Main Computing Centres (*) and Other Areas, 1979-1990*

Grade	*1979*	*1980*	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*(1)	*1988*(2)	*1989*	*1990*(3)
PO	8	8	8	8	9	9	12	13	13	13	13	15
AP	26	30	33	33	35	36	34	40	42	43	45	49
HEO	89	92	95	98	103	103	103	116	112	109	113	118
EO	85	96	102	111	119	113	114	122	121	119	113	152
SO	29	31	30	30	30	29	30	29	34	39	63	44
CO	130	131	144	153	151	147	145	158	162	166	146	159
Sub-total	367	388	412	433	447	437	438	478	484	489	493	537
Staff in other Depts.**	n/a	n/a	84	82	84	89	93	97	123	127	130	143
Total	–	–	496	515	531	526	531	575	607	616	623	680
KPOs and CAs	–	–	191	235	229	185	178	178	169	156	175	122
Grand Total	–	–	687	750	760	711	709	753	776	772	798	802

* Main centres–CITS, Revenue, Social Welfare, Health, Justice, Agriculture.

** Staff in grades CO to PO (inclusive) in other parts of the civil service.
Some estimated figures have been used in compiling these aggregates.

(1) This column is estimated on the basis of firm figures for the preceding and succeeding periods.

(2) This column is strictly the position at 1 November 1987

(3) Position at end-1990.

Sources: State Directory and figures supplied by Departments, including Dept. Finance.

Table 5.2: *Staff Turnover in CCS, Revenue and Agriculture, 1980-1986*

			'80	'81	'82	'83	'84	'85	'86		
(a) Remained in Dept.	Transferred Out	HEO+	1	1	1	2	2	1	2	10	23
		EO–	3	2	0	1	1	3	3	13	
	Promoted Out	HEO+	1	0	1	0	0	0	2	4	16
		EO–	1	0	2	3	3	2	1	12	
(b) Left Dept. but remained in Civil Service	Transferred Out	HEO+	1	1	1	0	1	2	0	6	42
		EO–	11	7	4	2	3	7	2	36	
	Promoted Out	HEO+	1	2	2	1	0	0	0	6	83
		EO–	21	6	6	6	11	12	15	77	
(c) Left the Civil Service		HEO+	3	1	4	5	9	8	5	35	184
		EO–	14	27	20	15	23	22	28	149	
Total			57	47	41	35	53	57	58		(348)
Percentage loss each year			12.1	9.7	8.3	7.1	11.0	14.4	14.3	10.8	

Notes: This table includes staff departures arising from Career Breaks.
The turnover percentages in 1985 and 1986 take account of the redeployment of staff from CCS to other parts of the Civil Service (such as Social Welfare) early in 1985.

Table 5.2 also shows that the proportion of staff losses due to promotion was 28 per cent. The vast majority of these involve staff in the grades of EO, SO and CO. 53 per cent of all computing staff losses in these areas were to organisations outside the civil service. The corollary of this merits attention, namely, that 47 per cent of IT staff losses are to other, non-computing, parts of the service. This is very significant, being due in the main to promotions. In other words, the traditional reward for dedication and service in the IT area, namely, promotion, is the very mechanism which robs that area of much needed skills.

The effect of the Career Break scheme is also clearly discernible in section (c) of Table 5.2. In the three years from its introduction (1984-1986), the rate of staff leaving the IT area increased by 32 per cent over the preceding three years. The effect on grades of HEO and above was significant, where the rate increased by some 120 per cent. This confirms that, over the period of its application to the IT area, the scheme encouraged a significant number of experienced staff to leave who would not otherwise have done so. The negative effects of this were acknowledged by the Government when they withdrew the scheme from the IT area, amongst others, in 1989.

Staff Survey

The composition of the IT area merits closer scrutiny. A survey in late-1986 of all computer personnel attracted a highly representative 70 per cent response rate. The term "computer personnel" covered the following categories of staff:

- data processing manager
- computer project/operations manager
- systems analyst
- programmer
- telecommunications specialist
- computer centre/unit administrative personnel (*other than* clerical personnel)
- computer operators at CO level and above
- off-line data preparation staff at CO level and above

- administrative staff at HEO, AP and PO level in an Organisation Unit with responsibility for preparing an IT Plan or introducing computerised systems within a department

- staff of the Computer Control section in the Department of Finance.

Respondents were evenly distributed between grades and across departments, and totalled 413 from a total eligible complement of 580.

Profile of Serving Staff

Tables 5.3 – 5.11 deal with the Group under such headings as grade, age, sex, length of service, computer-related work experience and entry grade to the service. (Please note that, unless otherwise indicated, the tables referred to in this Survey may be found in Appendix I.)

Equality considerations

It is clear from Table 5.3 that women are greatly under-represented in the grades of EO and above, comprising less than 20 per cent of that category. As a whole, female staff comprise less than 30 per cent of the Group. This would suggest either (a) that female staff have less aptitude for computer-related work or (b) that female staff have not been attracted to or provided opportunities for advancing into the IT area. Given that there is no independent evidence to support the former interpretation, we are forced to conclude that computer-related work is not generally perceived by female staff as affording attractive career opportunities. Since computer staff are recruited entirely from within the civil service, they should reflect to some extent the sex-related composition of the grades from which they are recruited. Only one IT grade (SO) compares favourably with the rate obtaining across the service for the same grade. Given that some 65 per cent of COs generally are female, it is a little surprising that only 40 per cent of COs in the IT area are female. The position in relation to EOs and APs is even more pronounced, though HEOs fare a little better.

The more favourable female to male ratio in the CO and SO grades is not being transmitted into the EO grade and above. This is due in part to the fact that there has traditionally been a rift between the programming stream (consisting of COs and SOs) and the analysis stream (consisting of EOs and HEOs). Entrants to the analysis stream have not been required to possess programming skills or IT experience in a grade below EO (only 25 per cent of HEOs have CO/Programmer experience). This has made it

more difficult for programming staff to pursue a career in IT beyond the grades of CO and SO. Further career development often necessitates a transfer, whether lateral or on promotion, into the non-IT area. The frequent occurrence in practice of this phenomenon has already been adverted to above. These findings would indicate that there exists a need (a) to improve the perception of IT work by female non-IT staff and (b) to build a career bridge for programming staff into the analysis stream. This latter issue was incidentally addressed in the White Paper on the public service (1985) which, amongst other recommendations, proposed the amalgamation of the EO and SO grades. However, in reply to a parliamentary question on 2 May, 1989, the Minister for Finance stated that, owing to the "financial cost" involved, he was not prepared to proceed with the amalgamation (though the PESP review of grading could re-open this issue). Whatever about its implications for the wider civil service, the amalgamation of the two grades may have been of benefit to the IT area. This loss was offset to a significant extent by the introduction in the late 1980s in some of the main DP centres of direct internal promotion from CO and SO to EO.

Tables 5.4 and 5.5 reveal that 62 per cent of the Group are under age 30. 75 per cent of the female staff are in this category, as against 56 per cent of the males. This is consistent with our earlier finding that the majority of female staff are in the more junior grades. The male-female ratio is evenly balanced in the age bracket 20-24, but the proportion of males doubles in the following bracket (25-29) and is almost four times that of females in the bracket 30-34. Analysis of Table 5.5 reveals that a sizeable 40 per cent of the Group are EOs and HEOs aged between 25 and 34. The prospect of finding suitable promotion outlets for this category in the years ahead, without losing valuable expertise, will be a major headache for management.

Age considerations

The mean age for the Group is almost 30 years. Separate analysis reveals that two-thirds of the Group have eight or more years service with the civil service, only part of which was spent in the IT area. Despite this, some 30 per cent of the Group have less than three years computer-related experience. This is significantly high. The corresponding figure for COs is 53 per cent and, for EOs, 44 per cent. However, the position regarding the higher grades, relative to their responsibilities, is more satisfactory. For instance, almost 60 per cent of HEOs have seven or more years experience, while almost 80 per cent of APs have more than ten years experience. Almost all the POs have fifteen or more years experience. These statistics

confirm that the stability and success of civil service computing to date is largely attributable to the dedication and experience of middle to senior DP management grades.

Length of service

Table 5.6 compares length of service in the civil service with computer-related work experience. It reveals that staff with a talent and aptitude for computing have spent a long time on ordinary administrative duties before being attracted into or offered a position within the computer area. This might suggest that difficulties to date in attracting suitable applicants into IT may be due in part to a lack of awareness amongst civil servants generally of the nature of a career in computing. We have already noted that this may be an important factor in accounting for the lower than expected proportion of females within the IT area. However, the principal reason for the accumulation of non-IT related service is the requirement in most interdepartmental IT competitions that applicants have served for a minimum period in their existing grade. (The Review Body removed one of the major obstacles in this area when it eliminated the requirement that COs complete their two-year probation period before being eligible to compete for CO/Programmer.)

The relatively brisk pace in staff turnover affects the number of years which staff can, on average, be expected to spend in each grade on computer-related work. Two-thirds of all staff have been less than four years in their existing grade on IT duties. This is a major consideration where project management, leadership, judgement and similar factors are concerned. The average officer requires a number of years' experience if s/he is to mature into his/her area of responsibility and acquire both the technical and the tacit skills needed to perform at a consistently high level. It is doubtful whether this can be assured in an environment where almost 90 per cent of all IT staff are less than three years in their existing grade.

Entry grades

Table 5.7 gives the grade at which computer staff entered the civil service. It is notable that a sizeable percentage of IT staff in each grade entered the civil service through a clerical grade: 50 per cent of POs, 40 per cent of APs, 44 per cent of HEOs and 51 per cent of EOs. This statistic reflects the fact that practically all recruitment to the IT area is by interdepartmental competition, thus individuals with an aptitude for IT work are identified and reassigned. This is also consistent with the traditional – and commendable – policy in the civil service of allowing equal opportunity to all grades of entrant. There is no prejudice against

the passage of clerical staff into the executive stream; it is all the more surprising then that IT staff in a clerical grade already within the IT area should have experienced such difficulty in advancing into an executive grade *while remaining* in the IT area.

It is not surprising that 65 per cent of COs in the IT area were formerly CAs (until 1990, the CO/Programmer competition was open to CAs and COs only, equivalent and departmental grades being excluded). The high representation of former CAs does, however, prompt the question as to whether there is any compelling reason, other than remuneration, for not extending the programming function to include CAs. Since programming as such is not dependent upon one's level of clerical experience, there is no apparent obstacle, in terms of aptitude, competence or commitment, to the extension of the programming function to this grade. When computerisation was first introduced to the civil service in the 1960's the grade of CO was settled upon (by Revenue initially) as the one most appropriate for carrying out the programming function. Many managers now believe that this was too low a level, purely from the standpoint of remuneration (though CO/Programmers were subsequently awarded an allowance). When experienced programmers began to leave in the 1970s, it became clear that the only way of retaining them for a longer period would have been to increase their level of remuneration, but this was impossible given the link between CO/Programmers and COs generally. Since the link between programming duties and the CO grade had by then been firmly established, there was no scope for upgrading the basic programming function to EO or even SO. In this regard it should be noted that the UK civil service has set the programming function at the EO, not CO, level.

Grade/function linkages

The traditional identification of the grade of CO with the programming function (and SO as senior programmer) has induced staff in the executive grades into believing that such work is outside their remit. This is an unfortunate state of affairs since the programming function itself has been undergoing change within the IT industry. Third level programming languages have gradually been ceding ground to the more flexible tools of fourth generation software. Such tools have a more pervasive application within the corpus of activities associated with systems development. They are therefore usable at several stages along the development hierarchy. It is invidious that executive grades on a project team should not be familiar with the programming aspects of these tools and fully competent in applying them. IT in the 1990s should not be constrained by outmoded

organisational and vocational practices which may have served the industry well in the 1960s and 1970s. The grading structure and job definitions of the future must embody a higher degree of versatility than hitherto.

The survey revealed that as much as 4 per cent of total staff time is devoted to normal administrative duties which are *completely unrelated* to their responsibilities in the IT area. Taken by itself, this may seem fairly innocuous but, in manpower terms, it is none the less equivalent to some 25 heads of staff in the executive and management grades.

Job descriptions

The crux of computing is the time that must be spent in maintaining extant systems. The view held by the majority of non-IT managers, namely, that IT staff exist purely to develop computer systems, is misconceived. A large percentage of IT staffing resources are dedicated solely to the maintenance and enhancement of earlier systems. As already noted, the more pervasive computerisation becomes, the more resources must be diverted to supporting it. This is an inescapable reality and one which weighs heavily on the industry. In the absence of an unambiguous definition of what exactly constitutes maintenance as distinct from development, the picture available from our statistics is indicative only. They would suggest that only 27 per cent of all IT staff spend more than half of their time on systems development. The corresponding figures for systems maintenance and technical support are 20 per cent and 5 per cent, respectively.

Tables 5.8 and 5.9 set out the job descriptions which come closest to describing the immediate responsibilities of IT staff. When aggregated into related clusters, the computerisation manpower profile for the civil service, based on how staff perceive their principal activity, is broadly as follows:

Management	14.7%
Systems analysis	31.2%
Programming	23.0%
Equipment operating & data preparation	16.3%
"Advanced" developments (*)	5.5%
User support	4.4%
Administrative/clerical	1.5%
Training	1.3%
Other (**)	2.1%

* Comprises OIS, telecommunications, Fourth Generation Language (4 GL), and new package evaluation.

** This category is not coextensive with that described in Table 5.8.

The most notable statistic relates to equipment operations and data preparation (where grades below CO are *not* included). The percentage (16.3) of staff devoted to this category of activity is fairly significant. The Group proportion in this category for grades *above* CO is 4 per cent; if Operations Manager is included, it jumps to over 10 per cent. One would expect it to fall by a few points over the coming years, however, with the increased use of on-line systems, advances in data management and on-line control techniques, the greater penetration of OIS and the improved sophistication of mainframe operating systems.

It is also notable that two areas of great importance in the years ahead – telecommunications and 4GL programming – were supported (at end-1986) by only 2.2 per cent of the Group. However, recent developments with the Government Telecommunications Network and networking generally have led to a greater deployment of staff to this area.

Versatility of EO grade

One is struck in Tables 5.8 and 5.9 by the diversity of activities to which IT staff are deployed, given that some of the categories (e.g., programmer, OIS) are amenable to further sub-division. The versatility of the EO grade is also notable in this regard, featuring in about 70 per cent of the job descriptions in both tables. This is indicative of the increased flexibility needed to service the IT area in the years ahead and the increased importance likely to attach to the grade of EO.

Computer-related work experience

Table 5.10 gives the average number of years computer-related experience for each job-description. The average for the Group as a whole was 6.27 years. It can be seen that OIS (which would include, among others, IT systems planning and technical strategy) has attracted some of the most experienced officers, having on average more than ten years experience. The relatively high level of experience of operations and data preparation staff reflects the fact that these categories are not as much in demand by the private sector. For example, programmers have on average only half the computer-related experience of persons in the data preparation category.

While it is generally accepted that IT staff are more committed to their vocation than to their employers, as witnessed, for example, by the high rate of turnover in the industry at large, the level of affiliation to professional bodies is quite low. Only 6 per cent of the Group are members of such bodies, 90 per cent of whom are in the Irish Computer Society. The strongest representation by far is in the upper grades – about 30 per cent of POs and 23 per cent of APs.

Future career perception

The most daunting statistic about the Group as a whole relates to future career perception – see Table 5.11 (below). Only 62 per cent of IT staff see their future career lying primarily in the civil service on computer-related duties. A very significant proportion – 25 per cent – see their future lying primarily in *outside* IT employment. Further evidence of the commitment of computer staff to their vocation rather than their employer is furnished by the fact that only 13 per cent see their future career in terms of non-IT employment. Given the time and expense invested in the training and development of these individuals, and given that the majority of them intend to remain within the civil service, it is worth asking whether the introduction of a mechanism to identify them at an earlier stage should be considered. One can assume that a proportion of them are unsuited for continued work in the IT area and that an appropriate career indicator would bring them to the attention of management. Existing IT aptitude tests only show whether a candidate possesses the minimum intellectual propensity for grasping computing concepts; they do not show whether the individual would actually find the work satisfying or congenial. It is not surprising, therefore, that a certain percentage of existing IT staff should be thinking actively in terms of a career change as soon as the opportunity arose. Under existing practices, many such individuals must normally await success in an interdepartmental competition before being re-deployed. IT management in many areas have, understandably, been reluctant to release staff for other reasons or, where they do recognise that an individual has not adjusted to work in the IT area, have had difficulty finding a home for him or her in a non-IT environment.

Some 37 per cent of the Group have either a computer science degree, an NCC systems analysis certificate or a computer diploma. As might be expected, this category also exhibits a strong commitment to the IT area, with only 11 per cent thinking in terms of an eventual move to non-IT employment. The proportion who propose to take up IT assignments outside the service is a little greater, however – 28 per cent. Given that this category comprises some of the better talent, this statistic gives added reason for concern. (If we take officers with a computer science degree by themselves, the proportion is even greater – 38 per cent.)

It is significant that over 30 per cent of the APs see themselves moving off computer duties. This could be accounted for by the pressure of work on IT management created by the high rate of staff turnover in the lower grades or by the poor promotion prospects within the computer area (the average age of APs on IT work is around 39 years). The changing shape of

the IT industry may also be a factor: many APs in the IT area are concerned that their skills are being eroded by changes in technology. Being the grade in receipt of the least amount of formal training, there are certainly grounds for this concern. Also, being primarily occupied with management and policy-type issues, they have less opportunity to acquaint themselves on the job with the niceties of recent technical innovations.

Table 5.11: *Individual Perception of Future Career: Respondents were asked to indicate the category in which they primarily saw their future career:-*

		PO %	*AP* %	*HEO* %	*EO* %	*SO* %	*CO* %	*% of Total Staff*
Primarily in the Civil Service on computer-related work	ALL	90	64	62	61	76	56	62
	**	80	69	60	42	75	58	61
Primarily in the Civil Service on non-computer related work	ALL	10	28	8	10	3	6	10
	**	20	23	7	11	13		10
Primarily outside the Civil Service on computer-related work	ALL		5	28	27	14	34	25
	**		8	31	47		42	28
Primarily outside the Civil Service on non-computer related work	ALL		3	2	2	7	4	3
	**			2		12		1

** Select staff, i.e. staff with a Computer Science degree, NCC Systems Analyst Cert. or a recognised Computer Diploma. This select category comprises 37% of all IT staff.

As noted earlier, the EO grade is the most versatile of all the IT grades and, given that it is an important training grade from which many of tomorrow's best managers are expected to emerge, the proportion with a specific computer qualification who see their future career in outside IT

employment is disconcertingly high – 47 per cent. This figure actually exceeds the corresponding number who propose to remain (42 per cent). The steady loss of EOs from the IT area in recent years has attracted criticism from many non-IT managers who are concerned that the IT area is acting as a conduit out of the service of the best available talent. This is undoubtedly the case. Since the IT area, especially in areas like Revenue and Social Welfare, is permitted through internal competitive redeployment to take promising young EOs from other parts of the organisation, and then subsequently loses them after a period to the private sector, it effectively acts as a brain drain. While the civil service was enjoying a steady influx of new recruits at EO level, this was not a significant problem, but given that there has been almost zero recruitment for most of the 1980s, the talent being lost in this fashion is simply not being replaced. The introduction of allowances for EOs and HEOs in the IT area may exacerbate this tendency. The full effects may not be felt for some years when the quality of management in the higher echelons of the organisation, and not necessarily in the IT area, becomes more apparent. It would not be surprising if non-IT management introduced measures to contain the extent to which this can occur. While this would be to the detriment of the IT area, it may be in the best interests of the organisation in the long run.

In some ways this phenomenon is akin to a trend which occurred in the 1970s. The computing area was then perceived as an intellectually challenging and attractive career option. It was novel to have an area for which one needed to be specially selected and only the brightest could enter. This netted a fair number of talented individuals, many of whom in due course found employment outside the service or in a non-IT area. With successive waves of internal recruitment, the pool began to shrink in the absence of open recruitment. It is difficult to be certain that a sufficient number of potential IT candidates with the necessary aptitude will continue to be available throughout the 1990s.

If Table 5.11 can be taken as an indicator of job satisfaction then (excluding POs) the grade of Staff Officer is the most settled and Clerical Officer the least. Given that an experienced CO/Programmer can earn appreciably less than the average industrial wage, this is not too surprising.

The proportion of staff (10 per cent) likely to be lost to other, non-IT, work in the civil service – both for the Group as a whole and for staff with a specific computer qualification — may not seem inordinately high in terms of the total picture but the gap left, in terms of both skills and experience, would be difficult to fill in practice. Furthermore, existing policy and staffing arrangements outside the immediate domain of the IT area are

not geared towards the proper utilisation of this kind of experience. It is not unusual to see an officer, newly promoted out of the IT area and possessing a B.Sc., in computer science, assigned to non-IT duties in another department. Given the changing shape of IT and increasingly important role of the end-user, these redeployed or promoted individuals would be potentially ideal facilitators and end-user co-ordinators, particularly where they have had an opportunity to become familiar with the administrative procedures in their new environment.

There is some indication, however, that officers at a more senior managerial level, having an IT background, perhaps as an EO or HEO, are being assigned to the IT area in some departments, often on the grounds that no other manager is too keen to take on the responsibility. While their technical skills are probably out of date, their understanding of the concepts and nature of IT is still relevant. One would expect to see more instances of this in the 1990s.

The loss of IT staff entails more than just the loss of skills and experience. It entails also the expense of training in replacements. Training in computing skills is probably the most expensive training cost incurred by the civil service, both on a per capita and a global basis. For example, 62 per cent of the COs who see their future career primarily outside the civil service on computer-related duties have already had 60 or more days training sponsored entirely by their employer. The corresponding figure for EOs is 46 per cent. The potential loss in terms of total computer-related work experience, and the high hidden cost involved, should also be noted. For instance, 55 per cent of the HEOs who see their future career primarily outside the civil service on computer-related work have already acquired a *minimum* of seven years computer-related work experience, the average for the category being 8.7 years. The average computer experience of HEOs who do not see their future career in the civil service on computer-related work, but in one of the other three categories, is a little over six years. The corresponding figure for APs is a little over eight years. It can readily be seen that the true cost of developing and maintaining an extensive IT infrastructure in the civil service is significantly inflated by the need to continually select, train and supervise replacement staff at all levels.

Importance of Morale

In the face of a continuing high rate of staff turnover, IT managers have been very sensitive to the need to maintain good morale amongst their staff. One way of doing this is to keep feeding them new and original problems. By installing leading-edge technology, staff have the satisfaction

of keeping abreast of the latest developments. This is believed to have been a positive factor in at least one large site.

Good morale amongst general service staff can be maintained through regular redeployment. Mobility, however, has not featured much in the IT area. Transfers of staff between major sites are almost unknown (if one discounts the reorganisation of CDPS in 1985). This only occurs on an individual level when IT staff are promoted through an interdepartmental IT competition and redeployed to another location.

Greater mobility between sites would, ostensibly, have the advantage of allowing ambitious IT staff to tackle a fresh set of problems or, at least, to meet the same ones in a new environment, thereby raising morale. New blood could also lead to a questioning of outmoded practices which may have developed in some areas. However, the reality is not so simple. The major sites use a diverse range of hardware – IBM, DEC, Honeywell, Wang, Hewlett-Packard. In addition to mastering a new operational environment, transferees would need to learn a good deal about the local applications before they could reasonably be expected to be productive. Therefore, despite the apparently high degree of concordance between IT skills in different areas, it would be self-defeating to redeploy staff in this fashion.

The question of staff mobility would hardly arise in any event in the smaller departments. With slim resources, often only one or two persons, the medium to small Departments (e.g., Labour, Energy, Marine, Tourism and Transport HQ, Oireachtas) are required to carry out a range of IT functions from systems development, user support, trouble-shooting, telecommunications, training, strategic planning, and so forth. The question here is how to maintain a minimum level of service: this creates a morale problem of a different kind. One possible solution is to establish a central pool of IT staff to service a number of departments. The greater flexibility in this arrangement would permit an optimum use of staff resources and skills. It would also lead to a greater exploitation of common solutions. Sudden departures from one department would not lead to a catastrophic termination of all IT work (as has happened in a few places). However, the concept of a trans-departmental staffing resource is unknown in the civil service. An officer must "belong" to some department and be assigned accordingly. The nearest existing expression of this idea is to be found in the role of the Central IT Services who develop common systems and provide a supporting role to departments who are prepared to match manpower resources on a head-for-head basis. (The role and evolution of CITS is examined in more detail elsewhere in this report.)

Morale also depends on career opportunities and their comparison with those available to non-IT staff. While IT staff are eligible to compete

in all general service competitions, they do not perceive themselves as competing on an equal footing with their general service counterparts. Since the composition of the interview board invariably leans in the direction of the general administrator, with only restricted scope for the IT candidate to demonstrate his/her professional expertise, IT staff consider themselves to be unfairly handicapped. There is undoubtedly substance in this grievance. The hallmark of the general service administrator, namely, the generality and breadth of his/her skills and experience, is normally identified and explored by an interview board; having spent such a high proportion of their time on technical matters, IT staff can often appear deficient in this respect.

Neither is the morale of IT staff helped by the fact that general service staff can compete for all the main IT competitions (CO/Programmer, EO/Junior Analyst, HEO/Systems Analyst and AP/Senior Systems Analyst). Apart from AP level appointments, they are normally quite successful. It can be galling for experienced IT staff to see non-IT people competing successfully for IT promotion outlets while their corresponding right to compete in mainstream general service competitions is perceived to bear lesser results.

Morale of IT Managers

The morale of the IT manager also comes into consideration. While one would expect his/her job to be difficult in changing times, it can often be rendered unnecessarily complicated, especially in the smaller locations, by a host of matters which contribute little to the realisation of the objectives of IT. A lot of time can be taken up with normal administrative chores and attending to staff problems. The task of purchasing a system, even a small one, is made unduly time-consuming by having to evaluate every tender, even when a preliminary examination quickly reveals which are best. In addition, there are a variety of rules and guidelines to observe, issued by the Department of Finance, the Government Contracts Committee, the C&AG, the Revenue Commissioners, the EC and standard-making bodies, as well as internal management. The political implications of certain courses of action have also to be considered.

Some IT managers are also concerned that the IT managerial function is ranked too lowly in the departmental pecking order. Its technical gloss and trade jargon tends to diminish the scope for informal exchanges between managers on either side of the fence. Furthermore, IT is seen as a technical *service*, not a tool for shaping policy or crucially influencing decision-making or the resolution of day to day problems. This tends to cast the IT manager in an inferior role. Apart from the specialist offices

such as CSO and the Meteorological Service, only Social Welfare and, to a lesser extent, Revenue, have a tradition of according an equivalent status to IT managers. This is undoubtedly due to the central role played by computer-based collection/disbursement systems in these two service-delivery departments.

The IT manager outside the main DP centres is somewhat isolated. Having less in common with his/her colleagues in his/her own department, he/she is more reliant on his/her communications with counterparts elsewhere. This helps with the transmission of experience gained elsewhere in the service on similar systems, dealing with suppliers, meeting user requirements, evaluating proposals, establishing internal standards, selecting application software, and so on. CITS have helped to boost this exchange of information by introducing a regular IT newsletter for the civil service in early 1988. In addition, the creation of the IT Group (at Asst. Secretary/PO level), the inauguration of an annual Civil Service IT Seminar, and the formation of a number of interdepartmental working groups and committees during the period 1988-90 have all contributed greatly to an increase in communication across departmental boundaries over this period. (These include LAN management, corporate information management, IT training, networking, data protection, business analysis, and an IT effectiveness study. The introduction of multi-annual reviews of IT strategic plans will reinforce this exchange.)

By remaining in the IT area, a young manager must decide whether he/she sees his/her longer term prospects on IT alone or whether he/she should move back into the administrative mainstream. As IT becomes more pervasive, there are more cases of this kind. However, the changing shape of IT, with its growing accent on business-related and personal communication skills, along with the introduction of a "business analyst" development programme by the CSTC, should help build a more effective bridge between the two areas.

Contract staff

The staffing crisis could never be fully addressed by the greater use of contract staff. Along with their lack of knowledge of local organisational procedures, the need for supervision, and various additional costs; one of the main reasons has been the strong degree of staff side [union] opposition to measures of this kind. The traditional line taken by the unions is that expansion should be met from within the civil service, that the existing quality of recruit has been satisfactory and that the proper development of suitable career paths for IT staff would only be obstructed by the use of contract employees. Staff would also resent working alongside

individuals who were paid more for similar work. These concerns are understandable, but so too is the management line, namely: that expansion cannot be achieved without a guaranteed high level of technical support; high staff turnover prevents this; contract staff would allow projects to be undertaken which in time would open greater opportunities to existing staff. Management have also indicated that contract staff would not be assigned to the more interesting or prestigious areas of work. Also, their employment would be temporary, with no question of the contracted individuals being offered permanent employment.

It should also be noted that the use of consultancy on an ongoing basis in a few areas is effectively the use of contracted staff for routine work and not wholly or primarily a mechanism for securing specialist skills and advice. Contract staff would be significantly cheaper. For example, over the three-year period, 1986-88, IT consultancy totalled IR£3.28m. On the (reasonable) assumption that an estimated three-quarters of this was in respect of staff shortages, about IR£2.5m was spent over that period to make up for such shortages. With consultancy running at around four times the cost per capita of contract staff, the scope for savings is significant.

The situation as it has evolved rests on mutual distrust. The staff side are concerned that, at a time when civil service numbers are being tightly squeezed, contract staff would be used excessively. Management, on the other hand, would contend that contract staff would never be used in such a way as to damage the prospects of permanent staff or to undermine morale. This, they say, would only defeat their purpose.

There is a further obstacle. The numbers of contract staff available in the Irish market are low. It is unclear whether the civil service would be successful in attracting them in any significant numbers or quality. There would also be resentment from the private sector if a relatively small pool was being tapped by such a big player. There is some possibility though that political support would exist for a scheme designed to attract back Irish IT emigrants from abroad, mainly the UK. Given the avidity with which foreign companies have been poaching the Irish market in recent years, such a scheme could help redress the balance. Too much talent (and the associated investment in their education) is being lost in this fashion.

There are alternatives to the temporary use of experienced IT staff. The civil service could instead try to attract some of the many IT graduates who emigrate yearly. An initiative along these lines was taken in 1990/91 when competitions were held to recruit Administrative Officers with specific IT-related skills. This was a significant development, being the first

time the civil service had attempted to recruit IT personnel directly from outside. This initiative reflects the need to safeguard the very considerable investment in IT in the late 1980s by ensuring that an adequate cadre of highly skilled staff would always be available to manage large, sophisticated and critical systems during the 1990s and into the next century. .

Another alternative is to recruit non-IT graduates and train them up for deliberate export to the Irish private sector. Given that the industry as a whole is suffering from a shortage of skilled personnel, a scheme along these lines would have the benefit of giving the civil service good material, probably with business skills, for an assured period, say four years. This would give some return on its investment. Their subsequent transfer to the private sector would be a clear contribution to the economy generally. Such a scheme would have an advantage over the existing *ad hoc* process of staff attrition in that the number and quality of the staff concerned would be more effectively controlled and the nett contribution to the national pool of IT personnel increased. (For additional comments in relation to recruitment from outside sources, see also "Recruitment of leading-edge skills" in Chapter 7.)

IT Gratuities

Another important initiative with regard to staff retention was the introduction in 1990 of a scheme for additional payments to certain IT staff (IR£2000 for HEOs, £1750 for EOs, payable as a lump sum on completion of each reckonable year of full-time service in the IT area). The package was conditional upon certain assurances from the staff side regarding the maintenance of a suitably trained corps of IT personnel, including an assurance of co-operation with contract staff where management considered their introduction necessary.

Management acknowledged that the introduction of IT gratuities would not solve the staffing crisis, but it would have the important merit of inducing staff to remain in service for a longer period. The offer was not without its disadvantages, the principal one being that the gratuity could lessen the morale of those members of the IT community, notably operations staff, who did not possess essential skills of a kind that would be difficult to replace – a necessary condition for qualification. It could also create some unrest amongst APs in the IT area whose staff (HEOs) might actually enjoy a higher level of total remuneration. However, the overall benefit, the greater long-term retention of skilled and experienced staff, was believed to outweigh these drawbacks. It is too early, however, to say whether it is achieving its objective.

Creating a Technical Stream

The need to maintain a minimum level of technical expertise, as well as the need to ensure that technical staff have a suitable career path, suggests the creation of a technical stream, that is a development path for a select group of IT specialists who wish to continue in the technical area but without the burden of managerial duties. Naturally, the number of staff concerned need not be large – less than 2 per cent to 3 per cent of the total skilled IT cadre – but they would represent a critical component in the overall expertise of the civil service. Technical streaming should be used sparingly since there are strict practical limitations on the extent to which suitably stimulating career paths can be assured in the longer term. There is little chance of the service retaining these individuals for any length of time under existing arrangements. Their career development needs, which essentially means greater remuneration commensurate with their high level of expertise, can only be met at present through promotion. However, higher IT grades have to devote an ever increasing proportion of their time to managerial issues. The purely technical component of their work is diminishing. A dedicated technical expert cannot necessarily expect an increase in job satisfaction by remaining in service after promotion. As a consequence, Government Departments can expect to lose many key individuals in the years ahead. These losses will become more noticeable as the penetration of IT continues and the dependence on technology percolates upward into higher levels of the organisation.

One possible solution to this problem is to assure such technical specialists that their career needs can be met in the longer-term through the mechanism of technical streaming. Individuals with a marked aptitude and personal orientation towards technical problem solving could be identified early and assigned to the technical stream. This would permit the more fruitful cultivation of their skills over time and provide an assured avenue for their long-term career development, thereby enabling the service to hold on to them for an appreciably longer period. Without such guaranteed technical support there will be strict limits on just how much progress can be made in the coming decades in the development of advanced management support systems and infrastructure. There may even be difficulties maintaining newer applications which require certain specialist skills to develop, e.g., relational database.

The grading of IT staff generally may need to be less rigidly categorised than it is at present. The strong identification of grade with function makes it difficult to utilise staff in the most flexible and productive fashion. At least one large semi-state body has succeeded in having its computer people renamed "information systems" staff, graduated on a numeric basis,

e.g., IS4, IS5, etc. Consideration might be given to the introduction of a similar grading structure to the civil service. Working relationships between staff and individual assignments could be more flexibly managed if this were the case. The existing grading structure leans too much towards historical precedent and makes it difficult for management to get the most effective use from emerging software development tools.

Industrial Relations Outlook

The industrial relations climate in the civil service at present, in the context of Government restrictions on recruitment and public sector pay, is not very accommodating. Attempts by management to negotiate any significant departure from existing practices, such as the greater use of contract staff or graduate recruitment, is unlikely to make further headway without concessions in relation to pay and promotion. Since management have almost no latitude in this area, any significant departure from existing practices during the 1990s will be difficult. Given the level of staff resistance to the recruitment of AOs into the IT area in 1990/91, particularly in view of the fact that management have traditionally held the right to assign AOs wherever they considered appropriate, tends to underscore the view that IT staff are themselves very resistant to change. It could be said that they are suspicious of any development that might lessen their "right" to receive valuable IT training and experience without a corresponding commitment to render a minimum period of expert service. As the above turnover and skilling statistics amply testify, the industrial relations regime down the years has consistently worked in favour of staff interests. The 1990s are unlikely to see any shift in this position.

Summary

The problem of retaining skilled IT staff may be considered, along with sustained commitment by top management, as the key factor determining the effectiveness of IT in Government Departments. Turnover has always been high, with leavers coming in the main from the ranks of the most skilled and experienced personnel. This entails an ongoing loss, not just of skills and experience, but of management potential. Outside employers recognise the high level of skills possessed by civil servants. Efforts to retain staff have been somewhat lacklustre, though the introduction in 1990 of an IT gratuity scheme as an incentive to staff to remain in service for a longer period was a significant positive step. The career break scheme in the mid-1980s exacerbated the rate of turnover. The grading of IT staff in the general service stream has made it almost impossible to implement

remedies germane to the IT area alone. The rigidities of public service pay policy has also been a major factor. The main civil service unions have traditionally not been disposed to treat their IT members as a distinct vocational group requiring separate attention. IT staff themselves have been content to let turnover continue at a high level on the grounds that they benefit internally by a more rapid pace of promotion and externally by improved prospects in the open market as trained and experienced IT personnel. The allegiance of IT staff lies principally with their career, not their employer. A very significant 25 per cent of all IT staff see their future careers outside the civil service in IT employment. There are indications that female staff are not adequately represented in the grades above EO and that, as a consequence, a source of staff possessing the requisite aptitude is not being fully utilised. The difficulty in ensuring a suitable career path between the programming and analyst functions, principally between the CO and EO grades, has been an obstacle to the retention of skills, though the blurring of distinctions between these two functions with the advent of 4GL-type tools will be an advantage in the 1990s. Forty per cent of all IT staff are EOs/HEOs between the ages of 25 and 34, a concentration which will make it difficult to find suitable career paths for everyone within the IT area. The higher grades of AP and, to a lesser extent, HEO, have provided the stabilising backbone for Government IT over the past three decades and are likely to continue to do so. The maintenance function, as distinct from the development or implementation of original systems, continues to absorb a significant proportion of staff time. The absence of external recruitment to the IT area – whether via consultancy, contractual arrangements, IT graduates, non-IT honours graduates, work experience programmes, part-time and undergraduate recruitment – has restricted the options available to management, making it difficult to guarantee that the IT area, with its significant level of investment in critical systems, will continue to enjoy a sufficient cadre of high level technical expertise into the 1990s. A more flexible attitude by existing staff to alternative sources of recruitment is warranted. The creation of a technical stream for a small percentage of the most able technical specialists should be considered.

Chapter 6

THE USER

This chapter examines the results of a survey of users of multi-user systems in a number of departments and the user-related aspects of the survey mentioned earlier on management attitudes. It also looks at the changed perception of the user by IT staff and the user-related aspects of industrial relations.

There was an understandable tendency until the microcomputer revolution to accord the user low priority. The huge increase in the number of VDUs in the service – an increase of about 36 per cent per annum between 1980 and 1988 – meant that the role and voice of users grew dramatically. They were even considered a resource where some of the most interested and committed could develop small local applications. At least one department – Energy – made significant use of this.

Survey of Multi-User Systems

Ten multi-user sites were surveyed in 1987, representing six Departments and Offices. From the total user base (130) the response rate was 67 per cent (87). Sixty-four per cent of the respondents were female. Forty-one per cent of the sample were in the administrative/executive category. The average operational age of the systems at each site was eighteen months, the oldest being 2.5 years and the youngest 8 months. All sites used intelligent terminals, with a minimum of 512K.

A wide variety of work was carried out across the ten sites: word processing, spreadsheet analysis, graphics, database management, information retrieval, financial analysis, statistical analysis, on-line enquiries, list processing, financial modelling and accounting, expenditure monitoring and text retrieval. Each site had an officer at HEO level specifically assigned to the duties of Systems Manager. No fewer than six of the ten sites carried out their own applications modelling and design, e.g., by writing procedures in DBase. Only two of the ten carried out a formal cost-benefit justification prior to purchase, both of which reviewed the systems subsequently to confirm that the benefits were being achieved. In all ten sites, the Systems Manager was satisfied that the throughput of the section had increased as a result of computerisation (with no increase in

staff). One site, with twelve users, claimed that the new system achieved a staffing reduction of 1 AP, 1 HEO, 1 EO and 1 CA.

The majority of systems were installed on foot of pressure from the AP/PO in the section (six sites). Two arose from staff interest generally and two as a direct result of Ministerial request. The principal reasons quoted by the Systems Managers for the introduction of the systems were, in order of importance: (1) to improve the quality of information in the section; (2) to modernise office procedures; (3) to cope with an increasing volume of work; (4) to increase the productivity of the section.

Almost every site made some enhancements to the system, whether in terms of hardware, software or both, since it was first introduced. Seven of the sites positively intend to make further enhancements. These are good indicators of the perceived usefulness of the core systems. The average period spent using the system was ten months. Given that the average age of the systems under review was eighteen months, this figure (10 months) is indicative of the expansion of the user-base in a relatively short span of time.

The work profile for the sample was as follows:

Grade	*% Daily Work On Computer*	*Number Of Hours Per Day At The Screen*
AP & HEO	30	2.0
EO	31	2.1
CO	37	2.3
CA	39	2.9
CA(typist)	86	6.2

These statistics would suggest that the computer systems are central to the work of the sections concerned. Even where staff were not actually working at the screen, they were likely engaged on work which was in some way related to the system.

User Attitudes

The attitude of the users was positive. Ninety-one per cent stated that they welcomed the introduction of the computer (98 per cent admin/exec, 85 per cent clerical). Ninety-four per cent stated that they would not go back to the old manual ways of carrying out the work of the section (100 per cent admin/exec, 89 per cent clerical). Ninety-four per

cent of the sample gave a nett positive evaluation of the microcomputer in the office (Options: makes most office work easier, are excellent office aids with considerable potential, are very useful in the office but are a little over-rated).

Eighty per cent of the sample stated that they had little or no difficulty in adapting their daily work routine to the computer when it was first introduced. No subject experienced "a lot of difficulty". The clerical group experienced slightly fewer difficulties, possibly reflecting the more routine nature of their duties. Almost three-quarters of the sample consult their colleagues before using a manual.

Thirty-five per cent of the sample felt they perceived an improvement, slight to noticeable, in the quality of communication between the staff in the office as a result of the new system, though a sizeable 59 per cent saw no change. While an assessment of throughput can be somewhat subjective, at least 60 per cent of each group of users (admin/exec and clerical) considered that the system had increased the *volume* of work being handled in the section. This finding supports the views of the System Managers in this regard. While a measurement of qualitative factors can be even more subjective, over 80 per cent considered that the system had improved the *quality* of the work in the section, with half the sample rating the improvement as noticeable. Amongst the admin/exec group, over 90 per cent of those who gave a neutral or negative response to the "volume" question gave a positive reply to the "quality" question.

On the whole, the survey revealed a positive attitude amongst staff in both the clerical and the admin/exec groups towards computerised office systems. The new technology does not appear to be causing any significant problems for the user. The percentage of work/time based on the computer (30 per cent-40 per cent) shows a meaningful degree of utilisation. The expected productivity gains appear to have been realised. Consultation with users before introducing the system was not always adequate; greater consultation would, in the opinion of users, have led to the more effective implementation of the system. Staff perceived nett positive gains in throughput and quality of work in the section. Training was inadequate in a large number of cases and appears to have been ascribed a low priority by management. Users expressed a pronounced desire for more training, preferably spread over time so that new lessons could be digested in the context of practice and experience. Screen-related health factors, particularly eye-strain, attracted comment. The survey findings suggest that this issue may require further attention. Some typists did not appear to be adhering to the VDU-user guidelines. The technical improvements which users most wanted to see introduced concerned the

overall response rate of the system; this suggested a need for the technology to more successfully accommodate a range of human work rates.

Changing Perception Of The User

The status of the civil service user has changed down the years. In the 1970s, he was remote from the centres where systems were designed and data processed; he had little contact, if any, with the experts, received output on monotonous reams of green-striped print-out, and had great difficulty securing timely enhancements to the system. He did not understand the technical problems faced by the IT specialists, while the latter were slow to build their procedures around the business needs of the former. The working relationship between the two sides was frequently strained. The situation was not helped by the fact that the IT specialist was trained in technical matters, not in inter-personal communication, consultation and the creation of shared, negotiated solutions.

The 1980s saw a definite improvement. PC technology provided local, controllable, observable computing and thereby gave the user a sense of ownership. The IT specialist in turn, primarily as a result of strategic IT planning exercises, began to think more in terms of the user's business requirements than in terms of the technology which could address those requirements. The shift in attitude in both communities improved communication. The increased size of the user community, as well as the user's improved technical knowledge and mastery of computing concepts, won greater respect from the IT specialists and made it more difficult for the latter to fudge their responsibilities.

The user community of the 1990s will show an increasing maturity which should benefit government computing. While the line of demarcation between "user" and "specialist" may be less starkly drawn than hitherto, with the former acquiring greater technical autonomy through the mastery of packages of increasing sophistication, there will, none the less, remain a clear distinction between the specialist who studies and determines the technical solutions for the organisation as a whole, and the user (or manager) whose task is primarily the application (or evaluation) of such solutions.

Industrial Climate

The two wider factors influencing the general acceptance of IT are staff attitudes and management perception of how new technology should best be introduced. On the whole, staff side interests do not appear to have sought much formal communication to date with management on the

introduction and role of new technology. The most significant agreements at General Council (under the scheme for conciliation and arbitration) in recent years related to the introduction of a Word Processing Allowance and a set of guidelines for the safe use of VDUs (concession of the former, worth IR£8.56 per week for CA(typists) on word processing duties, was premature). The attitude of the staff immediately affected by the introduction of new technology is, by and large, fairly positive, and there appears to be acceptance of the general thesis that office information systems confer many advantages if properly designed and implemented. Managers reported that staff were mainly concerned with the effectiveness of the new systems and their usability rather than with wider issues such as the effect of IT on job content, staffing levels, reporting arrangements, etc. Since job satisfaction was perceived to have increased in many instances with the introduction of computerised support systems, managers have an increased confidence in new technology. The agreement of a formal protocol with local staff representatives for the introduction of new technology does not appear to have been considered necessary in any department. In many instances, there has been as much "pull" to receive a system as "push" to install one. There are even instances where staff became annoyed that approval for a computer system was not granted sooner.

On the experience to date, it would seem that the industrial relations climate for the increased use of IT in the civil service is encouraging. Other factors need to be taken into account though, the principal one being the negligible rate of promotion in the lower, mainly clerical, grades during the 1980s. However, a number of special pay agreements in recent years have included recognition of new technology and the need to co-operate with its introduction.

Management Perception of IT Effectiveness

Management perception of the encroachment of IT is also an important determinant of user attitudes generally. When asked if they thought office automation would alter the structure of civil service organisation, only 5 per cent of mainstream managers believed that it would not, 38 per cent believed it would affect structures to a small extent, mostly in the clerical area, while a significant 57 per cent believed office automation would, at minimum, affect most organisational structures within a department to a moderate degree (This compared with 71 per cent for IT managers). So, on the whole, managers perceive IT as having a potentially pervasive influence on the organisation.

Managers' perception of the factors bearing on the overall effectiveness of an office computer system was surveyed. The purpose of the question was

to measure how well mainstream managers, as actual or potential users, understood the practical considerations which determine whether an office computer system would perform successfully. Their top ten factors, from a range of twenty-one, is given in Table 6.1. The Table also shows (in parentheses), for the sake of comparison, the corresponding priority ranking by IT managers of the same factors.

Table 6.1: *Managers' Perception of the Factors Bearing on the Overall Effectiveness of an Office Computer System*

Ranking	*Weighting*	*Factor*
1 (1)	25.8%	A high standard of user friendliness throughout the system;
2 (4)	15.1%	One's own screen/VDU;
3 (9)	11.0%	A wide variety of application packages;
4 (10)	10.0%	The capacity to enhance the system easily, e.g., to add on extra disk capacity, to upgrade the operating system;
5 (2)	8.0%	A good advisory/support service within the organisation;
6 (-)	7.9%	The ability to store files without regard to the storage capacity of the system;
7 (5)	6.7%	The facility to use the same data easily on different packages;
8 (-)	6.4%	Fast and clear printed output;
9 (6)	5.3%	An officer who is good as Systems Manager;
10 (3)	3.8%	A comprehensive "help" facility.

There was clear agreement in both groups as to the high priority of user friendliness. Not surprisingly, the survey revealed that the administrative group ascribed too much importance to purely technical considerations. Their fourth ranking factor was too highly placed, while the sixth factor has very little bearing on the overall effectiveness of today's

office systems. The high importance assigned to having one's own screen/VDU is worth noting. Providers of technical services often underestimate the importance to the user of resources which seem to cater more to convenience and comfort than technical utility. Immediate access to a screen is perceived by management as being significant if the user is to successfully integrate the facilities of the computer into his daily routine. The importance to the administrative group of fast and clear printed output is also worth noting. Until such time as the user base is so large that the need for printed output is sharply reduced, the importance of timely and well produced hard copy should not be underestimated. It can even be argued that the paperless office implied by the widespread use of electronic mail is something of a myth since new technology, by increasing the amount of information readily available, will automatically increase the number of original documents from which copies can be made.

The survey also revealed that managers, as potential users, were somewhat lacking in confidence when discussing computer-related topics. Twice as many (39 per cent) feel "below average" as feel "above average" (19 per cent) when asked to rank their knowledge and understanding of computers against that of other managers in the department. This would suggest that the new technology is still somewhat intimidating for many.

The potential usefulness of office systems to managers was also assessed by reference to the longevity of the files consulted during the normal execution of their duties. The statistics revealed that 40 per cent of all files in the sampled group, from AP to Asst Sec., were one year old or less. This jumped to 57 per cent for files which were two years old or less. The statistics clearly indicated that certain individual managers could adapt a computer facility to the main body of their work within a relatively short time. Half the files of almost half of the sample were one year old or less. Eighty per cent of the files of over one-third of the sample were two years old or less. It can be concluded that the textual age of information currently recorded by management will not of itself constitute an impediment to the greater use of IT at that level. This is certainly true of the AP grade where over 90 per cent of the files in common usage were two years old or less in almost 40 per cent of the cases.

Summary

The user is more knowledgeable and more pervasive than ever before. Communications with the IT specialist have improved and a more concrete and consistent contribution is expected from both parties. User attitudes to new technology are broadly positive and there appears to be acceptance of the general thesis that office information systems confer many

advantages if properly designed and implemented. Statistics would suggest that multi-user systems are achieving the expected improvements in quality and productivity. Civil service users do not appear to have experienced any significant difficulties in adapting to new technology or in applying it to proper effect. Managers as users accept the potential of IT to shape the organisation and have a perception of office technology which is not significantly at variance with that of IT specialists.

Chapter 7

EDUCATION, TRAINING AND DEVELOPMENT

This chapter addresses an area which is all too often of secondary importance to IT managers, namely, how best to optimise the use made of IT staff. It deals with such issues as the source, selection, deployment, training and development of IT staff and the factors influencing the success of an effective strategy in this area. (Given the degree of linkage between skilling and development, there will be some points of overlap between this chapter and Chapter 5 on IT staffing/skills.)

A major question in computing today is:- How to ensure that an organisation has sufficient IT skills and experience available to design, develop, install and support sophisticated information management systems which are crucial to the success, even survival, of the organisation? Management must endeavour to make maximum use of each member of the IT staff while he or she is still with the organisation. This means developing the necessary skills quickly and scheduling systems development so that available personnel can be deployed to best effect.

The increasing use of IT within the mainstream functions of the organisation creates additional problems. As more end-users are taken on board, the need for training non-IT staff also grows. Furthermore, non-IT management, whose involvement is crucial to the effective use of new technology in the achievement of business objectives, must also receive an education commensurate with their changing responsibilities.

Being a large and complex organisation, IT training is becoming increasingly important to the civil service, for the following reasons:

(a) The consistently high rate of staff turnover, which has been running at around 10 per cent in the grades CO-PO. New staff must be trained in and lost skills replaced.

(b) The increasing dependence upon computer technology. The service is significantly more computerised now than when, for example, the Review Body made its report in 1982. This dependence must be supported by an expanding cadre of skilled IT staff. IT expenditure in the 5 years to 1990 was, in real terms, some 2.4 times greater than in the 5 years to 1980.

(c) The continually increasing user-base. The number of VDUs in the service increased at an average rate of 36 per cent per annum between 1980 and 1988. The number of users has been increasing at least as quickly. Estimates would suggest that at least 3 civil servants in 10 are *using* a computer for some or all or their work; every user has a need for IT support and training, however modest.

(d) The continually changing nature of computer technologies. As further technical and other advances are made, information technology presents new issues for both IT and non-IT managers. Often progress cannot be made, or the status quo maintained, without many of the newer-type issues being addressed. As IT makes an increasing impact above the purely operational level, there is a greater need for management to address the issues involved.

There is also a relationship between some of the above factors:

(i) Staff turnover (factor (a)) is related to some extent to the type of technology in use (factor (d)). If IT staff are concerned that their skills are falling behind the industrial norm, they are more likely to seek alternative employment. Research data shows that some 40 per cent of APs in the IT area felt their DP skills were being eroded by advances in technology, the majority of whom were keen to get into an area which would increase their skills. Thus there is an increasing need for IT managers to manage the acquisition and development of skills by IT staff.

(ii) Increasing dependence upon technology (factor (b))increases the range and quality of the support and training needed by end-users (factor (c)).

IT training programmes in the civil service in the late 1980s did not adequately address the full spectrum of IT-related training needs. The approach to IT training was largely unplanned, giving rise to a less than satisfactory match between emerging needs and available training. This situation was exacerbated by a general lack of awareness of training requirements.

The numbers eligible for IT training at that time was sizeable. There were some 650 IT staff in the grades CO-PO each of whom received IT training to varying degrees in line with their changing skills requirements. In addition, if we assume a ratio of users to VDUs of 2:1, there were some 8,000 end-users across the service, each of whom had training and support needs of one kind or another. On top of these two categories, there was a marked training requirement amongst non-IT management. Their needs

were not strictly technical but related more to the general capabilities of new technology and the impact it had on information management and office administration. If even 3 per cent-4 per cent of all managers required training in this area, the numbers involved would be quite large.

Tables 7.1 and 7.2 set out details of the sources, internal or external, of IT training across departments in 1989. While Departments had varying experiences with external training, from poor to excellent, the market did appear to provide the range of IT-related training required, though programming training was often of mediocre quality and non-technical training for managers virtually non-existent.

Table 7.1: *The Provision of IT Training Across all Departments (1989)*

Systems Analysis:	Mostly external
Programming:	Mix of internal and external
Methodologies (*):	External
Advanced technical training (**):	Almost all external
User (mainframe):	Internal
User (PC):	Mostly external and CITS (to mid-1989)
Non-IT management:	CSTC (partly); not available externally.

* Systems development and project management
** Telecommunications, 4GL, database, prototyping

Table 7.2: *The Internal Provision of Programming and Systems Analysis Training in the Civil Service (1989)*

	Neither	*Programming only*	*Systems Analysis only*	*Both*
CITS	x			
Revenue		x		
Social Welfare		x		
CSO				x
Education	x			
Met Service		x		
Justice		x		
Agriculture		x		
Defence		x		

Despite its weaknesses, the quality of IT training in the 1980s appears to have met the necessary standard. The core of computing business was still concerned with programming and systems analysis. Strength in these traditional skills had been built up in the 1970s and carried over into the 1980s despite the high staff turnover rate. The IT selection procedure, which periodically trawled the civil service for the right people, was still securing well motivated individuals with both the initiative and the enthusiasm for the job. Deficiencies in the formal training process did not translate into learning deadlocks. Experienced managers and the more highly trained personnel were able to provide a good standard of on-the-job training. In addition, IT staff were themselves pursuing further IT educational courses after-hours. Table 7.3 gives details of the educational background of serving IT staff. It can be seen that the acquisition of skills in their own time by 40 per cent of all IT staff has been a valuable contribution to the maintenance of an adequate skills base in the service.

Table 7.3: *Some Statistics Regarding the Educational Level of IT Staff in the Civil Service*

- A not insignificant proportion (9 per cent) have a Computer Science degree;
- 27 per cent have a third level degree of some description. A further 24 per cent have a computer-related certificate or diploma;
- A sizeable percentage (60 per cent) had two or more science subjects in their Leaving Certificate (maths/physics/chemistry/biology/botany/maths-physics);
- Up to end-1986, TCD was far and away the dominant institution for officers pursuing after-hours study;
- 67 per cent of all after-hours courses pursued were of 3-4 years duration;
- 40 per cent of all IT staff have undertaken after-hours study to increase their IT skills. This proportion is evenly spread across grades CO-PO;
- The percentage of work time devoted annually to attendance at official training courses in each grade during the first half of the 1980s:

PO	AP	HEO	EO	SO	CO	Total
1.7%	1.1%	2.7%	3.6%	3.5%	3.8%	3.2%

These three factors – traditional strength, on-the-job learning, and after-hours study – helped to smooth over the difficulties encountered. Furthermore, some of the shortcomings identified were of relatively recent origin. For example, deficiencies in end-user training could not be expected to manifest immediately. Some of the more advanced skills would only be needed as the IT environment made the transition from the primarily operational uses of IT to the more integrated, administrative uses. Therefore, the lack of database skills, for example, could not be expected to be a cause of concern until the need for databases was itself recognised as a matter of concern by (non-IT) management.

Having put this matter in perspective, it can now be said that, of the six categories of training – programming, systems analysis, advanced technical, user, IT management, non-IT management – all but one (non-IT management) required further enhancement before it could be considered fully adequate for the apparent needs of the civil service in the years ahead. (The Civil Service Training Centre, in conjunction with CITS, designed a non-IT management development programme in 1990/91 to address this weakness.)

This study found evidence of confusion as to what training is needed and by whom. CITS itself recognised this and established an interdepartmental working group in late 1989 to examine the issues in detail and formulate proposals. Arising from the working group's recommendations, a detailed policy package was circulated in 1991 requiring, *inter alia*, the creation of an IT training plan for each department. The package emphasized the need for co-ordinated training in each category, clear objectives, feedback from staff, integration with career planning, secure resources, and the need to monitor results in each target group.

IT Education as a Process

There is an understandable tendency, especially amongst non-IT managers, to view IT training as a once-off event. It arises from the mistaken notion that the introduction and use of new technology is a purely mechanical activity based largely on the application of techniques to problems. It fails to take cognizance of the range and variety of the problems to be solved, the changing nature of the technology, the importance of interpersonal communication, the variety and mutability of business needs, and the criteria to apply in determining what should count as the correct solution in any instance. Formal training is a component in the overall education process. The tacit dimension cannot be ignored, comprising on-the-job training and induction, experience with specific

technologies, quality of supervision, individual development history and future profile, as well as personal goals and expectations. This will hold, not just for technical specialists, but for the end-user as well. The latter's needs, being less specific, may be harder to identify in practice but, once known, should not be unduly difficult to satisfy.

Manpower Planning and Staff Recruitment

The civil service as a whole does not operate a formal manpower planning model or scheme. Its overall staffing levels are strongly determined by political factors. Recruitment policy is set in the main by periodic Government pronouncements and the Budget. In addition, the assignment of staff who have been recruited is often purely random. Career management in any strict sense does not exist. (In fact, at least one middle-sized department does not even keep a formal record of staff assignments.) Staff with particular talents or aptitudes are not identified, nor are they assigned to a career path likely to optimise their potential. While it is not without its merits, the practice of allowing career progression to develop in response to random influences has the effect of ignoring, or even burying, a lot of good talent. Frequent staff transfers within the general service mean that accumulated experience and expertise in particular areas are periodically drained off, with replacement staff having to acquire a competence from scratch.

The IT area is probably unique within the civil service in that individual officers with a particular talent or aptitude are actively sought out and reassigned to an area where their skills are jealously protected. However, other than in the sense that it endeavours to match existing skills with imminent applications development work, the IT area does not operate a formal manpower planning policy. While there are probably a few exceptions, skills levels are not monitored; there appears to be no inventory of prevailing levels of experience and expertise; turnover profiles are not clearly projected, nor is a close link maintained between the demand to fill vacancies or build up particular skills and the machinery for recruiting the necessary staff. Delays between approval to fill a post and the eventual recruitment of a suitable officer are common and can run into several months.

Blurring of IT Job Boundaries

Changes in technology have meant that the range of technical skills required in any large installation has increased, as has the range of applications in need of maintenance and development. Also, the need for non-technical skills has become more pronounced. As IT becomes more

pervasive, computer staff are expected to interact more with administrative and business staff, to speak their language, and to possess, in some instances, no small measure of interpersonal skills. On top of this, the traditional roles of the programmer and systems analyst are changing and distinctions between their respective functions are blurring. It no longer makes sense, in fourth generation, prototyping and common applications environments, to have analysts who baulk at programming or programmers who have no competence in analysis. The more systematic management of staff afforded by a relevant manpower policy would enable available resources to be deployed more effectively in a changing environment.

The introduction of suitable project management and systems development methodologies in some large IT centres is a positive step and one which goes some way toward addressing the questions raised above. As mentioned elsewhere, the use of common standards across departments is also very desirable.

Manpower policy must address the three main stages in the staffing cycle – recruitment, deployment and development.

Stage One – Staff Recruitment

The number of people with a healthy aptitude for IT work is relatively low. This implies that the service should strive to recruit staff from as wide a pool as possible. At present, both the AP/Senior Systems Analyst and HEO/Systems Analyst competitions are open to staff on scales with equivalent maxima, i.e., a wide range of grades. This ensures optimum participation. However, due to union pressure, EOs are not eligible to compete in the EO/Junior Analyst competition and, prior to 1990, the CO/Programmer competition was not open to grades other than CO or CA. This needlessly excluded otherwise suitable categories of staff. (The opening of the latter competition to all equivalent grades in 1990 was a useful step forward.) It is important that access to the IT area be made as wide as possible, particularly after a decade when levels of recruitment to the civil service generally were abysmally low and the pool of suitable candidates correspondingly reduced.

In order to keep its options open, it is recommended that IT management not restrict itself to recruitment from panels. Internal promotion and redeployment are often tenable options and provide greater flexibility. It also helps management if staff are retained who are already familiar with existing systems, standards, methodologies and practices within the organisation. Internal promotion also ensures that key performers are rewarded. This can be an important means of addressing local unrest, especially at a time when staff advancement is slow. The

option selected by management – panel, promotion, internal redeployment – depends on a number of factors, such as availability of staff, task specification, existing grade ratios, staff morale and the need to introduce fresh "blood" into the organisation.

Recruitment of Leading-Edge Skills

As mentioned earlier, management needs the latitude to recruit staff from a wide variety of sources. This includes a need to tap the open market if required. While this option may not always be desirable, if only because it may restrict the scope for providing existing IT staff with a suitable career path, it is a valuable recourse where unexpected skills shortfalls occur, mainly as a result of high staff turnover. Management should thus be able to recruit IT graduates, experienced specialists, contract staff and consultants, as appropriate. Such options should be used sparingly, in response to genuine needs. It is no longer realistic of staff interests to expect a total monopoly of IT assignments, especially when its commitment is seriously undermined in practice by a continuing high level of staff turnover. General management, increasingly dependent on pervasive and sophisticated computer systems, cannot afford to run unnecessary risks when the investment level is so high and the consequences of failure so far-reaching. Other public administrations have had to resort to facilities management and out-sourcing, that is the contracting out of all or part of the organisation's computing resources, as a counter to skills shortages and rising costs. Presumably, such an option in an Irish context would be far less agreeable to staff interests.

Unions may contend that, if management want to bolster the skills reserve in the IT area, they should simply increase the number of staff serving in IT. This has been the traditional, if limited, solution. IT is only one priority area and conflicting demands across the service generally create stiff competition for resources. IT has already benefited significantly during the 1980s: while many areas saw staffing levels fall by 15-20 per cent, the IT area grew by some 37 per cent (This should be compared with the 80 per cent increase over a five-year period sought by the Review Body.) IT managers cannot realistically expect this trend to continue through the 1990s, particularly in the face of ongoing pressures on government to contain public service staffing.

Selection Procedure for Entry to the IT Area

The success of a recruitment policy hinges on the mechanisms used to determine the suitability of staff for work in IT. It is understood that the aptitude tests used to select staff for IT work in the civil service in the late

1980s were broadly similar to those employed in the early 1970s. Given the extensive changes that have taken place in the industry since then, the continued reliability of such aptitude tests is open to question. Furthermore, the same test is used to determine the suitability of staff for *both* programming and systems analysis. Separate batteries would seem to be more appropriate. It is understood that changes are pending in this area.

An aptitude test can only reveal potential ability, namely, that the candidate is capable of carrying out the duties in question; it does not reveal whether he has the motivation to do so. This distinction is not lost on IT managers, who have found to their cost that otherwise promising recruits can lack the temperament for long hours at a terminal, working with others in an informal environment, communicating with users, persisting with a difficulty until it is resolved, and tackling problems on their own initiative and with little supervision. For these reasons, greater emphasis should be placed on personality factors in the competitive interview. It is considered that the susceptibility of personality testing *per se* to deliberate distortion by subjects would render it unacceptable to both management and unions.

Interviews

The interview forms the main element in the selection process. This is the experience, not just in the service, but in many of the larger semi-state bodies. However, the service did not possess formal guidelines for IT interviewers during the 1970s and 1980s, nor were objective criteria laid down by which candidates were to be assessed. It is recommended that such guidelines and criteria be introduced to ensure greater consistency in the selection process. In addition, interviewers should receive appropriate training.

Post-entry Assessment

The probationary period forms an important element in the selection process. Competitions for EO/JSA, HEO/SA and AP/SSA each specify a probationary period of twelve months, while the CO/Programmer competition specifies 6 months. It is considered that the latter may be too short to permit all new recruits to be successfully assessed, particularly as such a high proportion – up to three months – of the probationary period is devoted to formal training. It is recommended that this period be extended to twelve months in line with the period applying to the other grades mentioned. Payment of the programming allowance could still be made after 6 months, provided management were satisfied with the candidate's performance.

Staff found to be unsuitable, whether through a formal assessment programme or otherwise, should be immediately redeployed out of the IT area. This is in the best interests of both the organisation and the individual concerned. There have been many instances in the past where management lacked the resolve to do this or where staffing arrangements were too rigid to facilitate sideways redeployment.

Stage Two – Staff Deployment

The second stage in the education cycle is deployment. The objectives of a deployment policy should be:

(a) To ensure that all work areas have staff who are capable of doing the task on hand;

(b) To provide satisfactory cover for all areas in the event of staff losses and other emergencies;

(c) To develop skills and improve the motivation of staff.

While these objectives are complementary in the medium to long term, they can compete in the short term and in relation to individual assignments. In fact it can be argued that they will only become complementary if an effective deployment policy is implemented and constantly monitored. Such a policy would need to take full account of the following factors:

(a) A continuing high rate of staff turnover. Work schedules should be drawn up on the basis that a certain percentage of staff are going to be lost in any year. It is unrealistic to undertake new projects based on staffing complements and skill levels currently prevailing.

(b) The high proportion of staff devoted to maintenance work. While it is inevitable that this should continue, it may be wasteful of resources to permanently deploy skilled individuals on maintenance alone. There exists potential in some areas for re-calling staff from development work and assigning them temporarily to the task of carrying out enhancements and modifications to older systems. This dual utilisation of staff could enhance productivity in some areas and improve staff morale. Such an approach probably necessitates the effective use of a proven project management methodology.

(c) The tendency to assign the best staff to key areas and leave them there. This understandable practice has the drawback that mobility within the organisation is curtailed and the benefits which can be derived from bringing the most skilled and experienced staff into contact with newer recruits is much reduced. The morale of the better staff is also blunted by this practice. The tendency could also be counteracted to some degree by redeploying the managers themselves.

(d) The need to distinguish between the four main categories of staff in the context of a deployment policy:-
- the weak performers (who are likely to remain so);
- those who are capable of being developed;
- those who are unsuited to IT work;
- those who are suited only to certain types of IT work.

A positive deployment policy must be capable of identifying which category applies and, having accepted the reality, using the staff concerned to best effect.

In the light of these considerations, a deployment policy should endeavour to rotate staff on a regular planned basis, over and above whatever changes may be necessary as a result of staff departures. This will help distribute skills evenly across the organisation and allow the development of replacements for key personnel. Care would need to be taken to ensure that the cultivation of high-level skills in key areas is not disturbed by this approach. There should also be recommended periods of assignment to each work area and commitments to staff in this regard, wherever possible. Assignment procedures would need to be established to ensure that rotation takes place. An annual review by management down to AP level would assist in this process. Some kind of central monitoring of skills, assignments, and turnover would be necessary to support a deployment policy along these lines.

Stage Three – Staff Development

The third phase in the overall education cycle concerns career development. A number of factors have a direct bearing on how precisely any individual member of staff is to be developed: current work priorities and profiles, staff turnover, individual performance level, experience in existing areas of work, time available to release staff for formal training, staff morale, formal staff appraisals, etc. A realistic approach must

recognise that corporate needs will always be in competition to some degree with individual needs and that the former must take precedence.

Staff development ought to be based on the continuous growth of the individual; it is important that relevant skills acquired at an earlier stage are not allowed to atrophy. Management will need to be aware of all the elements which contribute to this process: formal training, on-the-job training, in-house coaching and supervision, workshops, seminars, learning groups, the circulation of technical and policy papers, etc.

On-the-Job Training

On-the-job training should also be planned. The more experienced officers should be encouraged to raise the expertise of their less skilled colleagues. The extent to which this is taking place should be monitored. This would help to identify potential trouble spots and reassure staff that management are aware of their needs. This brings into question the aptitude and ability of APs and POs themselves in managing the skills of their staff. Having grown up in a broadly technical, project-driven environment, few will have had much experience in dealing with person-related problems. Being more object-oriented than issue-oriented in their thinking, the niceties of staff relations may not be receiving the necessary attention. We have already noted (see Table 7.3 above) that APs receive significantly less formal training than any other IT grade. It is recommended that APs receive more formal training in non-technical areas such as staff management, interviewing, leadership, inter-personal and presentation skills. This is consistent with the now accepted view in many quarters that people are the key resource in the industry, and not hardware, software or whatever. The staff development regime at all levels should reflect this.

Development Paths

In addition to "upward" directed training, thought needs to be given to "outward" directed training. Where is the officer likely to work next within the organisation? What additional skills will he or she need to perform satisfactorily in that area? These skills may not be easy to acquire before transfer since, to be fully effective, the officer would need to apply them immediately. This raises the question as to whether there is a preferred deployment route within the larger DP centres, that is a series of assignments which complement one another and add progressively to an officer's skills in an effective and orderly way? Perhaps a few such routes exist. If these were identified and a route assigned to each member of staff, individual training schedules would be easier to chart.

A development path should seek to benefit both the organisation and the individual. The earlier recommendation on staff rotation would enable a training schedule to be carried into effect in a smooth and predictable way. It should also be possible to use an officer's period on maintenance work as an opportunity to acquire skills to enhance that task while also being of value in later assignments, e.g. effective management, interpersonal skills, etc.

Personal motivation is an important factor in overall development. Research studies have shown that traditional DP staff, as a vocational category, possess four distinctive characteristics:

(a) A tendency to be motivated by the job itself rather than its contribution to the organisation. This manifests mainly as a fidelity to the profession rather than to one's employer;

(b) A low need for "social interaction", that is for involvement with others in the working environment;

(c) A desire for good management, especially for regular feedback on their own performance;

(d) A high growth need. This implies a high level of frustration if the motivating potential of their work falls below their growth expectations.

Management would need to be aware of these factors when devising an overall education and development policy.

Why Material Change is Unlikely

For some, the key question is not how best to utilise staff but how best to convince managers that concrete policies are required to achieve this. The fact of the matter is that manpower planning and staff development policies in the IT area have not been significantly better than those applying in the civil service generally. In the absence of a wider ethos to effect better standards of staff management, the IT area is itself unlikely to develop beyond a certain point. As we have seen, an important part of an IT manager's role relates to the development of his own staffing cohort but if his perception of that role is not significantly better than that of his counterpart in the non-IT area, the effective implementation of manpower development policies is not assured. The primary task, therefore, would seem to relate to the re-education of middle managers generally, mainly at AP level, in good staff management and development practice.

Summary

This chapter identified the key factors bearing on the effective use of serving staff, the recruitment and development of suitable replacements, and the general environment in which manpower policies are expected to flourish. While IT training has not been well coordinated, standards have been maintained. This cannot expect to hold however as IT expands. Three factors – traditional strength, on-the-job learning, and after-hours study – have helped to smooth over difficulties encountered. There is an increasing need for high level technical training, more systematic user training, and targeted training for managers whose work impinges on the IT area. Management will need to recognise that IT training is not a once-off event, but a process which occurs gradually over time. The lack of a manpower planning ethos generally in the civil service hampers the cultivation of better practices in the IT area. As technology changes, the distinction between particular IT functions will become less pronounced, with staff requiring a broader range of skills to be effective. Standard environments, tools and methodologies will help optimise staff productivity and mobility.

Manpower policy must address the three main stages in the staffing cycle – recruitment, deployment and development. Management should endeavour to recruit from as wide a pool as possible and to employ selection procedures which ensure that, in addition to having the necessary aptitude for IT work, staff possess the necessary personal attributes and motivation for a career in IT. Unsuitable staff should be redeployed to an appropriate non-IT area without delay. Deployment arrangements should take a range of factors into account, reflecting the individuality of each officer, and rotate staff on a regular planned basis wherever possible. Staff development policy should address the career of each officer, and not merely the demands of projects arising. Wherever possible, suitable career development paths across the IT area should be identified.

Chapter 8

REVIEW AND CONCLUSIONS

Good information is needed, not simply in the formulation and implementation of government policies, but in assessing their level of success; the value of new technology in the civil service cannot be measured solely in terms of the benefits immediately accruing to each individual department. The machinery of government, and how it assists, monitors and regulates the economy, is heavily dependent upon the timely availability of accurate and relevant information, as well as the ability to use it effectively. The long-term success of IT will depend, not only on the attitude to the new technology, but on the greater availability of information *per se*. This pertains equally to information transfers between sections or divisions within a department, between departments, or to interested groups or individuals in the public or private sectors (subject to the provisions of the Data Protection Act). As has often been stated, more information is of little use if it is not properly disseminated. The attitude of civil service managers to the information they "possess" must continue to improve if the integrated benefits of IT are to be felt.

Progress with Computerisation

Progress with computerisation in the public service has been mixed and, on the whole, rather slow until the early 1980s. The availability of good quality microcomputers in recent years has helped considerably to stimulate interest in information technology among civil servants. Computerised support which would not otherwise have been attainable has been introduced in a wide variety of areas. Individual initiative has been conspicuously reinforced by the flexible, economic, reliable and self-contained nature of microtechnology. While mainframe and minicomputer-based solutions required investment, commitment and planning across a fairly wide front, microcomputers enabled individual managers to proceed independently, accepting full responsibility for the success or failure of a particular system. The greater availability of good quality packaged software has passed autonomy and greater competence to the end-user, freeing him for the most part from his traditional sense of dependency on the technical experts.

Phases of Growth and Change

There have been several identifiable phases in the growth of civil service computing:

I 1960-1968: Becoming Aware of New Technology

During this period departments were learning about the scope and nature of new technology. Awareness of its practical utility was low and few general managers would have regarded DP as anything more than a quantitative advance upon the earlier electro-mechanical devices for processing large volumes of data. Only a few departments – Revenue, Finance, Lands, CSO, Defence – showed any real interest in computing as a means of solving practical administrative problems. Revenue were conspicuous in this regard. The Interdepartmental ADP Committee faded from view, while the ADP unit in Finance became the main focus for civil service computing initiatives. It was clear from the mid-1960s that Revenue would proceed independently. There were indications that some of the larger departments, notably P&T, Social Welfare, Education and Agriculture, would introduce computing for a significant proportion of their clerical activities.

II 1969-1972: Devising a Long-Term Strategy

It was recognised that departments would be reluctant to depend upon an outside computer bureau service and that the next phase of growth would require the creation of a public service bureau. The Foster Report gave independent confirmation of this proposed strategy. Aside from P&T and Revenue, no department was considered sufficiently large to justify its own mainframe installation, and a strategy along the lines adopted by Lands and Defence was not thought practicable. Lack of local management support made such a strategy too risky in any event. Even the CSO, who surrendered their small leased machine in 1968, did not follow this road. A centralised strategy was adopted to reduce costs, maximise the utilisation of resources, and present departments with a convenient service, thereby overcoming their traditional resistance or indifference to new technology.

III 1973-1975: The Creation of Operational Centres

The CDPS installation was opened in Kilmainham in 1973. P&T also opened a centre in Dundrum in that year. Social Welfare installed two small computers with a processing link to Kilmainham. Revenue carried out a major hardware upgrade. The Local Government Computer Services Board was established in 1975. This period was one of optimism, with plans that had taken some years to formulate crystallising at much the same

time. It was confidently expected that the public service had at least sufficient computing resources of its own to comfortably cater for its data processing needs for the foreseeable future.

IV 1976-1979: Recurrent Set-Backs

A number of factors impeded the realisation of the goals set in the preceding years. Demand was higher than expected, especially from the Health Boards. High staff turnover was a continual drain upon CDPS experience and expertise. A growing percentage of experienced staff were being absorbed by maintenance as opposed to development work; the more original work the centre carried out, the more staff it needed to maintain the status quo. A policy of increasing CDPS processing power in line with, rather than in anticipation of, increasing demand restricted the normal expansion of the service. On top of this, changes in technology cast doubt over the desirability of an off-line batch processing environment as the best continuing solution to public service DP needs. The only major decentralised initiative over this period was in the Meteorological Service. Several departments which could have introduced a minicomputer over this period failed to do so. Paradoxically, the existence of CDPS served to some extent to dampen interest in computerisation since departments were content to feel that responsibility for this lay outside their walls. There was a perceived need to decentralise DP policy formulation, not just services and development. The job-creation programme in the late 1970s also deflected attention from automation. The wealth of available manpower, especially in the clerical areas, removed the primary motivation for resorting to computerised assistance, namely, pressure of work and inadequate time and resources to meet demanding schedules.

V 1980-1984: Review

A major review of computerisation in the public service was clearly required. The Review Body was appointed in February, 1980, and reported in May, 1982. The Government did not respond to its recommendations until March, 1984. Very little use was made of this lengthy period by departments to increase their use of information technology. The most notable initiative over this period was in Social Welfare (Revenue had been operating independently since the 1960s and would be little affected by the Review Body's recommendations). The 8 years between 1976, when the need for a revision in strategy was becoming apparent, and 1984, when the Government finally agreed to the Review Body's recommendations, represented an inordinately long period in both administrative and computing terms.

VI 1985-1990: Reorganisation and Devolved Responsibility

With each department being required to take full responsibility for its own IT strategic planning, from formulation to implementation, and the remarkable improvement, both in performance and cost terms, of office technology, this period was a very productive one. An ever increasing number of officers, from the largest to the smallest departments, were becoming familiar with and skilled in the use of new technology. The attitude of staff generally was receptive. Continuing restrictions on public service recruitment encouraged managers to find new ways of coping with the steady volume of work. A major recommendation of the Review Body – the separation of the executive function (CCS) from the advisory and policy formulating function (IMAS) – was turned on its head with the reintegration of the two bodies in February, 1989. The Computer Control function, which sanctioned all IT-related expenditure, continued to operate independently of CITS but with continued close reference to the IT strategic plans developed by departments, usually in conjunction with CITS. Departments were becoming more aware that computing facilities were not an optional or random feature of public administration but an integral element in the range of considerations which every manager must address when tackling efficiency, effectiveness and performance at the workplace.

Phases I-III above are partially reflected in phases IV-VI. In each cycle there exists three steps: (re)evaluation of the existing position; formulating a suitable long-term strategy; implementation of that strategy. A closer examination of developments in the two main computerised departments (Revenue and Social Welfare), plus developments in Local Government, may be found in Appendices N, O, and P, respectively.

Organisational Effects

The organisational effects of data processing over the past twenty-five years have been fairly low key. On the whole IT has not penetrated to the core of departmental thinking; aside from CDPS and P&T, only Revenue, Social Welfare, the Meteorological Service and, possibly, the CSO, had made serious and consistent moves over time to exploit the new technology. They are, therefore, the only parts of the civil service where computerisation could have resulted in any significant shifts in management power. All other computer developments have occurred within an existing local political framework. There is no evidence, outside of the areas mentioned, that computerisation has advanced the power and internal influence of one lobby or group of managers at the expense of another. Given the nature of microcomputers and the localised, autonomous manner in which they can be developed and exploited, major

power shifts within departments in the years immediately ahead are unlikely. Even the increased prominence of integrated networks is unlikely to confer significant new privileges on an information or technological elite in the short term. The increased use of IT in the longer term, however, will gradually lead to a number of organisational shifts across each department and a consequent redistribution of power and influence. Nevertheless, given the relatively small size of most Irish government departments and the pervasive nature of Ministerial and political involvement in the day-to-day running of most of them, the implications of this redistribution should be mainly to conserve the status quo. It is unlikely that IT will bring into prominence many new voices which would not otherwise have been heard, nor remove much power and influence from those who would otherwise have reached positions of authority. Most changes of this nature will result less from the technology *per se* and more from the importance of certain intellectual and personal attributes which the increased use of IT will accentuate.

IT has been primarily a conservative force within government departments, serving in the main to reinforce the status quo. It can even be argued that in some cases IT has served to curb administrative reform by enabling more complex operations along traditional lines to be given effect. For example, the tax code could never have risen to its existing pitch of complexity were it not for the reliability of the technology which underpins it.

Principal Characteristics Over Time

A more broadly based attempt to crystallise the growing pains of computerisation in the public service over this period, with an identification of the main characteristics, would break down roughly as follows:

Management-Related

- The introduction of computer applications primarily to meet pressing and immediate needs rather than to optimise performance or to anticipate future needs;

- The persistent belief that computerisation only improves the efficiency of certain parts of the administrative process, without necessitating a fundamental revision of that process;

- A reluctance among many senior and middle managers to regard computer technology as an integral part of the public administrator's armoury;

- Growing evidence that greater top-level management support was essential if a computer system was (a) to get off the ground and (b) develop to its full potential;

- A superficial understanding by general managers and users of the time-consuming and labour intensive nature of many technical problems, including "minor" ones, in the DP area, which often led to impatience, frustration and loss of confidence in DP generally;

- A tendency by managers, both general and IT, to underestimate the amount of dedication and hard work required to implement and maintain a successful computer system and to overestimate the volume and throughput that can realistically be expected;

- A certain lack of communication between management in the main DP centres.

Organisational/Structural

- The difficulty of co-ordinating developments from the central departments or developing an overall strategy due to the semi-autonomous nature of departmental functions;

- The difficulties a centralised service has in responding flexibly and in good time to the wide diversity of needs of a large and dispersed user base;

- The constraints imposed on long-term planning by an annual budgetary cycle. (The introduction of 3-year administrative budgeting in 1990/91 signals a significant departure from the traditional approach.)

Staff/Skills Related

- A debilitating loss of skilled staff;

- The high proportion of experienced staff required to maintain existing systems;

- Delays in filling DP vacancies and (unavoidable) delays in training in new recruits;

- The absence of a more appropriate grading structure for DP staff (The Review Body did not recommend that this be changed in view of the

more decentralised nature of computing in the 1980s and 1990s and the more prominent IT role to be played by general managers);

- A reluctance in some areas to employ outside skills (consultants, contract staff).

Political

- A lack of appreciation by elected representatives of their role in promoting IT and accelerating its co-ordinated dispersion throughout the public service; this factor is reflected in the low political status accorded to the Devlin Report, which included an IT dimension;

- Difficulties and delays in securing important decisions, even at Government level.

These should certainly not be construed as a compendium of faults – which they are not – but regarded, rather, as a catalogue of the growing pains of a large and complex organisation as it strives to evolve new ways of handling information and come to terms with a rapidly changing environment. An analysis of IT in other public service structures in Europe and America over the same period is unlikely, given the evidence currently available, to be significantly dissimilar. The characteristics are most evident in phases I-V detailed above. Phase VI, "reorganisation and devolved responsibility", which commences around 1984/5, witnessed a changing attitude to IT and an upswing in management awareness. For the first time non-IT management were taking a serious look at new technology. Also, the technology itself underwent a major transformation. The microcomputer revolution presented a range of technical alternatives which were more congenial to a civil service environment. The shift away from mainframe- and mini-based technologies made it very much easier for managers to control all elements of the IT solution at a local level. Costs were significantly lower. The 1980s also saw a marked reversal in civil service staffing policy, with a nett drop of 15-20 per cent over a period when IT staffing increased by some 37 per cent. The Review Body played a valuable role in recommending structures for promoting the more effective use of IT. The 1980s also saw an increase in Ministerial awareness, manifesting principally in the White Paper on the Public Service. This improved attitude led to a very significant increase in the investment in IT and a heightened expectation of the benefits that should accrue. Government business had become significantly more dependent on IT, with investment in the 5 years to 1990 being 2.4 times greater in real terms than in the same period to

1980. An indication of the strides made during the 1980s is the fact that the Irish civil service was among the first in Europe to introduce an inter-departmental electronic mail and document transfer facility (end-1989).

Outlook for the 1990s

The 1980s ushered in a marked upturn in the fortunes of IT in the civil service. What can be expected for the 1990s? The survey of management (late 1986) referred to earlier found that most of the improvements suggested by managers, both general and IT, have since been introduced or are being developed, *viz.* the establishment of a dedicated IT Support Unit in each Department; a tiered programme of IT courses for all general service managers; greater emphasis on end-user computing; more competitive levels of remuneration for DP staff; greater investment in computer hardware; and the setting up of an inter-departmental IT committee to monitor and co-ordinate the introduction and use of new technology across the civil service.

What changes will characterise the 1990s? Given progress to date and current trends in the IT industry, one could expect developments along the following lines:

Organisational

- A continuation of the trend towards the devolution of responsibility for all IT services to individual departments. This will almost certainly lead to changes in services and the level of specialisation within CITS (For example, the bureau service provided by CITS is being phased out and is scheduled to shut down completely by end-1993);

- The traditional organisation of departmental activities along functional lines will gradually cede ground to more elastic organisational arrangements. More functions will be mixed than hitherto, with geographical considerations playing a lesser role in the deployment of general administrative staff;

- There will be a blurring of job boundaries and definitions in many areas, with fewer layers in the reporting hierarchy;

- Improved co-operation and communication across public sector agencies on the use of IT and the improvement of services;

- Growing pressure from the central departments for direct access to the databases of line departments and even state agencies, leading to possible conflicts in relation to control and regulation;

- Decentralisation is facilitated by IT telecommunications which contain costs while supporting timely communication. The 1990s will more than likely see a continuation of the trend towards decentralisation in the late 1980s.

Systems and Information

- Subject to the necessary safeguards, greater lateral integration of existing systems to improve the availability and value of information (The proposal to introduce a National Identifier, announced by the Government on 18 October 1991, would give a valuable fillip to progress in this area. The ID would be based on the extension of the current Revenue and Social Security (RSI) number system to every resident in the state);

- A trend towards greater vertical integration as the principle of information as a commodity becomes more acceptable to top management;

- The gradual development of decision support systems for higher management;

- A greater exchange of information between departments, leading in time to a greater openness in the access to information;

- The greater transfer of data from paper to electronic media, particularly as the cost of storage media continues to fall;

- The introduction of more user-friendly interfaces, particularly for senior managers.

Management-Related

- An expansion in the role of the IT manager and an increase in his/her status within the department;

- A greater emphasis on cost effectiveness and value from IT, with more formalised arrangements for assessing the return on investment;

- Better co-ordination and support of IT training at all levels, whether management, specialist or end-user;

- Greater awareness by the public of their rights under the Data Protection Act and the introduction of tighter security procedures by IT managers, both to observe the Act and to guard against the growing risk to corporate systems posed by viruses and hackers;

- A better understanding, both among general managers and among IT personnel, of the limitations of IT;
- Greater recognition of the need to adopt an inventive and imaginative approach to the development of relevant applications to address existing and latent management needs. This is a challenge, not just within the civil service, but across the industry generally. The 1970s and 1980s could rely on users to identify ways in which IT might assist them. There will be appreciably less scope for this in the 1990s.
- A better understanding of the role of the business analyst and the on-going need for impartial, informed strategic advice coupled with business expertise.

Technical/Developmental

- Greater standardisation of technical architectures, information formats, methodologies, and a range of software development tools;
- Continued support for the ideal of open systems and multi-vendor environments;
- The establishment of a well tested methodology for the creation and enhancement of corporate databases;
- A diminishing emphasis on traditional programming languages, in particular COBOL;
- The greater use of prototyping in the design of new systems, resulting in shorter development cycles, greater user involvement and satisfaction, more input at senior management level, and improved productivity.

Staffing

- A more fluid IT staffing structure, with more options being available to management regarding how precisely the IT function should be organised;
- Continuing difficulties in maintaining an adequate level of technical expertise in the face of high staff turnover.

Recommendations

Several of the following recommendations have implications which could qualify them for inclusion in more than one category. The reader is asked to bear this in mind. Also, while many are of a concrete nature, with specific objectives, others are somewhat aspirational, deriving in part from

the need for a large organisation to have a basic philosophy for the effective management of change. Some of the recommendations are already under consideration in a few areas and may even be in course of implementation.

It should be understood that implementation of each of the following recommendations would be subject to prevailing Government policies in relation to strategic development, pay and conditions generally. This may necessitate in some instances a closer examination of the cost implications involved, notably those arising, or likely to arise, outside the IT area. Such wider implications may be a constraining factor in some cases.

Staff Related

(a) IT staffing levels should be maintained, with additional posts created wherever significant improvements in effectiveness or necessary off-setting savings have been identified. It is unlikely though that IT staffing can expand in the 1990s at the same rate that it did in the 1980s because (a) public service staffing constraints, including competition from managers in non-IT areas, will continue to be a real limiting factor and (b) much of the expansion in the 1980s was in response to the need to establish a minimum infrastructure across the service.

(b) Staff in the IT area with essential technical skills and experience should be remunerated with greater reference to outside employments. It is impossible to be more specific than this, given the rigidities inherent in public service pay arrangements. The introduction in 1990 of an IT gratuity scheme for certain skilled staff, albeit on an experimental basis – the scheme has a three-year review clause – was a valuable step in this direction.

The recent recession has blunted marketplace demand for IT staff. This would suggest that any remuneration additional to basic pay should vary by reference to the prevailing rate of turnover across all departments, with periods when rates were below an agreed level attracting no additional financial incentive.

By permitting greater flexibility in remuneration arrangements, the introduction of a separate grading structure for IT staff would be a useful contribution in this context. However, as neither management nor staff interests have exhibited much appetite for such a major organisational change, it would be unlikely to attract the (significant) level of support needed for successful implementation. It is important to remember that civil servants have traditionally had a "cultural" resistance to any preferential pay arrangement for staff with particular expertise. This conservatism, which is reflected in the public service

pay structure and review mechanisms, will undoubtedly constitute a severe practical impediment to any material alteration in existing IT pay arrangements.

(c) Given that (1) IT staffing levels are unlikely to continue to expand at the rate seen in the past ten years, (2) the likely continuing high rate of turnover amongst the most skilled and experienced staff, (3) the increasing dependence on IT for the day-to-day running of government departments, and (4) the need to maintain an uninterrupted reserve of high level technical expertise, it is recommended that replacement IT staff be found from as wide a range of sources as possible. This means opening IT competitions to as many grades as possible and securing suitable recruits from the open market. IT graduates, business graduates, experienced contract staff and consultancy fall into this category. However, such a recourse should be purely in response to unavoidable or unforeseen shortfalls within existing IT staffing resources. Care should be taken to minimise the possible negative effects of this strategy on the careers of existing permanent staff.

(d) A sizeable proportion of all turnover in IT staff is to areas within the civil service but outside of IT, usually on promotion. This is a very significant "loss" of valuable skills. Even allowing for the fact that some of these staff will no longer wish to pursue an IT-related career, there would appear to be scope for utilising this resource more effectively. More systematic efforts should be made to identify non-IT staff with computer-related skills and education, with a view to redeploying them into the IT area or into key user/management areas. This includes staff who may have had no IT-related work experience but who nevertheless have undertaken IT-related studies after working hours.

(e) There would appear to be an under-representation of female staff in the higher IT grades (EO and up). The continued existence of this phenomenon should be independently verified and measures adopted to redress any imbalance identified. A possible lack of interest by female staff in computing as a career is a material loss to the IT area.

(f) Careful attention should continue to be placed on the cultivation of the skills needed to exploit the latest software development tools, as well as skills in such volatile areas as telecommunications, networking and database design. The cultivation of such skills implies the introduction of measures to ensure that a minimum level of expertise is always maintained. Without some formal degree of manpower

planning, the retention of strategic or critical skills is difficult to assure. The absence of manpower planning in the civil service as a whole has already been noted. (See also the recommendation below on technical streaming.)

(g) The existing policy of recruiting a proportion of staff via the clerical grades should be continued. It has worked well in the past and is consistent with the recommendation that recruitment be from as many sources as possible.

(h) The increased accent on the business dimension of IT necessitates a review of selection procedures. Oral and written methods of selection should be consistent with the shift in the industry towards a more widely based set of personal attributes, viz. management potential, interpersonal skills, presentation and communication skills, leadership and teamwork skills, inductive and business reasoning, self-motivation, etc.

(i) The career break option should continue to be withheld from IT staff.

Training/Skills

(a) IT training plans should be drawn up and implemented by all departments, particularly the larger ones, to coordinate training in the three main categories – technical, user, general manager. This proposal would work best within the context of a wider training plan for each department.

(b) Suitable systems development and project control methodologies for the civil service should be identified and promoted as standard. A proliferation of methodologies and standards should be avoided.

(c) The IT development programme for general managers should be fully developed and marketed.

(d) After-hours IT courses attended by serving staff, whether in the IT area or not, should continue to be subsidised and encouraged.

(e) Ideally, user training should be spread over time: "a little and often". The role of the key user in relation to both local support and applications development should be emphasised.

(f) Staff development or career paths should be identified wherever possible and staff mobility effected on a planned rather than a reactive basis.

(g) Standard criteria should be established for the post-entry assessment of all new recruits. Candidates who fail to reach the qualifying standard should be immediately redeployed outside the IT area.

Management Related

(a) Every new system should, as far as possible, be subject to a post-implementation review to ensure that the benefits and savings which originally justified its introduction have actually being achieved. The lessons learned from such reviews should influence decisions regarding the use of IT in other areas.

(b) IT managers at AP level would benefit from more non-technical training in such areas as business analysis, staff management, staff development, teamwork, leadership, and communication. Despite the seemingly trendy nature of this recommendation, there is a clear need for managers at that level to have the skills necessary to fully utilise the staffing resources at their disposal and to liaise effectively with users and local management.

(c) There should be a policy of full consultation with prospective users regarding the introduction or enhancement of computer systems before making irrevocable decisions which bear directly on their daily activities.

(d) IT managers participating on interview boards should receive some formal training in interviewing techniques and conventions (which is not the case at present). Ideally, objective assessment criteria for the selection of candidates should be established.

(e) Some "model" sites or applications should be identified to demonstrate to general managers the nature and benefits of applied technology.

Organisational

(a) The traditional rigid distinction between the programming and analysis stream should be dropped and greater emphasis placed on the integration of such skills so as to maximise the use that can be made of modern software development tools. In practice the gap between the two streams has been bridged to some degree by the introduction in 1989/1990 of direct promotion from CO or SO to EO. This is a positive development.

(b) Consideration should be given to the creation of a separate technical stream for a small proportion of highly skilled IT staff with a view to providing a long-term, specialised career path. The percentage of staff falling into this category would be quite small (less than 2 per cent-3 per cent) and would exist only in the large data processing and support centres.

(c) Consideration should be given to the introduction of binding minimum-service contracts for all new IT specialists. At present some

officers are leaving for the private sector within weeks of receiving expensive technical training. When salary and other overheads are taken into account, the aggregate cost of training IT staff to full proficiency can be considerable. It is unreasonable that such individuals can depart without being required to give an adequate return on this investment.

(d) The EO grade is the key grade for the future. The traditional accent on the CO/Programmer and HEO/Systems Analyst as the principal entry grades to the IT area should be reduced. It is recommended instead that a strategy be adopted which makes optimal use of the EO grade. A greater proportion of HEOs should be drawn from the ranks of experienced EOs in the IT area. Also, at present, EOs serving outside of the IT area are not allowed to compete in interdepartmental competitions for EO/Junior Systems Analyst. This anomaly should be removed.

(e) The smaller departments and offices will continue to require assured technical support from a central agency such as CITS. Future organisational arrangements should continue to recognise this requirement.

(f) There will be an on-going need to co-ordinate IT strategies across the service, to optimise the use made of existing IT, and to identify new opportunities. For these reasons, departments, supported by CITS, should continue to carry out multi-annual planning reviews. The scope for linking this activity into a wider management review process should be examined.

(g) There is evidence to suggest that certain IT staff may be spending a proportion of their time on duties completely unrelated to the IT area. It is recommended that this practice be discontinued.

Financial

(a) There is evidence that rates for hardware maintenance in the mid-1980s may have been unduly high in some instances. It is suggested that current rates be collectively reviewed and consideration given to the possibility of securing support from alternative sources. There is no reason why competitive tendering should not apply in this area.

(b) In the 5 years to 1990 (inclusive), the ratio of systems costs to staff costs was 2:1. While a standard investment level may not exist within the industry, some commentators consider a long term ratio of 1:1 more acceptable. Expenditure on systems is of little value if the necessary staff (and skills) are not available to utilise it. While conservative management practices and public service pay rates may

account in part for the existing ratio, there would still appear to be scope for improving the balance between staff and systems costs. This question should be given closer examination.

(c) Co-operation with the introduction of new technology has been the norm in the 1980s. Several special pay awards included recognition of this fact. However, the allowance paid to CA/Typists for performing word processing duties is an anachronism and should be discontinued for new recruits or incorporated into the pay-scale.

Technical

While specific recommendations in relation to purely technical matters lie beyond the scope of this report, it is considered that the open systems policy should be pursued to its maximum extent. Besides leaving departments exposed to the potentially restrictive pricing, technical and other policies of a single vendor, the closed approach limits the mobility of staff, the sharing of expertise, and skills development.

Prospect

Given the factors and considerations already identified, the recommendations notwithstanding, the shape of civil service IT in the 1990s will be most strongly influenced by (i) the extent to which senior non-IT management involve themselves in the complex process of maximising the contribution of IT to the overall business needs of the department and (ii) the extent to which fundamentally new applications of IT can be identified. These will both be influenced by the extent to which the newly introduced devolved administrative budget arrangements, which put the onus on departments to manage their own financial resources within guidelines laid down by the Department of Finance, will stimulate a more critical examination of local IT investment and infrastructure. Given that many of the benefits of IT are either difficult to quantify or are unrealisable in the short term, there is a distinct possibility that further investment could be curtailed in the pursuit of more pressing objectives. The continuing crisis in the public finances would only exacerbate this factor. In one plausible scenario, a combination of these factors could see a contraction in IT investment in real terms across several departments for part of the 1990s with corresponding implications for IT staffing and organisational arrangements.

APPENDIX A

WORK PROCESSED IN CDPS AT REGULAR INTERVALS DURING 1979 (FOR SYSTEMS DEVELOPED BY OR WITH THE HELP OF CDPS)

Health Services
Payroll, Disablement Allowances, General Payments, Expenditure Analysis, Cheque Reconciliation – all for Health Boards and Hospitals;
Farmers' Health Contribution collection for N-W Health Board;
Payment of Doctors & Pharmacists under "choice-of-doctor" scheme for General Medical Services (Payments) Board;
Medical Card Registration for Eastern Health Board;
Hospital In-Patient Information System for Medico-Social Research Board;
Index of Births & Adopted Children for General Register Office;
Health Services Personnel Census and other surveys for Department of Health.

Social Welfare
Disability Benefit;
Maternity Benefit;
Pensions (to pensioners resident in the UK);
Record keeping and payment of above benefits, including Pay-Related Benefit element and calculation of PRB for Unemployment Benefit;
Bank Reconciliation;
Treatment Benefit;
Occupational Injury Benefit;
Central Records – some elements.

Justice
Garda Payroll;
Stolen Vehicles;
Garda Work Survey;
Crime Reporting;
Imprest Control;
Prison Officers Payroll;
Firearms Registration;
Garda Duty Analysis;

Criminal Records;
Dublin Garda Parking Fines system.

Finance
PMG Bank Reconciliation

Public Service
Staff Information System;
Calculation of pensions and pay scales following pay awards.

Forestry
Labour Analysis;
Machinery Reporting.

Civil Service Commission
Main Examination system;
Short Answer Paper system.

Labour
Manpower Surveys;
Surveys of Second-Level School Leavers.

Tourism & Transport
International Road Haulage Statistics.

Environment
Vehicle Registration;
Dublin Corporation – on-line rates collection & accounting;
Valuation Office – Cork Corporation & Kilkenny County Council integrated system for updating valuation lists.

Defence
Army Payroll;
Bank Reconciliation;
Military Pensions;
Payroll for civilian employees.

Education
Payroll and teachers' records system for Primary Teachers;
Payroll and some personnel information for Secondary Teachers.

Central Statistics Office
Agricultural Wages Survey;
Agricultural Structure Survey;
Census of Glass Houses;
Employment & Earnings Analysis;
Planning Permissions Analysis;
Consumer Price Index;
Household Budget Survey;
Labour Costs Survey;
Vital Statistics;
Licensed Hauliers Inquiry;
Size of Herd Analysis;
Census of Population;
Orchard Fruit Survey;
Motor Registration Analysis;
Central Register of Builders;
Retail Sales Index;
Income Redistribution Analysis;
External Trade Statistics;
Labour Force Surveys;
Tourism Inquiry;
Survey of Industrial Enterprises;
Randomness tests of successful Prize Bond numbers;
Central Register of Business in the Distribution Sector.

Agriculture
Beef Intervention;
Brucellosis Eradication;
Farm Modernisation Scheme;
Headage Payments Scheme;
T.B. Eradication;
Beef Classification Scheme.

Industry, Commerce & Energy
Import Surveillance.

Foreign Affairs
Issue and control of passports.

Civil Service Payroll
System installed for the following Departments/Offices: Labour; Justice; Agriculture; C&AG; Environment; Fisheries & Forestry; Foreign Affairs; Health; Industry, Commerce & Energy; OPW; Social Welfare; Stationery Office; Tourism & Transport; Valuation & Ordnance Survey.

In addition to the foregoing systems which were processed at regular intervals, the CDPS facilities were used by the following agencies for research, education, planning, etc. purposes:
Office of Public Works;
Forest & Wildlife Service;
National Economic and Social Council;
Central Bank;
Central Statistics Office;
Geological Survey;
Department of Finance;
Department of the Public Service – Operations Research;
Department of Education;
Waterford Regional Technical College;
Dundalk Regional Technical College;
Department of Agriculture;
Institute for Industrial Research and Standards;
The Economic and Social Research Institute;
St Patrick's Training College;
National Board for Science and Technology;
National Manpower Service;
Foras Forbartha;
Dunsink Observatory;
National Institute for Higher Education.

APPENDIX B

PROJECTS UNDERTAKEN BY CDPS IN 1979

Client Department/Agency	*Project*
Agriculture	Beef intervention.
Public Service	Staff Information System; Historical pay scales system.
Tourism & Transport	EC transport statistics.
Stationery Office	Computerisation of payroll.
Finance	PMG bank reconciliation; Processing of unemployed persons on Pay-Related Benefit survey; Installation of economic modelling package.
Justice	3 x Garda information system; Fines on the spot system; Magistrates Court system for Dublin Metropolitan Courts; Land Registry system; Interim general payments and financial analysis systems.
Social Welfare	UK pensioners system; PRSI and Central Records system; Automation of employment exchanges; Enhancements to treatment benefits system.
Foreign Affairs	Passport Office system.
Labour	NMS job placement system.
NBST	Implementation of EC energy model.

Valuation Office	Market value records system.
All Govt. Depts.	Standard cheque production and accounting system.
Health	Computerisation of payroll; Survey of orthopaedic in-patients; Revised survey of peri-natal mortality; New drug survey.
GMS (Payments) Board	Revised/enhanced payments system.
Health Boards	Interface system between Paid Cheque and Cheque Reconciliation systems; Revised/enhanced general payments system.
James Connolly Memorial Hospital	Implementation of general payments and expenditure analysis systems.
Dublin Voluntary Hospital	Stores control & accounting system.
Eastern Health Board	Revision of medical card registration system.
Southern Health Board	Revision of medical card registration system.
Health Boards and Voluntary Hospitals	Improved payroll system; Payroll history system; Plant/equipment register.
North-Western Health Board	Farmers' Health Contribution system; Assistance on development of financial/ accounting systems.
Various Health Boards	Revised disability payments system.

APPENDIX C

SUMMARY OF COMPUTER SYSTEMS IN DEPARTMENTS AND OFFICES AT MID-1988

This is not an exhaustive inventory of all computer systems/ applications/ packages in every department. For instance, it does not detail the full extent to which networked systems are being utilised in some departments. Neither does it detail the use of word processing systems throughout the civil service, whether by dedicated word processing staff or by executive/managerial staff using desk-top workstations. Telephone and flexi-time monitoring systems are also excluded. The summary does, however, give a fairly comprehensive picture of the extent to which IT has penetrated all departments and offices.

In this inventory, "system" can denote anything from standalone PC to mainframe applications. The number of "systems" in any department/ office cannot, in itself, be taken as a reliable indicator of the extent or importance of computerisation in that department/office. Systems are not listed in priority order.

Agriculture
Beef Intervention (batch & on-line)
Farm Improvement/Modernisation
Cattle Headage validation & payment
Suckler Cow validation & payment
Sheep Headage validation & payment
Ewe Premium validation & payment
Cereal Statistical Analysis/DUS Testing
Potato Register & Potato Trials systems
Biochemical Analysis (Abbotstown)
Minister's Office filing system
Animal Health System (local offices)
Land Commission (batch)
Emergency Schemes
Accounts System
Flock Recording
Grass Variety & DUS Testing

Calving Survey
Tully Performance Test
Statistical Summaries
Dairy levy/fees system
Personnel records
Marketing Inspectorate system
Training Centre system
Economic Unit (analysis)
Beef Cow validation & payment
On-Line Enquiry system
Calf Premium System
Sheep Progeny Testing
Butter Intervention
Beef Progeny Analysis
Pig Carcass Analysis
Livestock Statistical Analysis
Veterinary Inspectorate system
Monthly EC (cereals) accounts
Monthly EC (FEOGA) accounts
Horticulture Inspectorate system
Secretary's Office filing system

Civil Service Commission
LAC On-line Enquiry Index
Precedents Register
List Processing
Tele-reception system
OMR Scanning

CSO
Census of Building & Construction
Labour Cost Survey (Distribution, Industry & Building)
Quarterly Agricultural Enumeration
Road Freight Survey
Census of Distribution
Industrial Production Index
Size of Herd Analysis
Agricultural Wages Survey
Labour Force Survey
National Accounts
Household Budget Survey

Census of Industrial Production
Employment & Earnings Inquiries
EC Farm Structure Survey
Census of Population
CPI Quarterly
Retail Sales Index

Central Computing Service (now CITS)
Microcomputer Training
Systems Development Methodology
Administration system

Work processed on CITS computers (Note: there may be some duplication between the following applications and those listed separately for individual Departments):-

1. HEALTH SERVICES
   Payroll for Health Boards & Hospitals
   Disablement Allowances for Health Boards
   General Payments
   Expenditure Analysis
   Cheque Reconciliation and Plant/Equipment Register for Health Boards & Hospitals
   Farmers' health-contribution and employment levies and collection system for North Western Health Board and Mid-Western Health Board
   General Medical Services (Payments) Board:
   Payments to Doctors and Pharmacists under "choice of doctor" scheme
   General Medical Services (Payments) Board:
   Statistical Analysis of GP visiting and prescribing patterns
   Medical Card registration for Health Boards
   Medico-Social Research Board - Hospital in-patient enquiry system
   General Register Office - Index of births, index of adopted children
   Health Services Personnel Census and other surveys for Department of Health
   Peri-natal Information System for Department of Health
   Children in Care statistics for Department of Health

2. JUSTICE
   Garda Payroll
   Prison Officers' Payroll

General Payments and Financial Analysis
Standard Accounting System
Imprest Control System

3. FINANCE
PMG Bank Reconciliation
PMG Receipts
Payment of PMG Pensions
Valuation Office - Valuation Lists system
Staff Information System
Pensioners Information System

4. TOURISM, FISHERIES AND FORESTRY
Labour Analysis System
Machinery Reporting System

5. CIVIL SERVICE COMMISSION
Examination System

6. LABOUR
Job Seeker/Job Vacancy Statistics
Job Placement System for NMS (East Region)

7. COMMUNICATIONS
International Road Haulage Statistics

8. ENVIRONMENT
Vehicle Registration
Dublin Corporation on-line rates collection and accounting system
House Purchase Statistics

9. DEFENCE
Army Payroll
Military Pensions
Bank Reconciliation

10. EDUCATION
Payroll and teachers' records system for Primary Teachers
Payroll and some personnel information for Secondary Teachers
Payroll for Substitute Teachers

11. CENTRAL STATISTICS OFFICE
Various data collection and aggregation systems in the following areas: agriculture; building; industry; distribution; prices and labour costs; external trade; demography; transport and tourism

12. AGRICULTURE
Beef Intervention
Brucellosis Eradication
TB Eradication
Pedigree Cattle Recording

13. INDUSTRY AND COMMERCE
Import Surveillance

14. FOREIGN AFFAIRS
Issue and control of passports
Standard Accounting System

15. CIVIL SERVICE PAYROLL
Payroll system installed for the following Departments/Offices:-
Labour; Justice; Agriculture; Finance; Comptroller and Auditor General; Education; Environment; Tourism, Fisheries and Forestry; Foreign Affairs; Health; Energy; Industry and Commerce; Office of Public Works; Social Welfare; Stationery Office; Communications; Valuation and Ordnance Survey; Defence (including Army civilian employees); An Bord Pleanala.

16. In addition to the foregoing systems which are processed at regular intervals, the CITS computer is used by the following agencies for research, education, planning, etc. purposes:
OPW; Tourism, Fisheries & Forestry; CSO; Finance; Education; Agriculture; Health; Geological Survey; Central Bank; ESRI.

Communications/Tourism & Transport
Planning Unit financial analysis, etc
Civil Aviation analysis/monitoring
Aeronautical Message Switching (Shannon)
Licensing renewal system
Bandwidth allocation system

Comptroller & Auditor General
Audit File Control
Library cross-reference
Audit programme development
Work returns
System for importing and analysing data from other computer systems.

Defence
Army Payroll, Pensions, Reconciliation
Army Personnel System
Work processed on PC LANs in four locations

Education
Teachers Pension Calculation
Substitute Teachers (Primary) Payroll
Post-Primary Psychological Services
Planning Section financial file/schools database
VEC financial & personnel database
Educational packages using Eirpac comms.
Primary Branch PQ/Filing database
Accounts Branch system
Primary Teachers Payroll
Primary School Grants
Policy Analyst System
Vocational/Financial System
Higher Education Grants
Secondary Teachers & Dept. Payroll
Statistics System
ESF/Colleges (Financial) System
Building Unit System
Library database

Energy (includes Forestry)
Comprehensive Oil Market Information & Reporting system
Semi-State Bodies: financial models
Energy Information System Project
Oil Exploration Licences
Gas & Electricity Projects
Geophysical Mapping
Industrial Payroll (Forest Service)

Environment
Housing Policy & Finance Statistics
Sanitary Services current capital works & payments
Housing Construction weekly payments
LA Registers: salary scales & staff numbers
Environmental Inspectorate Statistics
LA Estimates Booklet production
Constituency Boundaries Analysis
Housing Grants
Vehicle Registration Unit
Minister's Office
Rents Tribunal
Dept. Estimates
Accounts (Dept. subheads)
Motor Taxation Accounting
Minister of State's Office
Roads Policy: Statistics
Desktop publishing

Finance
Foreign Borrowing/Debt Management
Civil Service Superannuation Vote Control
National Debt
Top-Level Appointments
Payroll & Pensions
Economic Analysis/modelling
Forms Design
Superannuation Legislation
Estimates system
Salary Scales system
PRSI/Tax/Oil models
PMG Receipts
Vote Control (S/H A)
Staff Information System

Foreign Affairs
Admin. of Bilateral Aid Programme
Data Processing (visa applications etc)
Passport Office System

Stock Control and other DB applications
Budget preparation/Monitoring
Accounting System

Garda Siochana
BRS/Search
Fines on the Spot
Criminal Records
Criminal Intelligence
Suspect Vehicles
Crime Statistics
FOTS Persistent Evaders Report
FOTS Vehicle Ownership Certs
NVF Update
NVF Search using Partial Information
BRS/CABS
Firearm Registration
Missing Persons
Stolen Vehicles
National Vehicle File (Enquiry)
FOTS Reminders & Summonses

Geological Survey
Database of Mineral Localities
References Database
Prospecting licence monitoring

Health
Personnel Census & Enquiry
Adoption Survey
Drug Product Authorisation
Management Information & Control System
Hospital Equipping System
Outpatient (Hospital) Statistics
Diagnostic Related Groupings
SPSS Statistical Analysis

Industry & Commerce
Companies Registration Office System
Insurance companies monitoring system
Financial modelling

Patents Office system
Friendly Societies database
Small Industries Modelling
Equifacs cross-referencing

Justice Group
Dublin Metropolitan District Court System
Limerick District Court system
Dublin & Cork Parking Court Scheduling
Prisons Payroll
General payments
Prisoner Records system
OIS word & list processing
Dept. Payroll
General Ledger
Probate Office
Various PC applications

Labour
Redundancy & Insolvency Payments
Labour Court System
Dept Accounts/General Ledger
NMS job seekers
Training Unit
Enterprise Allowance Scheme
Social Employment Scheme claims
NMS Apprenticeship Scheme
Industrial Diseases Database

Marine
Fisheries Research
Fisheries statistics, data collection & engineering analysis

Meteorological Service
Meteorological Data Communications
Climatological Database
Numerical Weather Prediction
Scientific Processing (Valentia)

Office of Public Works
Engineering/Hydrology Analysis/Calculations

Electrical & Heating Maintenance Contracts
Building Services Engineering Design Package
Vote Accounting (Payment & Records)
Local Loans (Billing & Repayments)
Industrial Payroll
Project Management
CAD (Architecture)
Bills of Quantities System
Property Register
Bank Reconciliation
National Monuments Records

Oireachtas
Text Processing, Storage and Indexation
Text Retrieval

Ordnance Survey
Digital mapping & geographical information system

Revenue
Income Tax/Corp Tax/CGT Collection
C&E Deferred Payment/Special Clearance
Income-Related Health Contributions
PAYE Employees
Income Tax Assessing
VAT System
C&E Warehousing
Residential Property Tax
Revenue Payroll
Money Control
Supply Branch
Youth Employment/Income Levy
PAYE Employers
Corporation Tax Assessing
C&E Ex-Ship (Trade Statistics)
Construction Industry Tax
Taxes Secretariat System
Accountant-General's Non-Payroll
Capital Acquisition Taxes
Dublin Castle OIS Network

Social Welfare
General Benefits
Central Records
INFOSYS
Unemployment Payments
Child Benefit
Pensions
Family Income Supplement
Rent Allowance
Office Automation
Cheque Reconciliation
Travel and Subsistence
Management Information System
Outdoor Staff Work Returns
Qualification Certificate
Parliamentary Questions
Disability Benefit Appeals
Medical Referral
Free Schemes (Electricity, Travel etc)
Treatment Benefits
Personalised Payment Orders
PLOW (Unemployment Payment)
Refund of Payments
Miscellaneous Payments
Self-Employed

Taoiseach
Text editing/storage/retrieval
File Registry system
Personnel/Accounts/Estimates/Economic analysis
Government Secretariat expert system
Government Secretariat database
Office of Min. State for European Affairs.

APPENDIX D

LOCAL AREA NETWORKS (LANs) BY DEPARTMENT

Note: Position at March, 1988. This Appendix should be studied in conjunction with Appendix E (Number of VDUs by Dept).

AGRICULTURE	2
CSO	multiple implementation
CIVIL SERVICE COMMISSION	1
COMMUNICATIONS	2
C & AG	2
DEFENCE	4
EDUCATION	2
ENERGY	multiple implementation
ENVIRONMENT	6
FINANCE	multiple implementation
FOREIGN AFFAIRS	2
GEOLOGICAL SURVEY	1
HEALTH	1
INDUSTRY & COMMERCE	multiple implementation
JUSTICE	3
LABOUR	2
MARINE	1
OMBUDSMAN	1
OPW	1
OIREACHTAS	2
ORDNANCE SURVEY	1
METEOROLOGICAL SERVICE	multiple implementation
REVENUE	multiple implementation
SOCIAL WELFARE	multiple implementation
STATE LABORATORY	1
STATIONERY OFFICE	1
TAOISEACH	multiple implementation

Note: A multiple implementation comprises a number of inter-connected LANs.

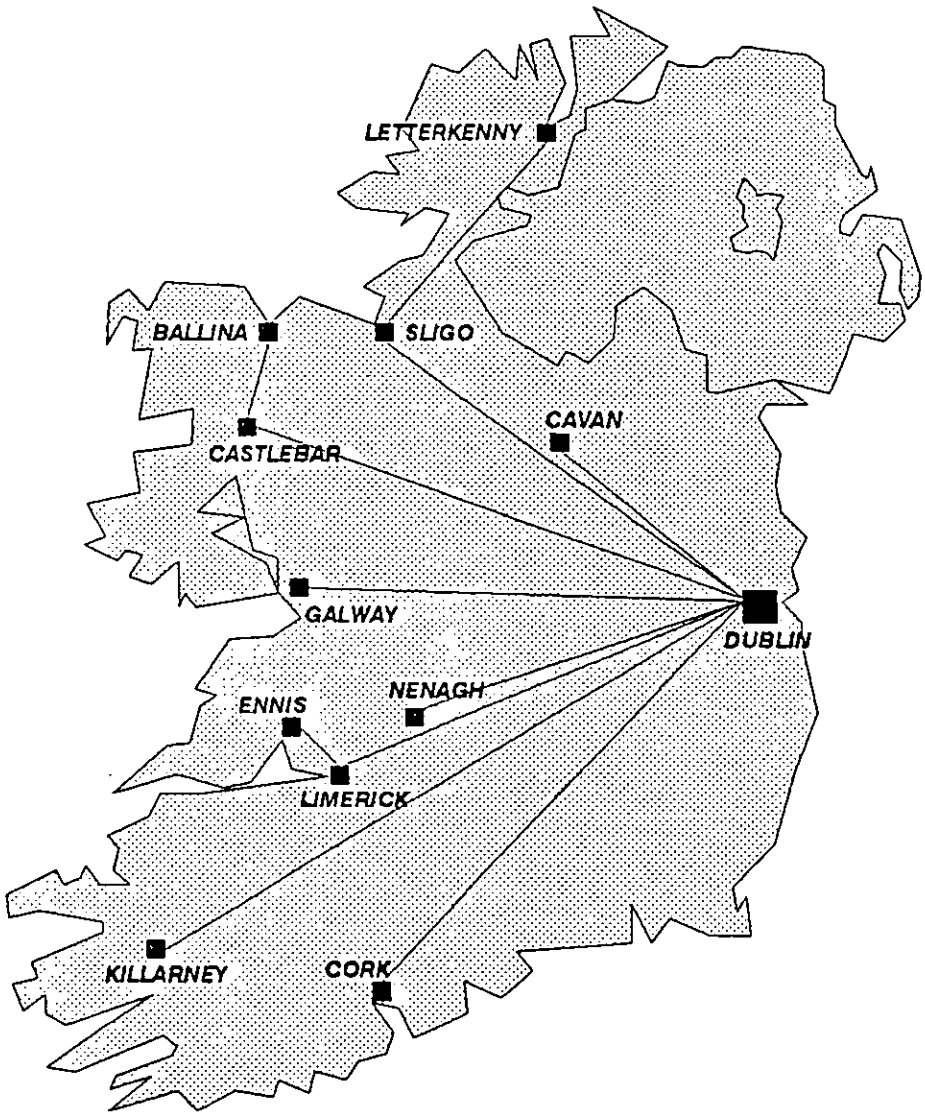
APPENDIX E

NUMBER OF VDUs AS AT MARCH, 1988

Departments/Offices	*No. of VDUs*
Taoiseach (Group – includes CSO)	238
Foreign Affairs	117
President's Estblishment	1
Houses of the Oireachts	20
Finance	318
Comptroller and Auditor General	9
Revenue Commissioners	906
Office of Public Works	99
State Laboratory	31
Director of Public Prosecutions	2
Valuation Office	11
Ordnance Survey Office	67
Civil Service Commission	16
Ombudsman	7
Justice	181
Tourism and Transport	131
Agriculture and Food	
– H.Q.	129
– Local Offices	123
Social Welfare	
– H.Q.	782
– Exchanges (Dublin)	80
– Exchanges (Other)	118
Industry and Commerce	127
Communications	5
Energy (includes Forestry)	118
Marine	33
Environment	182
Labour	43
Health	59
Defence	68
Education	82
TOTAL	4,103

APPENDIX F

GOVERNMENT TELECOMMUNICATIONS NETWORK (GTN)



Note: The GTN is used by departments as a carrier network for their data. Both Revenue and Social Welfare operate additional regional nodes using the GTN as a backbone.

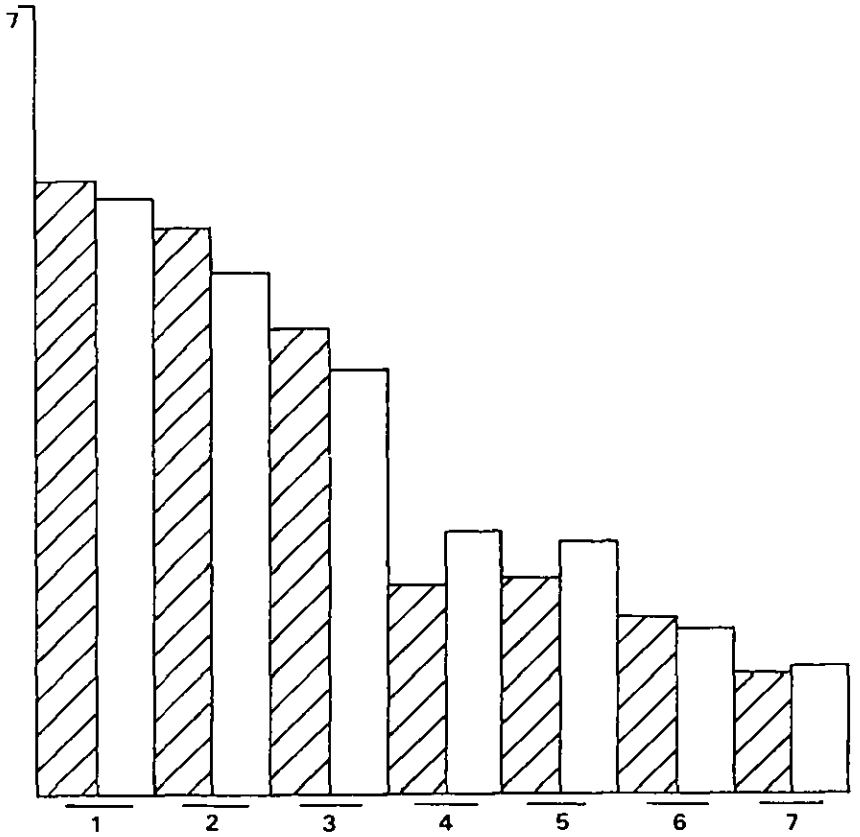
APPENDIX G
Survey of Management Attitudes
[See Chapter 4]

Table A

Note: Figures in square brackets refer to DP/IT Managers.

(a) On the whole would you say your attitude to office automation was		
(i) very positive	44%	[63%]
(ii) quite good/open	49%	[33%]
(b) Do you think widespread office automation is		
(i) essential if the civil service is to cope with today's pressing administrative problems	57%	[46%]
(ii) highly desirable because of the encouragement it gives to extensively and critically review existing work practices	33%	[50%]
(c) Do you think widespread office automation will		
(i) enrich the working environment by removing the mundane, repetitive chores and enabling an officer to participate more effectively in the decision-making processes of management	23%	[18%]
(ii) improve the quality of performance and output by facilitating the dissemination of views and opinions, analyses, reports, minutes, etc.	54%	[73%]
(d) Do you think the process of adjustment to office automation in the Civil Service will be		
(i) very gradual and, on the whole, slower than many commentators would have us believe	18%	[17%]
(ii) fairly quick, with the majority of staff showing a lot of willingness to get the most out of new technology	13%	[13%]
(iii) a combination of (i) and (ii) above, with the rate of adjustment ranging from poor to excellent in sections across the Service	69%	[70%]
(e) Do you think job definitions and job boundaries will be altered much by office automation		
(i) Maybe in a few cases but, by and large, it will not be a key influence	42%	[21%]
(ii) Yes, within the next five years office automation will be an important factor in shaping and moulding job content	21%	[29%]
(iii) Yes, in 5-10 years (or longer) office automation will be an important factor in shaping and moulding job content	32%	[42%]

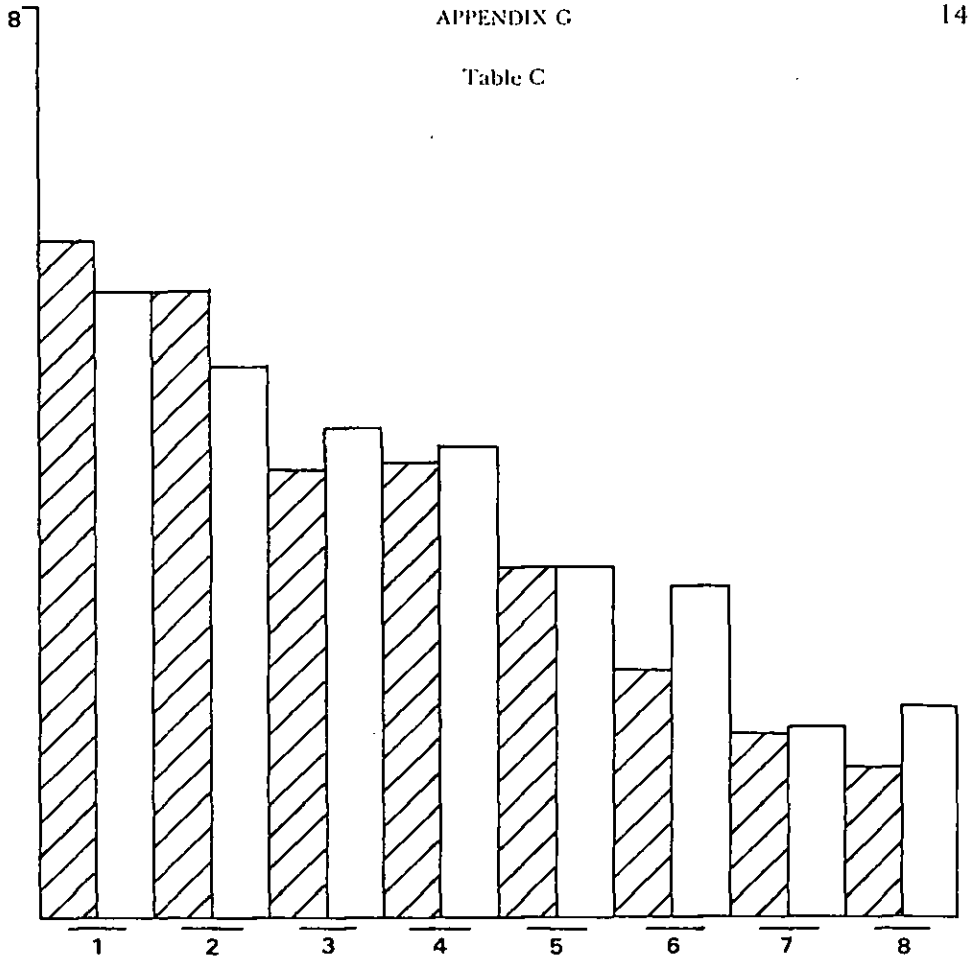
Table B



Comparison of the relative importance ascribed by Data Processing managers (▨) and General Managers (□) in the civil service to the following seven factors justifying the introduction of computerised office systems:-

1. Increased productivity and efficiency;
2. Improved quality of service to the public and other sections;
3. The more timely and effective use of existing information;
4. Greater job satisfaction;
5. Greater long-term integration of Departmental functions;
6. The facilitation of organisational change;
7. Staff reductions.

Table C



Comparison of the relative importance ascribed by Data Processing managers (▨) and General Managers (□) in the civil service to the following eight factors influencing the successful introduction of computerised office systems:-

1. Senior management support and commitment;
2. A planned, co-ordinated approach to the introduction of technology into the organisation;
3. Office staff interest and commitment;
4. A detailed examination of existing manual procedures to determine how best to make the transition;
5. Plenty of staff training;
6. A trouble-free, easy to use technical system;
7. The assignment of one key person in the office to mastering the system;
8. Plenty of time to gain experience in using the system.

APPENDIX H

IT GRADES IN THE CIVIL SERVICE

Notes: (a) This summary includes movement within the IT area.
(b) Unless otherwise indicated, all competitions are run by the Civil Service Commission.

CO/Programer
Only access route to CO/Programmer post.
Confined competition open to COs, CAs, and all equivalent grades - pay ceiling of CO maximum point applies.

SO/Senior Programer
Promotion grade only from CO/Programmer.
No interdepartmental competition. However, departments may employ an internal competitive selection procedure if they wish.

EO/Junior Systems Analyst
Confined competition open to all grades with a pay celing below that of the EO maximum point.
Note that general service EOs are not eligible.

HEO/Systems Analyst
Confined competition open to all grades with a maximum pay point equal to or above the EO maximum; primarily for EO and equivalent grades.
Note that non-IT HEOs are eligible.

Administrative Officer (IT)
Open competition for IT graduates with an honours degree.

AP/Senior Systems Analyst
Confined competition open to all grades with a maximum not less than the HEO maximum.
Note that non-IT APs are eligible.

EO on IT duties
School leavers and other non-IT EOs may be deployed or promoted to the IT area. No prior computer experience or expertise is required.
The appointment may be non-competitive, though some departments employ a competitive selection procedure. Direct promotion of COs/SOs to EO was introduced in some selected areas during 1989/90.

HEO on IT duties
Similar to EO on IT duties.

AP on IT duties
Similar to EO on IT duties.

CO/Senior Computer Operator
Confined competition open to COs and equivalent grades.
Note that CAs etc are not eligible.
No prior computer experience or expertise is required. This competition is meant to be the only source of CO/Senior Computer Operators (though some non-competitive assignments and designations have taken place in practice).

EO/Officer-in-Charge
Confined competition open only to CO/Senior Computer Operators (as well as SOs in Officer-in-Charge posts). This competition is the only source of EO/Shift Leaders.

Miscellaneous appointments
In addition to the above, there is a grade of CA(Data Entry) and a number of non-competitive assignments at CA, CO and SO levels to certain work in the larger computer areas - operations, data preparation etc.

APPENDIX I

Survey of IT Staff

Note: This appendix comprises Tables 5.3-5.10 of the survey of IT staffing detailed in Chapter 5. Tables 5.1, 5.2 and 5.11 may be found in that Chapter.

Table 5.3: *DP Expertise by Grade and Sex (percentage)*

	% of Group		*% of Females in each grade*	
Grade	*Male*	*Female*	*DP Group*	*Total Civil Service*
PO	2.5			
AP	9.1	1.2	12	25
HEO	23.7	7.1	23	35
EO	18.4	4.8	21	42
SO	0.5	6.3	93	61
CO	15.9	10.5	40	65
	70.1	29.9		

Table 5.4: *DP Expertise by Age and Sex (percentage)*

Age	*Male*	*Female*	*Total*
<20	1.9		1.9
20-24	9.1	8.0	17.1
25-29	28.2	14.3	42.5
30-34	19.0	5.0	24.0
35-39	4.9	1.8	6.7
40-44	2.8	0.8	3.6
45-49	1.7		1.7
50-54	1.5		1.5
55-59	1.0		1.0
60+			
	70.1	29.9	100.0

Table 5.5: *Computer-Related Manpower by Age and Grade–Percentage of Grade in each Bracket*

Age	*PO*	*AP*	*HEO*	*EO*	*SO*	*CO*	*% Total Staff*	*Cumulative %*
< 20				5		3	2	2
20-24			7	23	7	34	17	19
25-29		3	36	46	65	59	43	62
30-34		30	43	22	28	3	24	86
35-39		33	8	3		<1	7	93
40-44	30	15	3			<1	3	96
45-49	20	7	2				2	98
50-54	20	10	<1				2	100
55-59	30		<1				<1	100
60+		2		1			<1	100
	100	100	100	100	100	100	100	

Table 5.6: *Comparison Between Length of Service in the Civil Service and Total Years on Computer Related Work*

	% of all Staff	
Years	*Length of Service in the Civil Service*	*Total Years on Computer-Related Work*
> 2	94.9	81.1
> 4	92.0	64.8
> 6	86.0	48.3
> 8	67.1	23.8
> 10	49.2	21.5
> 12	32.4	15.1
> 14	20.1	10.6

Table 5.7 *Civil Service Entry Grade of Serving Staff*

Specific Entry Grade to Civil Service	% *PO*	% *AP*	% *HEO*	% *EO*	% *SO*	% *CO*	% of *Total Staff*
CA		10	7	7	66	65	27
CO	50	15	34	41	28	29	32
EO	40	51	50	45			32
PO Clerk		15	3	3		2	4
Other	10	9	6	4	6	4	5
	100	100	100	100	100	100	100

Table 5.8: *Job Description by Grade [Respondents were asked to indicate the job description which came closest to describing their immediate responsibilities.]*

	PO %	*AP* %	*HEO* %	*EO* %	*SO* %	*CO* %	% of *Total*
Data Processing Manager	70.0	7.3	2.4				3.1
Project Manager		56.1	4.8				7.0
Operations Manager		7.3	6.3	8.3			4.6
Systems Analyst		4.9	59.5	13.5			21.8
Analyst/Programmer			4.0	33.3	3.6	0.9	9.4
Systems Programmer			1.6	6.3	3.6	1.8	2.7
Programmer			1.6	4.2	75.0	50.9	20.3
Telecommunications Specialist		2.4	4.0	2.1			1.9
Equipment Operator				2.1		40.2	11.4
Data preparation			1.6	3.1	14.3	2.7	2.9
Advising users about computer systems		7.3	0.8	4.2			1.9
IT Planning in Organisation Unit		4.9	0.8				0.7
IT Information Centre		2.4		1.0	3.6		0.7
Administrative Responsibilities		2.4	0.8	3.1			1.2
Other	30.0	4.9	11.9	18.8		3.6	10.2
	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 5.9: *Breakdown of Category "Other" in Table 5.8 [The percentage total for each grade corresponds with the percentage in category "other" in Table 5.8.]*

	PO %	*AP* %	*HEO* %	*EO* %	*SO* %	*CO* %	*% of Total*
Development and user testing				1.1		0.9	0.5
Programming with 4GL				1.1			0.25
Shift leader				6.6			1.5
Clerical-type Work						0.9	0.25
Evaluating, implementing software packages			0.8	2.2			0.8
O & M				1.1			0.25
Forms Design				1.1			0.25
User Testing				1.1			0.25
Managing Preparation of data			1.6				0.5
Training		2.5	1.6	2.2			1.25
Computer security			0.8				0.25
Liaison with programmers and users			1.6	2.2			1.0
Library-type duties						1.8	0.5
Office Automation	30.0	2.4	5.5				2.7
("Other" Total)	(30.0)	(4.9)	(11.9)	(18.8)		(3.6)	

Table 5.10: *Average Number of Years Computer-Related Work Experience for each Job Description*

Job Description	*Average Years Computer-Related Experience*
DP Manager	13.44
Project Manager	12.15
Office Automation Specialist	10.65
Data Preparation/input-output	9.25
Operations Manager	8.17
Systems Analyst	6.82
Telecommunications Specialist	6.75
Systems Programmer	5.97
Programmer	4.35
Analyst Programmer	3.69
Equipment Operator	2.50
Others	6.34
Average for Group	6.27

APPENDIX J

BIBLIOGRAPHY

ASTMS, 1987. *VDU Users Survey*, Dublin, January.

BANNON, L., U. BARRY, and O. HOLST, 1981. *Information Technology: Impact on the Way of Life*, NBST/FAST Conference Proceedings, Dublin: National Board of Science and Technology.

BARDWELL, G. H., 1984. *Evolving and Implementing an Operational Strategy in the Department of Health and Social Security, ICA Journal*, No. 31, October.

BARRINGTON, T., 1982. "The Task of the Civil Service in the 1980s", *Seirbhis Phoibli*, Vol. 3, No. 1, June.

BEKEMANS, L. (ed.), 1982. *European Employment and Technological Change*, European Centre for Work and Society.

BELL, D., 1979. *The Social Framework of the Information Society* (in Forester, 1980).

BERNSTEIN, S. J. (ed.), 1976. *Computers in Public Administration: An International Perspective*, Oxford: Pergamon Press.

BERNSTEIN, S. J. (ed.), 1976. *Data Processing in 1980-1985*, New York, N.Y.: Wiley.

BERTRAND, O. and N. THIERRY, 1986. *The Evolution of New Technology, Work and Skills in the Service Sector*, Paris: OECD.

BIRD, E., 1980. *Information Technology in the Office: The Impact on Women's Jobs*, London: Equal Opportunities Commission.

BJORN-ANDERSEN, N., M. EARL, O. HOLST, and E. MUMFORD, 1982. *Information Society: For Richer, For Poorer*", FAST Conference Proceedings, Amsterdam: North-Holland.

BLACKWELL, J., 1985. *Information for Policy*, Dublin: National Economic and Social Council.

BLENNERHASSETT, E., 1985. *Senior Civil Servants and Information Technology: Experience of a Pilot Management Development Programme*, Dublin: Institute of Public Administration.

BLENNERHASSETT, E. and J. HASKINS, 1985. *New Technology in the Public Service: Consolidated Report*, Dublin: European Foundation.

BLENNERHASSETT, E. and R. MORAN, 1985. *New Technology in the Public Service: Ireland*, Dublin: European Foundation.

BLENNERHASSETT, E. and M. RUDDOCK, 1983. *Senior Civil Servants and Information Technology: Towards a Management Development Programme*, Dublin: Institute of Public Administration.

BOMBERGER, O., 1985. "Microcomputers and Their Impact on Local Government Operations", Proceedings of the Third ALGIS Conference, Ennis, Co. Clare, April 1984, in *Computers, Environment and Urban Systems*, Vol. 10, No. 1, London: Pergamon Press.

BUCHANAN, D. and B. BODDY, 1983. *Organisations in the Computer Age: Technological Imperatives and Strategic Choice*, Aldershot: Gower.

BUTLER COX FOUNDATION, London: Research Reports 49, 58, 65, 66, 67, 69, 70, 72, 73, 75.

CAMPBELL, B. T., *Information Technology and Civil Service Culture* (in Pitt, 1984).

CEDEFOP, 1983. "New Technologies", *CEDEFOP Journal*, No. 11, June.

CEDEFOP, 1984. *Microelectronics and Information Technology: Training Implications in Firms*, Berlin.

CENTRAL COMPUTER AND TELECOMMUNICATIONS AGENCY, 1980. *Principles for the Management and Organisation of Computing in Departments: Report of the Study Team*, London, May.

CENTRAL COMPUTER AND TELECOMMUNICATIONS AGENCY, 1983. *Expert Systems: A Report on a CCTA Visit to the USA*, London: HMSO, June.

CENTRAL COMPUTER AND TELECOMMUNICATIONS AGENCY, 1983. *Human Factors Associated with the Use of VDUs*, London, September.

CENTRAL COMPUTER AND TELECOMMUNICATIONS AGENCY, 1984. "Strategic Study of Government Administrative Communications", *IT Series*, No. 5, London: HMSO, March.

CENTRAL COMPUTER AND TELECOMMUNICATIONS AGENCY, 1984. "Method for Evaluating the Impact of New Office Technology Systems", *IT Series*, No. 6, London: HMSO, March.

CENTRAL COMPUTER AND TELECOMMUNICATIONS AGENCY, 1984. "Early Experience with Multi-User Office Systems", *IT Series*, No. 7, London: HMSO, April.

CENTRAL COMPUTER AND TELECOMMUNICATIONS AGENCY, 1984. "Review of the Central Computer and Telecommunications Agency", *IT Series*, No. 8, London: HMSO, July.

CENTRAL COMPUTER AND TELECOMMUNICATIONS AGENCY, 1984. *The Impact of Application Generators on CCTA Procedures and Methodologies*, London, August.

CENTRAL COMPUTER AND TELECOMMUNICATIONS AGENCY, 1984. "Interdepartmental Electronic Mail", *IT Series*, No. 9, London: HMSO, September.

CENTRAL COMPUTER AND TELECOMMUNICATIONS AGENCY, 1985. *Procurement of Information Technology: A Guide for Suppliers*, London: HMSO.

CENTRAL COMPUTER AND TELECOMMUNICATIONS AGENCY, 1985. "Who Needs Kneetops?", *IT Series*, No. 10, London: HMSO, June.

CENTRAL COMPUTER AND TELECOMUNICATIONS AGENCY, 1985. *Central Computer and Telecommunications Agency: Progress Report*, London: HMSO, August.

CENTRAL COMPUTER AND TELECOMMUNICATIONS AGENCY, 1986. "Inter-Departmental Electronic Mail: Stage 2", *IT Series*, No. 14, London: HMSO, May.

CENTRAL COMPUTER AND TELECOMMUNICATIONS AGENCY 1986. *List of Computers in Central Government*, London, June.

CENTRAL COMPUTER AND TELECOMMUNICATIONS AGENCY, 1986. *Government Procedures for Information Technology Turnkey Projects: A Review by Government and the Computing Services Association*, London, July.

CENTRAL COMPUTER AND TELECOMMUNICATIONS AGENCY, 1986. "Open Systems Interconnection – CCTA's Expectations and Suppliers' Implementations: Part 1 – Summary and CCTA's Expectations", *IT Series*, No. 15, London : HMSO, September.

CENTRAL IT SERVICES, 1988. *Proceedings of the First Civil Service Seminar on Information Technology*, Dublin: Department of Finance.

CENTRAL IT SERVICES, 1989. *Proceedings of the Second Civil Service Seminar on Information Technology*, Dublin: Department of Finance.

CENTRAL IT SERVICES, 1990. *Proceedings of the Third Civil Service Seminar on Information Technology*, Dublin: Department of Finance.

CONFEDERATION OF IRISH INDUSTRY, 1984. "Survey of Information Technology in Irish Business", *CII Newsletter* 41 (18), Dublin.

CONFEDERATION OF IRISH INDUSTRY, 1987. *Submission from the Customs Facilitation Action Group*, Dublin, January.

CONNOLLY, F., 1984. "Is This Computer System Good for Our Health?", Dublin: *Sunday Press*, 16 December.

COMPTROLLER AND AUDITOR GENERAL, 1971. *Report of the Comptroller and Auditor General*, 1971 to 1986 inclusive.

CROSS T., 1984. *Computer Teleconferencing: New Electronic Management* (in Zorkoczy, 1984).

CROZIER, M., 1983. *Implications for the Organisation* (in Otway, 1983).

DAHL. O. J., E. W. DIJKSTRA and C. A. R. HOARE, 1972. *Structured Programming*, New York, N.Y.: Academic Press.

DANZIGER, J., W. DUTTON, R. KLING, and K. KRAEMER, 1982. *Computers and Politics: High Technology in American Local Governments*, New York, N.Y.: Columbia University Press.

DEPARTMENT OF HEALTH, 1983. *Department of Health Computer Policy: Key Steps to Date and Specific Responses to Recent Comment*, Dublin, 18 May.

DEPARTMENT OF LABOUR, 1981. *Manpower Consultative Committee: Report on Computer-Related Manpower*, Dublin, February.

DEPARTMENT OF LABOUR, 1987. *Guidelines on the Safe Operation of Visual Display Units*, Dublin, January.

DEPARTMENT OF THE PUBLIC SERVICE, 1982. *Report of the Review Body on the Organisation of Computerisation in the Government Services*, Dublin, June.

DEPARTMENT OF THE PUBLIC SERVICE, *Seirbhis Phoibli*, 1980 to 1986, inclusive.

DHSS, 1980. *A Strategy for Social Security Operations*, London: HMSO.

DHSS, 1982. *Social Security Operational Strategy: A Framework for the Future*, London: HMSO.

DIJKSTRA, E. W., 1972. "The Humble Programmer", *CACM*, 15, (10).

DIJKSTRA, E. W., 1976. *A Discipline of Programming*, Englewood Cliffs, N.J.: Prentice Hall.

DOONEY, S., 1976. *The Irish Civil Service*, Dublin: Institute of Public Administration.

DUTTON, W., J. DANZIGER, and K. KRAEMER, 1980. "Did the Policy Fail?: The Selective Use of Automated Information in the Policy-Making Process", in H. M. Ingram, and D. E. Mann, (eds.), *Why Policies Succeed or Fail*, London: Sage Publications.

DUTTON, W. and K. KRAEMER, 1980. "Automating Bias", *Society*, Vol. 17.

EC, 1984. "New Technologies and Social Change: Special Issue 1983/1984", in *Social Europe* Series.

EC, 1985. "New Technologies and Social Change: Office Automation", in *Social Europe* Series.

ELGSAAS, K., 1983. *An Inquiry into Public Data Processing in Norway* (in Kraus).

ENGLISH, M. and A. WATSON BROWN, 1984. *National Policies in Information Technology: Challenges and Responses* (in Zorkoczy).

EVANS, C., 1979. *The Mighty Micro: The Impact of the Micro-Chip Revolution*, London: Gollancz.

FAHNRICH, K. *et al.*, 1984. *The Extent of the Introduction of Electronic Machinery in the Office*, Dublin: European Foundation.

FITZGERALD, J. M. and A. FITZGERALD, 1973. *Fundamentals of Systems Analysis*, New York, N.Y.: Wiley.

FITZGERALD, K., 1987. "Putting the Public Service on Tape", Dublin: *The Irish Times*, 31 March.

FLINDT, B., 1983. *The Multi-Functional Working Place of the Future* (in Kraus).

FORESTER, T.(ed.), 1980. *The Microelectronics Revolution*, Oxford: Basil Blackwell.

FOSTER, F. G., 1968. *Computers, Statistics and Planning – Systems or Chaos?*, Second Geary Lecture, Dublin: The Economic and Social Research Institute.

FOSTER, F. G., 1971. *Computers in Ireland*, Dublin: The Economic and Social Research Institute.

GAINES, B., 1984. *Perspectives on Fifth-Generation Computing* (in Zorkoczy).

GOTLIEB, C. and A. BORODIN, 1973. *Social Issues in Computing*, New York, N.Y.: Academic Press.

GREY, S. and E. CORLETT, 1985. *The Impact of New Technology on Experienced Workers: Consolidated Report*, Dublin: European Foundation.

HARTY, B. P., 1983. *Local Authority Financial Information Systems and the New Technology* (in Kraus).

HASKINS, J., 1982. "Information Technology and the Organisation", *Seirbhis Phoibli*, Vol. 3, No. 2, November.

HEA, 1985. *First Destination of Award Recipients in Higher Education (1985)*, Dublin: HEA.

HEDBERG, B., and E. MUMFORD, 1975. "The Design of Computer Systems: Man's Vision of Man as an Integral Part of the System Design Process" in E. Mumford and H. Sackman, (eds.), *Human Choice and Computers*, Proceedings of the IFIP Conference, Vienna, 1974, Amsterdam: North-Holland.

HIRSCHHORN, L., 1984. *Beyond Mechanization: Work and Technology in a Post-Industrial Age*, Massachusetts: MIT Press.

HMSO, 1982. *A Programme for Advanced Information Technology: The Report of the Alvey Committee*, London.

HMSO, 1984. *Public Accounts Committee: Report by the Comptroller and Auditor General on Administrative Computing in Government Departments & Review of the Central Computer and Telecommunications Agency*, London, March.

HMSO, 1985. *Computer Fraud Survey: The Audit Commission for Local Authorities in England and Wales*, London.

HODGES, A., 1983. *Alan Turing: The Enigma of Intelligence*, London: Unwin.

HOLDEN, P., R. COOPER, and R. COCHRAN, 1983. *New Technology for Leinster House*, Dublin: NBST, September.

HOFSTADTER, D. R., 1979 *Godel, Escher, Bach: An Eternal Gold Braid*, London: Harvester Press.

HORTON, F. and D. MARCHAND, 1982. *Information Management in Public Administration*, Arlington: Information Resources Press,

HOUSES OF THE OIREACHTAS, 1976, 1978. *Report of the Public Accounts Committee.*

HOUSES OF THE OIREACHTAS, 1985. *Serving the Country Better:A White Paper on the Public Service*, September.

HOUSES OF THE OIREACHTAS, 1987. *Seventh Report of the Joint Committee on Small Businesses: New Technology and the Small Business*, January.

HUMPHREYS, P., 1983. *Public Service Employment: An Examination of Strategies in Ireland and Other European Countries*, Dublin: IPA.

JOYCE, L., 1986. "Can the Civil Service Become More Like The Private Sector?", *Seirbhis Phoibli*, Vol. 7, No. 2, June.

KELLY, M., 1980. "Management Information Systems: The Current State of the Art in the Irish Public Service", *Seirbhis Phoibli*, Vol. 1, No. 2, November.

KELLY, M., 1983. "Review of the Data Processing Organisation in the Irish Government", *ICA Journal*, No. 27, July.

KIRCHNER, J., 1986. "Federal Computing: The Good and the Bad", *Datamation*, 15 August.

KLING, R., 1978. "Information Systems in Policy Making: The Influences of Computer Technology and Organisational Arrangements", *Telecommunications Policy*, 2(1).

KLING, R. and W. SCACCHI, 1979. *Recurrent Dilemmas of Computer Use in Complex Organisations*, National Conference Proceedings, Montvale, N.J.: AFIPS Press.

KLING, R., W. SCACCHI, and P. CRABTREE, "The Social Dynamics of Instrumental Computer Use", *SIGSOC Bulletin*, Vol. 10, No. 1.

KOUSHEDE, K., 1983. *Challenges for a General Organisation of DP in the Public Sector* (in Kraus).

KRAEMER, K., 1980. *Computers, Information and Power in Local Governments: A Stage Theory* (in Mowshowitz).

KRAEMER, K., J. DANZIGER, and J. KING, 1978. "Local Government and Information Technology in the United States", in *OECD Informatics Studies*, Vol. 12, Paris: OECD.

KRAEMER, K., W. DUTTON and A. NORTHROP, 1981. *The Management of Information Systems*, New York, N.Y.: Columbia University Press.

KRAEMER, K. and J. KING, 1983. *Information Technology and Local Government in the Next Decade* (in Kraus).

KRAUS, H. (ed.), 1983. *The Impact of New Technologies on Information Systems in Public Administration in the 80s*, International Federation for Information Processing Conference, Amsterdam: North-Holland.

LOCAL GOVERNMENT COMPUTER SERVICES BOARD, *Annual Report*, 1984 and 1985.

MARCH, J. G., and H. A. SIMON, 1958. *Organisations*, New York: Wiley.

MARTIN, J., 1984. *An Information Systems Manifesto*, New York, N.Y.: Prentice-Hall.

MATHESON, S., 1984. *Computerisation of the Pay As You Earn System* (in Pitt).

McANDREW, M. and J. MULHALL, 1986. *Office Automation in Irish Business*, Dublin: Irish Management Institute.

McCARTHY, N., 1986. "A Society under Surveillance", Dublin: *The Irish Times*, 24 November.

McCOSH, A., 1985. "The Organisation, Its Aims and Using Information Technology to Achieve Them", *Information Technology and Public Policy*, Vol. 4, No. 1.

McLOUGHLIN, R. and A. FOLEY, 1985. *Information Technology in Northern Ireland and the Republic of Ireland*, Dublin: Co-operation North.

MILES, I. and J. GERSHUNY, 1984. *An Overview of New Technology in the Public Sector* (in Rush).

MOOS, J., 1983. *Social Aspects of Computing and Strategy for Communication in Denmark* (in Kraus).

MOWSHOWITZ, A., (ed.), 1980. *Human Choice and Computers*, Vol. 2, Amsterdam: North-Holland, International Federation for Information Processing.

MUMFORD, E., 1983. *Successful Systems Design* (in Otway).

NAGEL, E., 1961. *The Structure of Science: Problems in the Logic of Scientific Explanation*, London: RKP.

NATIONAL AUDIT OFFICE, 1984. *Report by the Comptroller and Auditor General: Administrative Computing in Government Departments*, London: HMSO, February.

NATIONAL AUDIT OFFICE, 1987. *Report by the Comptroller and Auditor General – Inland Revenue: Control of Major Developments in Use of Information Technology*, London: HMSO, January.

NATIONAL BOARD FOR SCIENCE AND TECHNOLOGY, 1986. *Report and Recommendations on Ways of Accelerating the Application of Information Technology in the Services Sector*, Sectoral Development Committee. Report 11, Dublin.

NATIONAL BOARD FOR SCIENCE AND TECHNOLOGY, 1986. *Study on Ways of Accelerating the Application of Information Technology in the Services Sector*, Parts 1 & 2, Dublin.

NATIONAL SOFTWARE CENTRE, 1985. *First Annual Survey of Computer Usage in Ireland, 1985*, Dublin: NSC.

OECD, 1985. *Software: An Emerging Industry*, Paris.

O'HALPIN, E., 1986. "Oireachtas Committees: Experience and Prospects", *Seirbhis Phoibli*, Vol. 7, No. 2, June.

O'HIGGINS, M., 1984. "Computerising the Social Security System: An Operational Strategy in Lieu of a Policy Strategy" (in Pitt).

O'SHEA, R. and P. TALBOT, 1987. "Computers in the Public Service", *Accountancy Ireland*, Vol. 19, No. 2, April.

OSVALD, T., 1983. "Computer Aided Revenue Taxation in Sweden" (in Kraus, 1983).

OTWAY, H. and M. PELTU (eds.), 1983. *New Office Technology: Human and Organisational Aspects*, London: Frances Pinter.

PITT, D. C. and B. C. SMITH (eds.), 1984. *The Computer Revolution in Public Administration*, Brighton: Wheatsheaf Books.

POLANYI, M., 1958. *Personal Knowledge*, London: RKP.

POPPER, K., 1963. 4th Reprint 1972. *Conjectures and Refutations: The Growth of Scientific Knowledge*, London: RKP.

PUBLIC SERVICE ADVISORY COUNCIL, 1974-1985 *Reports*, Nos. 1-12, 1974 to 1985.

PYE, R., 1985. "Computerisation: Some Essential Considerations", Dublin: Institute of Public Administration, *Administration*, Vol. 33, No. 4.

PYLYSHYN, Z. W. (ed.), 1970. *Perspectives on the Computer Revolution*, Englewood Cliffs, N.J.: Prentice Hall.

RADA, J., 1980. *The Impact of Microelectronics*, Geneva: ILO.

RAJAN, A., 1984. *New Technology and Employment in Insurance, Banking and Building Societies: Recent Experience and Future Impact*, Institute of Manpower Studies.

REUTER, H-J, 1983. *Technological Development in Banking and Insurance: A Consolidated Report on the Impact on Customers and Employees*, Dublin: European Foundation.

ROSS, M., 1986. *Employment in the Public Domain in Recent Decades*. Dublin: The Economic and Social Research Institute, Paper No. 127, General Research Series.

RUSH, H. and C. ZMROCZEK, 1984. *New Technology in the Public Service: United Kingdom*, Dublin: European Foundation.

SAMMET, J. E., 1969. *Programming Languages : History and Fundamentals*, Englewood Cliffs, N.J.: Prentice-Hall.

SCOTT, W. D., 1984. "Computer Knowledge and Attitudes Among Officers of the Second Division of the Government of Australia", *ICA Journal*, No. 29, March.

SHAW, A., 1974. *The Logical Design of Operating Systems*, Englewood Cliffs, N.J.: Prentice Hall.

SIMON, H. A., 1965. *The Shape of Automation*, New York, N.Y.: Harper and Row.

SIMON, H. A., 1971. "Designing Organisations for an Information-Rich World", in M. Greenberger (ed.), *Computers, Communications and the Public Interest*, London: Johns Hopkins Press.

SIMON, H. A., 1973. "Applying Information Technology to Organisation Design", *Public Administration Review*, Vol 33.

SIMON, H. A., 1977. "What Computers Mean for Man and Society", *Science*, Vol. 195, 18 March (in Forester 1980).

SLEIGH, J., *et al.*, 1979. *The Manpower Implications of Micro-Electronic Technology*, London: HMSO.

SMURFIT MANAGEMENT CONSULTANCY SERVICES, 1986. *Dail Committee on Public Expenditure: Discussion Document to Full Report on Computersation in Health Services*, Dublin, December.

STATIONERY OFFICE, 1969. *Report of the Public Services Organisation Review Group (1966-1969)*, Dublin.

STEINESS, T., 1983. *Decentralisation by Mini-Computers in Municipal Data Processing* (in Kraus, 1983).

STRASSMAN, P., 1985. *Information Payoff*, New York, N.Y.: Free Press (Macmillan).

TURSKI, W. M. (ed.), 1973. *Programming Teaching Techniques*, North Holland Publications.

UNIVERSITY COLLEGE CORK, 1986. *A Review of the Employment and Training of UCC Graduates and Teachers of 1985*, Careers and Appointments Office, UCC, September.

UK TREASURY, 1984. "Computerisation of Pay-As-You-Earn", *Economic Progress Report*, No. 170, August.

UK TREASURY, 1986. "IT in Government", *Economic Progress Report*, No. 187, November-December.

URBIS Group Report, 1985. *The Future of Information Systems in Local Government*, Public Policy Research Organisation, Graduate School of Management Information and Computer Science, University of California, Irvine. (Published on diskette).

WARD, J., P. GRIFFITHS, and P. WHITMORE, 1990. *Strategic Planning for Information Systems*, New York, N.Y.: John Wiley.

WEINBERG, G. M., 1971. *The Psychology of Computer Programming*, New York, N.Y.: Van Nostrand.

WEINER, N., 1950. *The Human Use of Human Beings: Cybernetics and Society*, New York, N.Y.: Avon Books.

WEITZMAN, C., 1974. *Minicomputer Systems*, New York, N.Y.: Prentice Hall.

WEIZENBAUM, J., 1972. "On the Impact of the Computer on Society: How Does One Insult a Machine?", *Science*, Vol. 176, May 12.

WEIZENBAUM, J., 1976. *Computer Power and Human Reason*, London: Penguin.

WEIZENBAUM, J., 1978. "Controversies and Responsibilities", *Datamation*, 15 November.

WEIZENBAUM, J., 1980. *Once More, the Computer Revolution*, MIT Press (in Forester).

WEIZENBAUM, J., 1980. *Human Choice in the Interstices of the Megamachine* (in Mowshowitz).

WERNEKE, D., 1983. *Microelectronics and Office Jobs: The Impact of the Chip on Women's Employment*, Geneva: ILO.

WHITE, G. 1982. *Technological Changes and Employment: A Review of Some Implications for Company and Union Policies* (in Bekemans).

WOLFGART, L., *et al.*, 1985. *New Technology in the Public Service: A Bibliographical Study*, Dublin: European Foundation.

WOODWARD, J., 1965. *Industrial Organisations: Theory and Practice*, Oxford: OUP.

WYNNE, B. and H. OTWAY, 1982. *Information Technology, Power and Managers* (in Bjorn-Andersen).

YEH, R. T. (ed.), 1977. *Current Trends in Programming Methodology*, Volumes 1-4, Englewood Cliffs, N.J.: Prentice Hall.

YOURDON, E., 1974. *Techniques of Program Structure and Design*, Englewood Cliffs, N.J.: Prentice Hall.

ZORKOCZY, P. (ed.), 1984. *Oxford Surveys in Information Technology*, Volume 1, Oxford: Oxford University Press.

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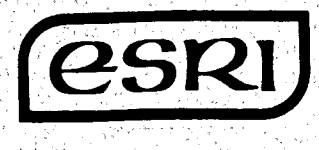

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Appendices (K,L,M,N,O,P) to the report,

AN OVERVIEW OF CIVIL SERVICE COMPUTERISATION, 1960-1990

Robert Pye

(ESRI Broadsheet Series, Paper No.26, Price £10.00)

"An examination of these Appendices is not critical to an understanding of the main body of the Report. They are being made available primarily by way of background information."

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** These appendices are available under separate cover in photostat form only upon request to the Institute. Their examination is not critical to an understanding of the main body of the report and they are being made available primarily by way of background information.

APPENDIX K

Department of Posts & Telegraphs

[Position to end-1983.]

First Steps in the 1940s.

The first introduction to automatic data processing in the Accountants Branch was a small Power Samas 40-column punch card system to process telephone operator assisted trunk call tickets. This system was introduced on a pilot basis for Dublin calls about the end of the 1940s but was discontinued in the early 1950s in favour of a ledger card system based on Underwood accounting machines. These machines were used to deal with all the items in telephone bills, viz. rentals, local calls, trunk calls, and miscellaneous charges.

In 1963 an IBM punch card system was introduced in Telephone Accounts to replace the underwood equipment. This system also included a punch card bill with an attached payment stub which enabled a payment card to be reproduced automatically in respect of paid bills.

The first mini-computer installed by Posts & Telegraphs was at the Air/Ground Communications Station at the Department of Transport and Power at Ballygirreen near Shannon Airport in the 1960s. P&T engineers provided Aviation Radio Services for Transport and Power at that time. The system was a dual ADX6300 Message Switching System based on dual PDP-8 computers with Vermont Research magnetic drums as peripheral memory. It handled real-time teletype traffic from 15 private wire AFTN (Aeronautical Fixed Telecommunications Network) circuits. It accepted on-line messages from 10 radio operators, communicating directly with North Atlantic airline traffic. These messages were entered in a shorthand form from which the ADX composed full ICAO multiple addresses for onward international forwarding via the AFTN.

The P&T computer centre.

There were two parallel developments in P&T during the 1960s. The first built on the experience of using punched card machines in the Accountants Branch. The second came from the use of computing by engineers on work relating to the Telephone Exchanges. These two strands came together to form the Computer Unit in 1971. The P&T computer centre in Dundrum opened in 1973 using an IBM 370/135 (240K). Reflecting the influence of engineers, the programming language selected was PL/1 (which was also used by Aer Lingus and ESB; CDPS and Revenue used COBOL). While IBM equipment was installed initially the department did not have a policy of buying only from that vendor; instead the most appropriate equipment for a particular job was selected.

The telephone service.

The Accountants Branch handled the processing of accounting records for operator assisted calls. In the 1960s they switched from Underwood's accounting machines and manual sorting to automatic processing using mark sense cards. This conversion alone was estimated to have eliminated ninety sorting assistant jobs at a stroke. The volumes grew steadily so that by the late Seventies there were 100,000 trunk tickets, as they were called, being processed daily. The pricing of these calls and the production of telephone bills for subscribers was computerised in 1970 using the bureau service offered by Aer Lingus on their IBM 360/50 mainframe at Dublin Airport. In 1978, the mark sense technology was replaced by optical character recognition. This major change involved training about 6,000 telephone operators around the country to write clearly and legibly in characters of a fixed size. It also involved programming in machine language for IBM channels. With the subsequent introduction of digital telephone exchanges, call data for telephone billing also began to appear on magnetic tape.

The Savings Bank.

The Savings Bank accounts records were transferred from a Burroughs ledger card system to an IBM 80-column punch card system in 1960. Deposit and withdrawal dockets used at PO counters were in the form of dual-purpose punch cards; balance and ledger cards at HQ were also in the form of punch cards. The installation at HQ consisted of card punches and verifiers, sorting machines, collators, interpreters, ledger card printing machines, and a calculator which processed transactions and old balance cards to produce new updated balance cards.

The first system selected for transfer to computer working was the Savings Bank, which had been run on an IBM 80-column punch card system since 1960. This system was written in PL/1. The terms under which the Savings Bank operates are laid down by law, consequently the basics are not subject to much change -- programs written for this system in the early 1970s were still in operation almost twenty years later. An important change at that time was the decision to make the Savings Bank itself responsible for its own data entry. The Computer Centre simply processed the data when it was submitted, leaving the Savings Bank in complete control at all times. Data was submitted via an IBM 2780 remote card reader and printer terminal linked initially to the IBM bureau in Burlington Road. This was later switched to CPDS and then to Dundrum. By integrating with the original batch-oriented files, on-line access was provided in 1975 between Dundrum and the Savings Bank HQ in College house. Subsequently, the other savings products operated by P&T were also computerised. These included National Instalment Savings, Investment Bonds, and Savings Bonds.

Directory enquiries and printing.

A major development in 1982 was the introduction of a computerised screen-based system for directory enquiries. Its principal purpose, however, was the production of the national telephone directories. The printer was supplied with magnetic tapes and the production of the output was then automatic. This system considerably speeded the production of the directories and helped keep them more up-to-date. There were fewer errors and the costly expense of proof-reading was eliminated. At the time of its introduction the new directory printing and on-line enquiry system was believed to be the most comprehensive of its type in the world. The department is also believed to have been the first PTT in Europe to install a stored program controlled telex exchange.

Payroll.

After a thorough survey of the market, the department selected UNIPAY in 1972, the first organisation in Ireland to do so. The original impetus for this came from the requirement to automate the payroll of the Engineering Branch which employed some 10,000 people. Data entry was on ICL equipment.

When PAYE was introduced at short notice for civil servants in the early 1970s, P&T implemented a distributed system for payment of clerical, postal, and telephonist staff. There were 14 sites around the country equipped with IBM 3741s, a small mini-computer. These were replaced in 1980 by DEC PDP 11/34s and 11/44s. The software for payroll processing was completely redesigned and written in MUMPS, a software system combining a programming language, database, and operating system. The experience of UNIPAY and the IBM 3741 influenced the redesign. The environment was planned to allow the addition of other distributed systems, such as TV licence administration, on the same hardware and using MUMPS. By 1980, 18,000 people were being paid through the system.

Accounting.

The MUMPS system was used to develop an application for the main postal accounting system -- Cash Accounts. The system handled cash accounts documents from 1400 post offices on at least a weekly basis, balancing cash and stock movements. It was based on a PDP-11/44 and was implemented in 1980. The system improved the accuracy of the accounting process and reduced the staffing in the Cash Accounts section from 65 to 34.

User groups and software exchange.

P&T had a long-standing policy of open contact via user groups with outside and international organisations. They were an active member of the GUIDE project, a group of European computer users dedicated to the effective exchange of in-house software. The library maintained by the department included operating system modifications and utility programs. Software developed by P&T's computer centre was adopted for use by such bodies as the London Stock Exchange and a number of multinationals. Standards set by P&T for the use of certain newly developed software were eventually adopted by a number of large industrial groups in the UK.

Financial arrangements.

The department had delegated sanction from the Department of Finance in relation to computer expenditure; while an overall ceiling applied, the department could purchase individual items without having to refer back to Finance. This helped speed the acquisition process and allowed management more room for manoeuvre. Contractual arrangements between the department's technical support staff and outside software houses, mainly in relation to the distribution of software, enabled the department to use a significant number of software packages without charge (During the Seventies the commercial value of this option is believed to have been in the region of £100,000). The department also had a long-standing policy of justifying every system using cost-benefit analysis techniques, with the benefits of each newly installed systems being identified and subsequent savings monitored on an annual basis. Through its links with an international software house, the department was able to obtain free consultancy by providing actual case studies for training the company's consultants.

Systems development environment.

In the mid-Seventies P&T adopted what one commentator described as a fourth-generation environment for developing batch systems, incorporating an advanced high-level language and a data dictionary. This allowed for more rapid applications development than previously and facilitated subsequent amendments. For example, in one instance the data storage arrangement on the National Instalment Savings system was converted from sequential tape to index sequential with direct access on disk by changing a single parameter. Results like this encouraged the department in the course it had adopted. The mid-Seventies also saw the introduction of database management software, structured programming techniques and a second programming language for engineers (APL) as part of a long-range plan to keep the department abreast of technical developments in the industry at large. The department also adapted a quality control technique known as "software inspection", developed by IBM. Used in conjunction with a range of allied aids, significant increases in quality and productivity were reputedly achieved.

Staffing.

The staffing of the computer centre remained relatively stable during the Seventies. On the whole, the numbers of staff leaving to take up outside employment during this period was not significant. Management attribute this to the use of leading-edge technology and the level of technical challenge provided by the centre. The use of PL/1 rather than COBOL or another commercially popular language may have been a factor here, there being little demand on the Irish market for PL/1 programmers. The department also had a policy of retaining newly promoted computer staff within the data processing area wherever possible. This helped to avoid the serious loss of skills through internal redeployment. The size of the Department (some 30,000 individuals) greatly facilitated this policy.

APPENDIX L

The Health Sector

[Reference date: Start-1989]

At the time of the Review Body (1981) the computing arrangements in the Health Sector were broadly as follows:

(a) Four of the eight health boards were linked to CDPS;

(b) Three main voluntary hospital groups, supporting 23 hospitals in all, each had their own ICL 2903 with a processing link to CDPS, viz.

- o North Dublin Voluntary hospitals Group (based at the Mater Hospital);
- o South Dublin Federated Hospitals Group (based at St Vincent's Hospital);
- o Federated Dublin Voluntary Hospitals Group (based at St James's Hospital);

(c) Two health boards had independent data processing centres:

- o Eastern Health Board (ICL, upgrading to ICL ME39);
- o South Eastern Health Board (ICL 2903, upgrading to ME29);

(d) The two remaining health boards availed of computer bureau services: Midland and North Eastern Health Boards;

In addition, some health boards had installed small computers, though in no case were these linked to mainframes. Some hospitals had also installed smaller computers, a few of whom were former clients of the Voluntary Hospitals Group.

The computerisation requirements and general awareness of the potential applications for new technology amongst the health boards underwent a gradual change in the course of the Seventies. Though reticent about confronting the corporate questions posed by data processing, they were slowly becoming aware of the implications in the longer term if the new technology was not drawn into the mainstream of hospital administration. Their demands grew to the point where CDPS, hampered by continual staff losses, could not be expected to meet their requirements. The health agencies were seeking systems which could give information to management on all aspects of hospital operations. The areas covered by these requests included stores, pharmacy and patient administration and potentially represented a considerable expansion on the then existing computer capability in the health sector. In addition to this, major new hospitals were being planned and would require a broad range of computer systems.

Main features of health sector computing in 1980.

The main features and problems with computerisation in the health sector at that time could be summarised as follows:

(a) There was a recognisable unevenness in the pace of systems development across the health sector;

(b) There were limited resources available, with some unnecessary duplication of systems in centres isolated from CDPS;

(c) There was a general shortage of systems development staff amongst agencies, which problem was especially acute in centres remote from the main large urban areas. Furthermore, a lot of staff time was devoted to maintaining existing systems;

(d) Developments in some areas were being directed by individuals with insufficient technical knowledge and experience, and there had been a number of instances where equipment of restricted capability had been installed;

(e) The growing diversity of hardware types, with a score of vendors vying for this lucrative market, would make subsequent systems integration next to impossible, as well as greatly increasing maintenance and development overheads;

(f) Demands by health agencies for expanded services were a strain on CDPS -- the health sector at that time comprised a substantial 22% of all public service computer systems.

Review Body.

The Review Body appointed a special study group to examine the position in the health sector. As mentioned earlier in the main text, the Review Body recommended that the Department of Health should be responsible for overall policy, co-ordination, control and development of information management services in the health sector and should establish a small computer unit to undertake this task and to issue standards, guidelines and procedures to be applied throughout the health sector. It also recommended that standardised systems and procedures should be applied throughout the health sector, with a health agency nominated as the centre of responsibility for each common system, that centre assuming complete responsibility for the initial installation of the system and for support to those agencies subsequently implementing it. According to the Public Service Advisory Council, the main vehicle for systems development and maintenance for the health sector would be the health agencies themselves. This is not how matters transpired, however. The Review Body's recommendations only received Government approval in 1984, after the Department of Health had already committed itself to a very ambitious and expensive programme for computerising the health sector.

In developing a suitable strategy, the Department of Health would have had regard to a number of factors, mainly cost, reliability, flexibility and speed of implementation. This would strongly suggest the acquisition of a packaged system, with the necessary tailoring carried out by the supplier to meet local requirements. Widespread introduction of a comprehensive system in all hospitals would contain costs while achieving the ideal of standardisation of both hardware and software. The basic procedures involved in patient admission and registration, maintenance of medical records, pharmacy control and other hospital practices were considered to be sufficiently standard to be met satisfactorily by a common system. The Department considered the experience in other countries to be supportive of this view. In settling on this course, it was fully aware of the ambitious nature of the undertaking. The system selected would have to be highly sophisticated, with a level of integration which did more than anticipate future interface requirements but constituted an intrinsic feature of the design philosophy from the outset. It would also need to possess networking capability, database software and a range of standard office automation facilities.

Merits of a centralist approach.

Apart from the obvious advantage of lower costs, the merits of a centrally developed strategy designed to achieve widespread standardisation were considered to be broadly as follows:

- It should avoid any necessity to introduce a duplicate back-up system or redundant hardware since critical files could, in the event of a system failure, be transferred to a neighbouring location using a similar system;

- A standard system (both hardware and software) requires fewer computer experts at each location;

- It facilitates the greater mobility of staff, both computer and non-computer, between locations;

- System maintenance problems are reduced since modifications effected in one location can more easily be implemented in other sites, and without a considerable duplication of effort;

- Future developments, including legislative ones, are easier to anticipate and control;

- Inter-site networks are easier to establish;

- The risk of independently installed systems failing to meet minimum requirements is greatly reduced;

- Vendor support, and therefore system reliability, is increased in proportion to their overall investment in the success of the system.

The events which ensued have become probably the main controversy in public service computing. As an NBST/Eolas report stated, the Department's approach has "come in for widespread criticism -- on the selection process through which a software supplier was chosen, on the wisdom of nominating a standard package for all hospitals, and on the functional limitations of the selected package." The issues fall under two broad headings: the manner in which the system was chosen and the extent to which its technical characteristics recommended it for widespread use in the health sector. The criticism and controversy surrounding the system since it first began to attract outside attention early in 1982 have not to date led to a complete public resolution of all the facts and it will probably be some years before a definitive assessment can be made.

Criticisms of the system selected.

Following the Review Body's recommendations for the health sector, a project group was established by the Department of Health. Taking up where the Review Body's Study Group left off, it compiled a detailed request for proposals which issued in August, 1981. In drawing up the RFP, the project group by-passed the health sector user representative group, known as the Health Computer Co-ordinating Committee, which had been established in October, 1980, and comprised administrators from the health boards and voluntary hospitals. In February, 1982, the Department awarded the contract to McAuto, a subsidiary of the McDonnell Douglas Corporation, a company which had installed systems in one out of every six hospitals in the US.

According to the Department, the McAuto proposals were finally selected having regard to the overall suitability of their products, the wider range of facilities on offer, lower costs, better support arrangements and volume discounts. Many commentators were very concerned at the apparent haste with which the system was selected and the criteria applied. Health agencies were unhappy -- some very unhappy -- with the lack of consultation. As the Department itself states, "the Department has developed a policy of computerisation for the health sector ... Details of this policy were circulated to all health agencies on 3 March 1983" -- i.e. one year after the system was selected. Prospective users and staff representatives objected to the effective granting of a monopoly to McAuto. In their view at least two systems should have been piloted. Subsequent developments support this view.

The McAuto system comprised two main packages, one for patient administration and one for laboratory services (The financial system was not awarded to McAuto) -- see **Table 1** for a list of the integrated modules comprising the two systems. Both systems were written in a low level programming language, Macro II Assembler, and were designed to run on PDP 11/44 computers.

Table 1

- o on-line interactive system
- o patient management control
- o clinic appointment scheduling
- o outpatient appointmt.scheduling
- o ward order entry/result reporting
- o food (catering) management
- o speciality (theatre) scheduling
- o ward administration
- o advanced radiology
- o pharmacy information system
- o laboratory information system
- o patient master index
- o waiting list module
- o pre-admission module
- o advanced pharmacy module
- o cost of service module
- o physicians' registry
- o nurse allocation
- o nurse scheduling
- o advanced laboratory
- o three-level security system
- o preventive maintenance scheduling.

The main drawbacks with the strategy adopted by the Department, which ran counter to what the Review Body was to propose, were as follows:

(a) Low-level languages were machine specific; it would be highly undesirable to be irrevocably committed to one vendor (Digital) and one model of computer (PDP 11/44);

(b) Substantial modifications over and above those normally considered desirable for a packaged system, particularly one written in a low-level language, would be required;

(c) The system selected had not been used in Europe, was not designed with Irish hospital procedures in mind, and normally ran in conjunction with the vendor's financial package;

(d) The level of consultation with users, whose cooperation was critical to the success of the strategy, was wholly inadequate.

In its defence the Department could contend that, under the terms of the contract, the supplier would carry the cost of any necessary amendments. This failed to address the key issue, namely, whether the amendments could in fact be satisfactorily effected and in good time. While a low-level language system consumes fewer hardware resources, thereby containing overall costs, it can be extremely difficult to tailor in practice. Such systems ceased to enjoy a vogue since the Sixties, being superseded by the greater productivity and flexibility of third-level languages. With the Eighties witnessing the increased use of fourth-generation software, the selection of a broadly out-of-date technology for the health sector was difficult to justify. The Department also contended that the proposed system could run on the higher range of VAXs, thereby countering the charge that the system was tied to an out-of-date machine (the PDP 11/44). However, most significantly, no evidence was adduced to the effect that the McAuto suite of modules had actually been tested in a VAX environment.

Dail Committees.

The cumulative weight of these drawbacks led to the collapse of the strategy. In December, 1986, the now defunct Dail Committee on Public Expenditure (PEC) convened a hearing to examine the matter. While the question of the technical suitability of the system selected was not specifically addressed, the question of the cost-effectiveness of the system was examined, as well as the range and sufficiency of the information then available from it. At that date, certain parts of the system were in place in three pilot sites only -- Crumlin, Cork and Tralee. The contract had cost some £10m since 1982, while the itemised strategy plan was expected to cost £20m in all. Full computerisation of the entire health sector over a longer period had been estimated to cost somewhere in the region of £40m, with some 60%-70% being absorbed by hardware costs. Full consultation with users had not taken place, according to the Department, since the commitment of financial resources was not assured, with funding to 1986 being found from a variety of (unspecified) sources. The absence of central commitment was, rather illogically, used to justify the imposition of central policy formulation and control. Furthermore, the Department had undertaken no specific analysis in relation to cost benefit.

The consultants engaged by the PEC were very critical of the Department and made a number of recommendations, including the following:

- that an external review of software policies in the Department be undertaken to determine the suitability of the software system selected;
- that a five-year statement of strategy be made available by the Department to participating institutions;
- that a cost-benefit analysis be undertaken to highlight the effects of computerisation in the health sector;
- that relevant health boards and other institutions collaborate more closely with the Department on future policy issues.

The Public Accounts Committee concluded, on foot of its examination of the matter in 1988/89, that "the Department was simply learning as it was going along and doing so expensively with the major beneficiaries being the suppliers and the consultants whereas the learning process should have taken place before any commitments were entered into....Since this expensive exercise was carried out at the expense of the taxpayer, the Committee is highly critical of the entire episode which seems to be without justification."

In the wake of these findings, the Department has since abandoned its strategy, with health agencies having a free hand in determining their own IT arrangements.

APPENDIX M

Some Comparisons with Denmark

[Reference date: mid-1987]

While Denmark is very similar to Ireland in many respects, its overall approach to computerisation in the public service appears to have been more effective. Two large bureaux, Datacentralen and Kommunedata, serve central government and local authorities, respectively. During the Seventies these centres were geared to take the fullest advantage of economies of scale. Common systems were developed to perform common tasks in both central and local government. Their civil service concentrated large and important applications on one highly sophisticated and powerful computer centre. A number of very large mainframes (IBM and Amdahl) met most of the processing requirements of the public service, with users communicating from remote terminals -- 650 to Datacentralen and some 400 to Kommunedata.

There was a high level of public debate between 1970 and 1977 on the holding of personal details on computer. This was within a tradition which acknowledged the value of personal data banks. A 1924 Act of Parliament laid down that each of the Danish municipalities should establish and maintain up to date a local population register containing information about all residents of a municipal district, recording name, occupation, date of birth, residence, family status, citizenship etc. Another Act of Parliament in 1966 gave Denmarks Statistik (their equivalent of the CSO) authority to collect administrative data for the production of statistics from public bodies and to organise the necessary co-operation between the various administrative systems. The Act also stipulated that data collected for statistical purposes and referring to an identifiable individual or enterprise could not be passed on to any other Government department or private person. In 1968 the Central Population Register was computerised. An essential part of this major undertaking was the introduction of a permanent identification number for each individual person. The number was to be introduced into all sectors of public administration, replacing the many different numbers and references then in use. The Public Registers Act, 1978, gave legislative effect to existing practices and ensured that the setting up and use of such registers by public authorities did not violate the individual citizen's legal protection or private rights.

In addition to these important legislative initiatives, there were several significant developments to ensure the proper co-ordination in the growth of data processing. These included the creation in 1978 of a Board of EDP Co-ordination with the agreement of Datacentralen, Kommunedata and other corporate bodies. A number of ministries and local government organisations were represented on the Board. Where sectoral questions of administration need to be examined, EDP Co-ordination Committees are appointed by the Ministers concerned. The powers of the Minister for Finance in the

field of DP co-ordination were subsequently given statutory force in the Public Registers Act, 1978, which stated that the creation of any future central or local person-based registers must have his prior approval. Yet another body was set up in 1981 to co-ordinate the use of resources (personnel, equipment etc) between Datacentralen and Kommunedata. The Joint Agency was in effect a board of directors empowered to establish guidelines binding on both organisations.

The existence of accessible EDP registers -- some 500 by 1983 -- enables Denmarks Statistik to carry out extensive statistical analysis of several major areas of national economic importance using information already supplied to public authorities. The expensive time-consuming overhead of data collection is therefore sharply reduced. For instance, it has not been necessary to conduct a traditional business census since 1958.

What lessons does the Danish experience hold for Ireland? While hard and fast comparisons are not easy to make due to differing conditions -- for instance, more welfare and tax collection tasks are devolved upon local government in Denmark -- a number of important features can be identified:

- There is a comparatively high level of public awareness in Denmark of the nature and merits of computerised information;
- A good deal of public, trade union and Parliamentary debate has taken place to establish what impact progressive computerisation is likely to have on the rights of the individual and what benefits it holds for society;
- Structures and protective guarantees have been formulated, debated, and embodied in legislation;
- Computer-related issues have received a fair deal of attention and encouragement at Government and Ministerial level;
- The degree of consultation with prospective users and all parties concerned appears to have been good, even in the early planning stages;
- Emphasis has been placed on the need to remove ambiguity as to where responsibility lies for systems delivery and support;
- Administrative machinery and recognised forums have been set up to co-ordinate public service DP activities and to maintain a coherent strategy;
- The relative level of expenditure on computerisation in the public service has been high (for example, five times the rate obtaining in Ireland in 1980);
- Attention was placed at an early stage on the organised use of information as a resource.

APPENDIX N

Office of the Revenue Commissioners

[Reference date: Start-1988]

1963 - 1975.

In the years prior to the eventual establishment of CDPS in Kilmainham, the area of principal computer activity was Revenue. The first computer in the civil service and one of the first in the country (an ICT 1301T) was installed in Revenue in 1963. The decision in principle to adopt computerisation on a significant scale was made as early as 1960. Revenue was very much ahead of its time in this regard. If one discounts the scientific and statistical offices of the civil service (as well as P&T), the next department to commit itself to widescale use of computers was Social Welfare about twenty years later (though management in that department might argue that 1973 was closer to the mark, with the introduction of the disability benefit system).

Revenue selected Honeywell hardware in 1967 as providing the greatest functionality, the main alternatives being the ICL 1906A and the IBM 370/165. The decision to select Honeywell was based on the fact that it was the only vendor who, in their opinion, could provide a working version of COBOL. It is to Revenue's credit that it recognised the breakthrough offered by a third generation language at such an early stage. Other routes could have left them stuck with the mire of assembly level language and all the problems faced by American organisations in the Seventies. Having satisfied themselves that there had been substantial increases in tax revenue as a direct result of computerisation, they continued to press for new ways to exploit the technology. Some evidence of the programme they set themselves is shown by the fact that the two Honeywell 1200 machines installed in July, 1967, (with an aggregate of 114K) were replaced the following year by two 2200 machines (with an aggregate of 196K) -- the duplication of equipment was to meet the internal back-up requirement. The capital investment which this involved is an indication of the support computerisation was receiving at the highest management level. The 1967 expansion was part of a major policy decision by Revenue to develop fully computerised systems for all tax heads in the long term. Apart from direct financial benefits, Revenue stated that computerisation led to a marked increase in flexibility in the use of resources, allocation of work areas and regrading of duties. Some measure of the cost effectiveness of computerisation in Revenue can be gathered from the following figures which show the relationship between nett inland revenue and administrative costs:

1959/60	£33m	3.6%
1964/65	£78m	2.7%
1970/71	£215m	1.8%

This sizeable decrease was probably influenced by a number of other factors -- increases in average income, increases in income tax, inflation, slow increases in tax free allowances -- but the impact of computerisation can realistically take a share of the credit.

The benefits of automation.

The operational effectiveness of the computer systems in Revenue made it easier to implement changes in the Finance Acts. For example, the provisions of the 1971 Finance Act, relating to interest on late payments and payments on account, were implemented much more speedily than could have been achieved by manual means. The provisions increased the rate of interest, shortened the interest-free period and introduced new rules relating to payments on account. The implementation of these changes involved a comprehensive range of amendments to the income tax etc suite of programs, which were completed by the end of November, 1971. In early December approximately 90,000 initial demands for the first instalment of the 1971/72 income tax and sur-tax were issued, representing a hundred percent increase on similar issues in previous years. An increased yield of about £5m income tax in the financial year 1971/72 resulted directly from this operation. Revenue considered that it would not have been possible to mount the operation if the system had not been so completely and effectively computerised.

The Health Contribution Act, 1971, provided for the collection of flat-rate health contributions from, inter alia, self-employed persons other than farmers within certain income tax limits. Commencing October, 1971, a file was set up of such persons (47,000) mainly by automatic extraction of existing computer records. This operation, which could not have been carried out on a manual basis, yielded almost £200,000 which would not otherwise have been collected in the tax year 1971/72.

Another interesting benefit conferred by computerisation, which might possibly be regarded as part of Revenue folklore, was the rounding-up of tax free allowances to the nearest 1p, instead of 25p under the original manual system. This change, which would not have been possible without automation, resulted in an increase of about £1m annually in tax yield.

The new technology also made it possible to check annually the tax liability of employees under the PAYE scheme. This involved the input of actual earnings and tax deducted in each of 650,000 cases approximately, with a computer check in each case. Subsequently, lists were produced for each income tax district of those cases where the tax deducted did not appear to agree with the liability as calculated from the records. These lists enabled inspectors to review liability in the bulk of PAYE cases.

On the whole, not only did computerisation improve the general efficiency of existing tax collection procedures but, by allowing for the more flexible implementation of changes in those procedures, it enabled more effective systems of tax collection to be introduced. For example, systems in operation in the early Seventies, which had not been envisaged in the mid-Sixties, included wholesale tax, VAT, computerised trade statistics, health contributions and construction industry tax. In addition, payments balancing, which had not been envisaged as a significant separate system, had become an important part of Revenue's overall accounting procedures. For the financial year ended March, 1973, over 90% of the total collection of all the following taxes were based on the use of computers: income tax, sur-tax, corporation profits tax, PAYE and sales taxes. This represented over 50% of all taxes collected by Revenue in that year.

Strategic re-evaluation.

Their increasing processing requirements forced another strategic re-evaluation. The equipment had again reached maximum capacity and further development was becoming impracticable. With collection under all tax heads supported by mature computer systems, over three billion characters of tax information had accumulated on magnetic tape master files. In addition, the delays inherent in large scale batch processing were causing problems for administrative staff dependent on the computers for information on tax collection. It was decided to overcome these bottlenecks by providing on-line access, country-wide, to data held on computer files and, by increasing the computer power to handle other anticipated data processing needs in the medium term. The switch to on-line systems again demonstrated the foresight of Revenue management in accurately identifying future trends. New equipment, with the capacity to support current batch applications, further expansion of those applications and the new telecommunications network, was acquired in 1973. It consisted of a dual Honeywell 6060 processor and a comprehensive range of peripherals, including special processors to handle the network communications. Internal back-up was again an over-riding consideration. The H2020-based systems were converted over a period of eighteen months, with all work being transferred to the H6060 installation by end-1974. The new system had a capital value of £2m and was the largest in the public service, handling about 1.2m Revenue accounts (2000MBs). The installation of a disk-oriented system to complement that based on magnetic tape, plus the complex suite of programs required to handle each tax system, made this period (1972-75) a very testing time for Revenue. Its success was a clear indication that the organisation had a full working mastery of the mainframe environment.

The Revenue installation had a brief contribution to make to the development of the computer bureau concept in the civil service. A number of departments made use of unutilized machine time in the second shift to process some small to medium sized jobs. In 1968, the DP unit in Finance hired an outside firm to operate a third shift on one of Revenue's machines in Aras Brugha. Revenue subsequently hired Honeywell to operate the third shift on both computers in O'Connell Street. However, the upgraded system of 1973, with its more demanding configuration, convinced Revenue of the undesirability of a third shift operation if at all possible. This had been borne out by the experience in other countries where it was found to strain staffing and machine resources as well as diluting communication between key personnel. It also left insufficient spare capacity to handle a crisis.

Outside contact.

Since there were no large users of Honeywell in Ireland, Revenue had good deal of informal contact with Honeywell mainframe users in other countries, especially the UK (e.g. Littlewoods). Revenue exchanged information with government departments in certain other European countries using Honeywell equipment and had negotiated formal back-up arrangements with two EC member states in case of a catastrophe. In addition, they received study teams from such countries as Belgium, Turkey, Cyprus and Taiwan. It had been their policy in the Seventies to encourage staff participation at conferences and to send delegations abroad to keep abreast of leading-edge developments. The 1973 conversion was carried out in the Eastern Electricity computer centre at Ipswich using night-shift and weekend working, with different teams travelling across as required. Revenue's top DP manager was president of the Honeywell Computer Users Association for the UK and Ireland, vice-president of the OECD computer group and president of the Irish Computer Society. He also had the unusual advantage, from an organisational standpoint, of combining both the technical and executive managerial functions. This helped reduce problems and delays in reconciling technical and administrative interests and objectives.

1975 - 1987.

In the period 1975 to 1987, computer equipment in Revenue was upgraded on a planned annual basis to meet anticipated needs for processing power, memory, data storage and extra peripherals. Some of these upgrades crossed the threshold into a new class of Honeywell machine, for instance from the H6060 to the H6080 in 1976 to a DPS 8/70 in 1981. New operating system releases were also introduced where they offered significant development features or improved machine performance. A significant software development was the acquisition of a database management system, Honeywell's DMIV, in 1980, in conjunction with a new version of the COBOL programming language, COBOL 74. A marked increase in disk usage to cater for on-line application files was notable throughout this

period. Memory also increased sharply, from 1MB in 1973 to 16MBs in 1985. Overall daily transaction processing volumes grew from 1,200 messages in April, 1975, to about 150,000 in April, 1986.

In addition to the ever expanding on-line applications, heavy batch maintenance has been a marked feature of Revenue work. Many of the batch systems date from the late Sixties and early Seventies; a phased re-writing of these systems has been taking place since, e.g. major redevelopments of the PAYE and VAT collection systems were accomplished in 1975-78 and 1979-83, respectively. The number of batch programs grew from 212 in 1972 to some 2,000 programs in 1986 -- over two million lines of code. Bulk data input and output methods also underwent radical change with papertape being replaced in 1978 by key-to-disk equipment and microfiching.

Position of DP within the organisation.

Within the Revenue organisation, the DP division was originally part of the Collector-General's area, its first major end-user. In 1978, it moved further into the mainstream of the organisation, alongside Personnel and the Supply Branch. A further reorganisation saw the division become part of the Accountant General's Office in 1983. Over this period, the organisational functions committed to computerisation expanded greatly. By 1986, the administration and collection of the following were dependent on computer systems:

- o VAT
- o PAYE
- o PRSI
- o Income Tax (Schedule D)
- o Corporation Tax
- o Capital Gains Tax
- o Health Contributions
- o Youth Employment Levy
- o Capital Acquisitions
- o Customs & Excise Trade Statistics
- o Customs & Excise Deferred Payments
- o Residential Property Tax
- o Revenue Payroll

In addition, computer systems were being used to support the following:

- o Income Statistics
- o Budget Estimation
- o Customs & Excise Warehousing
- o Accounts Payable

Some idea of the volume of work being handled at that time may be had from the following statistics:

Application	Cases
PAYE Employees	1,450,000
PAYE Employers	131,000
Collection of Income Tax, Corporation Tax and CGT	428,000
Assessing Income Tax and Corporation Tax	535,000
Value Added Tax	175,000
Construction Industry	36,000
Health Contributions	282,000
Property Tax	68,000
Capital Acquisitions Tax	47,000
Payroll	6,750.

Processing of the above was concentrated on a Honeywell triple processor mainframe which supported a network of over 350 VDUs located around the country, since expanded to over a thousand VDUs. This network has witnessed a vast expansion in the volume of on-line traffic, as the following table shows:

Year (January)	Number of VDUs	Daily average number of transactions
1976	79	20,000
1977	84	25,000
1978	106	30,000
1979	119	35,000
1980	135	45,000
1981	149	60,000
1982	181	65,000
1983	239	70,000
1984	247	75,000
1985	288	80,000
1986	293	120,000.

These statistics represent some 19,500MBs of stored data.

The burden of developing, acquiring, operating and supporting computer-based systems which improve the effectiveness of the whole organisation lies squarely with the DP division. This includes a major project in Dublin Castle to develop a large-scale microcomputer office information system. Overall direction, however, was provided through the Computer Planning Group comprising representatives of the major user areas. This Group, which extends to Commissioner level, meets at least once every quarter to examine each project in progress, where it stands, and what additional resources, if any, may need to be deployed to accelerate it towards a deadline. The Group is the main means of involving top management across the organisation in formulating strategy and lending support. Future activities coming within the Group's scrutiny will include two major projects, the computerisation of Customs & Excise data entry and a highly detailed and comprehensive study to re-write all tax systems to support an extensively integrated database.

Maximising the value of Revenue data.

The main concern amongst managers in Revenue has always been the speedy and efficient collection of revenue in accordance with statutory requirements. The generation of additional information, statistics and reports from the data collected has been of minor importance. In the opinion of some commentators, this neglect has been unwarranted ("there is no particular incentive on the part of Revenue to produce the desired statistics" - Blackwell). Revenue data could provide very revealing national statistics for a range of policy purposes -- earnings, employment, income distribution, business activities, profits, taxation, coding of firms etc. The biggest obstacle to producing tables which would help policy making outside the specific remit of Revenue itself is, according to Blackwell (1985), the need to deploy clerical staff to "clean" the data, that is remove individual identifying characteristics. While the question of data release is not, strictly speaking, an IT problem, except in so far as it relates to the availability of staffing resources, it does highlight the need amongst management generally, whether in Revenue or elsewhere in the public service, to adopt an attitude towards information technology which is broader than the automation per se of manual procedures.
The information generated by a computer system should be regarded as an integral justification for the system and not merely a by-product of procedures transferred from a manual to a mechanical environment.

APPENDIX O

Department of Social Welfare

[Reference date: Start 1988]

Some developments in the Department of Social Welfare have already been discussed in the main text. Up to 1985, CDPS was responsible for systems development in that Department. This responsibility was complete, being neither purely technical nor agency-based. CDPS worked on the basis of joint responsibility with Social Welfare management on all aspects of planning and development. Operations were the sole responsibility of Social Welfare. This co-operative participation at both management and lower levels should be kept in mind throughout this appendix.

The systems in operation in the Department fall into five broad categories:

(a) Systems originated in the Seventies, viz. (i) general benefits, which includes disability benefit, occupational injuries, maternity allowance and (ii) treatment benefit (dental and optical);

(b) The Central Records system which operated from late 1980;

(c) Office automation and on-line enquiry systems;

(d) A number of recently introduced applications, including children's allowance, pensions, a pilot system for unemployment assistance/benefit, family income supplement and rent subsidy, which were all initiated during 1984/5;

(e) Networking and telecommunications.

General Benefit system.

The general benefit system was first installed in 1973. In line with the policy prevailing at that time, Social Welfare were not given the latitude to expand too quickly into a fully self-sufficient installation, in addition to those already operating in Revenue and P&T. Instead, a two-tier approach was adopted. Two Honeywell 716 minicomputers were used together with a remote job entry link to the IBM 370 in Kilmainham. The smaller machines handled the time-critical local processing on-line, such as claim entry and payment calculations, while the mainframe handled such batch work as master-file updating, cheque reconciliation and statistical analysis. Transaction throughput was high even then, with 50,000 medical certificates and 6,000 new claims per week. The Honeywell processors were eventually replaced in 1981 with DEC PDP 11/70 computers using DECNET software for transmission. This system provided greater processing power for increased functionality and supported a larger number of VDUs.

The application was transferred again at end-1984 to two VAX 11/780 computers. The batch work on the IBM machine was subsequently transferred to the VAXs. The overall system architecture remained similar to the Honeywell/IBM arrangement but with the notable advantage that the common operating environment for both on-line and batch processing made the phased re-design of the entire system easier to effect. In an effort to contain operations staff requirements, the on-line application was transferred again to a VAX 8600 in 1986.

Central Records system.

Following the changeover from insurance stamps to a system of pay-related social insurance (PRSI) in 1979, the department's central records sections were computerised with effect from 1980/81. This was a major turning point for Social Welfare since it committed them to a long-term strategy. The DEC proposal to use their PDP 11/70s was accepted by the department as the most flexible solution, opening up possibilities of transparent access between the Benefits and the CRS systems. This factor would have influenced the decision referred to above to migrate the Benefits application from the Honeywell machines to the PDPs.

The Central Records System (CRS) is a very large database containing employment and earnings details of over 1.5 million insured persons. The bulk of the CRS data comes originally from Revenue on magnetic tape who collect PRSI using the PAYE system. It also records details of all claims. The CRS, as the focus for the administration of all insurance-based schemes, is the conceptual hub of Social Welfare's network. The other systems feed into and draw from it. There is no reason, though, why the CRS should be restricted to coverage of insured persons only. For instance, non-insured persons who come within the orbit of the Social Welfare code -- which can, in theory, embrace all Irish residents -- could also be included.

The CRS is undergoing a phased re-design. This could result in a move away from the distributed architecture employed to date. The department states, however, that it is aware of centralised database systems of similar size and complexity which operate effectively on a distributed data network. A fairly lengthy migration time to a full-blown DBMS-type solution is anticipated; this may allow VAX-based software to be proven in the intervening period.

Telecommunications.

During 1981-82, the data network was essentially local in nature, with a small number of remote experimental connections. It comprised about 150 terminals connected to five PDP 11/70 computers located in two sites and serving six HQ buildings in Dublin and the employment exchange in Cork. In parallel with the decision in 1983 to make the major move from TRAX to VAX/VMS for Benefits and CRS,

the department carried out a strategic study of their immediate and long-term telecommunications requirements. It decided to select a local area network (LAN) in preference to the more traditional approaches such as conventional point-to-point cabling, front-end processors or a PABX solution. In pursuing this course the department ran against their consultants' recommendation. Despite their heavy investment in DEC equipment, the department installed another product, PLANET, instead which supported all standard protocols, including IBM.

Office information system.

An information system, INFOSYS, was implemented in 1983 to allow queries from the public to be answered at a number of local centres. Several Dublin and provincial information offices were linked into INFOSYS using the public telephone network. Originally INFOSYS, which currently runs on a VAX, handled dial-up enquiries in respect of general benefits and CRS. It has since been extended to cover children's allowance and pension queries. The department intends INFOSYS to incorporate new applications as they come on stream. In addition, links have been set-up to the department of Health and FAS.

1984 saw a marked increase in the number of general managers using a terminal for standard enquiries and some basic OA activities. By mid-1986 there were 140 users at management level or thereabouts availing mainly of the electronic mail, document filing/retrieval and word processing features under VAX/VMS. Some use was also being made of spreadsheet and graphics. A more comprehensive and user-friendly system, DEC's All-in-One, was implemented on a phased basis during 1985. It was the department's intention at this time that all officers at middle and senior management level would participate in a Management Information System based on All-in-One.

Hardware configuration.

The hardware configuration in the department by the mid-Eighties made it one of the largest DEC installations in Europe, with total CPU memory of 208 MBs, total MIPS of 27.5, and 800 VDUs [By 1990, these figures had grown significantly to 606MBs, 59.8 MIPS, and 1550 VDUs]. The following table schedules the hardware in Social Welfare at start 1987:

Processors:	2 x VAX 8650 2 x VAX 8600 3 x VAX 11/785 3 x VAX 11/780 5 x MicroVAX II	These processors (excluding the MicroVAXs) had an equivalent overall throughput of 19 x VAX 11/780s.
Disks:	65 x RA81 (total c 30,000 MBs)	

Terminals: 800 VDUs at over 40 different locations
140 VDU-associated printers
22 laser printers
16 line printers

Telecommunications: 194 city lines; 17 dial-in lines;
12 lines to provincial centres
(excluding shared lines).

[See Annexe A for more recent statistics.]

The large VAXs are clustered in each site. They are also connected by an Ethernet LAN over which DECNET is transmitted. The Department claims to have successfully integrated two distinct LAN technologies to create a level of resilience not otherwise achievable. Their telecommunication arrangements enable all the department's terminals, irrespective of location, to access data on any of their computers. The implementation of the PLANET and Ethernet LANs gives the end-user the appearance and functionality of a very substantial LAN with access to all processors and databases. Further developments are expected to result in even greater integration of LANs across the department.

Growth of computerisation within Social Welfare.

When examining the growth of computerisation in the department, it is important to note that the greatest expansion occurred in the space of only four to five years. Significantly, these developments created or facilitated fundamental changes in the structure of the administration. When one considers that the skills and know-how needed to manage a large computer installation take many years to acquire, the pace of change was notable. There can be no doubt that this required considerable commitment at management level, as well as firm Ministerial support. CDPS must also have been strongly committed to this rapid rate of expansion. This general policy would have been strongly endorsed by both DEC, whose equipment was exclusively employed, and the firm of consultants who have had a significant involvement with Social Welfare throughout the Eighties.

The following table will give a clear picture of the rate at which computerisation expanded in the department:

	1980	1981	1982	1983	1984	1985	1986
Number of VDUs	50	150	250	300	450	500	800
Disk storage (GBs)	4	5	6	7	12	17	30
Memory (MBs)	-	12	18	25	35	90	208
Computerised claims in payment (000s)	-	-	-	c100	800	900	1000

The volumes of data supported by various applications at mid-1986 were:

Application	Active Clients
Short term benefits (5 applications)	700,000 claims per annum;
Central Records	1,300,000 (c.2m records);
Child Benefit	0.5m families (1.2m children);
Pensions	0.5m persons;
Unemployment Assistance	25,000 on computer;
Family Income Supplement	6,000;
Rent Subsidy	6,000.

Note: The Family Income Supplement system is programmed in Datatrieve; all other applications are in Cobol.
[See Annexe A for more recent statistics.]

Design philosophy.

The approach taken by the department to computerisation has been basically incrementalist. Instead of employing one or two large mainframes to handle their heavy processing requirements, they opted for a system comprising a totally compatible range of minicomputers linked by powerful inter-processor communications. A mainframe-based strategy was seriously considered but management in Social Welfare felt their short and medium term needs were better served by a hardware configuration which allowed the widest flexibility in dealing with systems development, project control, security, and changing administrative requirements. The two short-listed proposals in 1979 were both for minicomputers. The final selection of Digital was fully supported by both CDPS and Social Welfare. In the early Eighties the department, with the assistance of consultants, undertook major studies in networking and hardware strategy which further supported this approach. These studies were influenced by the following considerations which the department regarded as important: operational independence; reliability, availability and performance; flexibility and expandibility; security, e.g. resilience in recovering from emergency situations; ease and speed of implementation.

Minicomputers, it was considered, enabled a long-term strategy of networking and distributed processing to be more flexibly pursued -- this was an important consideration for a department whose staff were located in eighteen buildings in Dublin and about 200 offices throughout the country. It is probably fair to say that the department took a calculated risk when it opted for a minicomputer solution. Some experts in the early Eighties were of the opinion that a networked minicomputer system could not continue to expand indefinitely since the operating system overhead and the proliferating problems of inter-processor communication would become excessive; thus, when the time came to graduate into a mainframe environment, it would be impossible to do so since the investment in the minicomputer solution would have become too great.

The calculated risk was supported by their confidence in Digital's technology. Social Welfare found in Digital a good partner who continued to produce the improved hardware which was essential to the success of the strategy adopted. Digital continued to develop more powerful machines; the networking software did not disappoint, while the software development and applications tools, TDMS and ACMS, performed well. In addition, Digital found in Social Welfare a suitably sized customer to test out its new software products -- the department was quite prepared to act as a test site for original software in controlled circumstances, though they maintained a general policy of only installing proven hardware. Another factor weighing in favour of the strategy adopted was the continuing low cost of minicomputer processors -- the department estimate that the mainframe alternative would have been at least twice as expensive.

Situations arising.

The department has not been without its headaches and setbacks. To begin with, the huge increase in claimants in the Eighties had to be catered for. For example: The Disability Benefit application got into serious difficulties in 1981 -- this is a very sensitive area since a one-day stoppage can leave thousands of families without their payments. In 1984, a postal cheque payment scheme for the long-term unemployed fell foul of bank branch closures in high density areas, necessitating a return to the manual/cash approach. A major project to rewrite the general benefits system, had been deferred a few times due to pressure of work on other fronts and which did not commence until late 1983, was stopped by senior management in June, 1985, despite protests from the technical staff engaged on the project. Another important problem for the department arose from the decision in 1978/79 to use the Revenue tax number as the social insurance identification code upon the changeover to PRSI (The UK gave priority to the social insurance number).

Further research.

The introduction and expansion of IT in the Department of Social Welfare is a very complex subject and deserving of in-depth analysis. This appendix could only sketch the main issues and developments. In addition to the vast range of operational and technological changes during the Eighties, the department has undergone profound changes at an organisational and management level. The department has not been slow to address these issues as they arose but has continually re-structured the organisation at both staffing and procedural levels to best avail of technological opportunities. Given the volume of its transactions, the size of its staff, the distribution of its services network, and the extent of its client base, it is unlikely that any other organisation in the country has undergone more extensive IT related change. When one considers its high exposure to public scrutiny, it has shown conspicuous courage in addressing the challenge of new technology.

ANNEXE A

Recent statistics on IT in the Department of Social Welfare

A: Staffing and Clients, 1990

The department has 3800 staff in over 150 locations. It has 715,000 clients (who in turn have about 580,000 adult or child dependants). It handles gross expenditure of some IR£2.7bn.

B: Schedule of hardware, 1990

CPUs

1 x VAX 11/785	These processors are in three clusters comprising 4, 3, and 2 VAXs, respectively.
2 x VAX 8600	
2 x VAX 8650	
2 x VAX 8530	
3 x VAX 8550	Total main memory = 606MBs
2 x VAX 8810	Total MIPS = c 60.
	Estimated overall throughput equivalent to 36 x VAX 11/780.

Disks

40 x RA90	
29 x RA70	
10 x RA82	
4 x SI83	
20 x RA81.	Total disk capacity = 92.3GBs

Terminals

1550 VDUs
147 Terminal servers
13 line printers
56 laser printers.

Telecommunications

A virtual LAN comprising 4 Token Ring LANs bringing data to 4 CSMA/CD segments linked by fibre optics to create one virtual Ethernet.

231 analogue multiplexers
14 digital multiplexers
13 digital circuits
228 analogue circuits
3 fibre optic circuits.

The department's telecommunications network, INFONET, is being developed country-wide to provide multi-node access to centrally held applications and INFOSYS. On completion, the network will provide central access for 2500 VDUs located around the country.

B: Applications growth

General Benefits	November	1973
Central Records	January	1981
INFOSYS	October	1983
Unemployment Payments	January	1984
Child Benefit	May	1984
Pensions	August	1984
Family Income Supplement	October	1984
Rent Allowance	October	1984
Office Automation	January	1985
Flexitime	October	1985
Cheque Reconciliation	January	1986
Travel and Subsistence	January	1986
Management Information System	July	1986
Outdoor Staff Work Returns	September	1986
Qualification Certificate	September	1986
Parliamentary Questions	October	1986
Disability Benefit Appeals	October	1986
Medical Referral	February	1987
Free Schemes	February	1987
Electricity, Travel etc	March	1987
Treatment Benefits	May	1987
Personalised Payment Orders	August	1987
PLOW (Unemployment Payment)	December	1987
Refund of Payments	January	1988
Miscellaneous Payments	January	1988
Self-Employed	April	1988
Free Fuel	October	1988
Voucher Reconciliation	August	1989
Widowers' Allowance	November	1989
Deserted Husbands' Allowance	November	1989
Carers' Allowance	January	1990
Pre-Retirement Allowance	March	1990
Free Natural Gas	May	1990
General Ledger	July	1990

APPENDIX P

Local Government

[Reference date: start-1988]

Computing in local authorities is primarily the responsibility of the Local Government Computer Services Board which was established in September, 1975, by an order made under the Local Government Services (Corporate Bodies) Act, 1971. The functions of the Board are:

(a) To organise, administer and provide (or arrange the provision of) a service for the supply of computer facilities (including facilities relating to the preparation of data for input to a computer, computer programming, systems analysis and design and the operation of data processing facilities) for local authorities;

(b) To co-ordinate and secure compatibility in the use of computers by local authorities generally with a view to securing the most effective use of available resources;

(c) In matters relating to its function under paragraphs (a) and (b) above to:

(i) Provide or arrange the provision of training and education;

(ii) Carry out, promote or assist in the carrying out of research, and

(iii) Furnish advice, information and assistance to the Minister and to local authorities.

Operations.

Computers were first introduced to the local government sector in the early Seventies. By 1974 five of the larger authorities had acquired computers and sixteen were using bureaux services. Accounting applications and the processing of large volumes of data such as municipal rates and the register of electors were the principal applications at that time. The establishment of the Board was a timely move to ensure the proper co-ordination of activities and the most effective use of resources in the local government sector. The only local authorities to operate independently of the Board are Cork and Dublin (both corporations and county councils), Wexford and Cavan.

From the earliest date the Board had a policy of pursuing the optimum degree of standardisation of both hardware and software across the sector. All users were directed to use one model of mainframe, the ICL 2903. By 1983, 28 of the 31 local authority computer installations were operating on ICL equipment. In 1982 the Board proposed a major change in hardware strategy which resulted in a decision to standardise on Honeywell equipment (the DPS6/75). It was considered that Honeywell then offered the kind of on-line facilities and terminal support which was most

consistent with the Board's long-term plan for a national network allowing distributed on-line processing. Westmeath was the first user to convert to the Honeywell DPS6 in autumn, 1984. By the end of 1986 all but one site had been converted from ICL to Honeywell. The value of the contract was reported to be in the region of £3.5m but this seems fairly conservative, covering minicomputer hardware only and excluding VAT. In the five-year planning cycle, 1983-87, the Board are understood to have worked within a £15m budget, covering hardware, bought-in applications, training, etc.

Funding IT developments.

The Board functions on a cooperative basis, being funded directly by the local authorities. It had a turnover in 1985 of about £2m. Initially funding came from participating local authorities, with payment being made on a rolling basis while a system was being developed. This method was found to be less satisfactory as a diminishing proportion of the board's activities could be clearly categorised as systems development and because the local authorities who would ultimately end up using a system were somewhat reluctant to contribute towards its initial development costs. This method was replaced in 1986 by one whereby all local authorities were levied in proportion to their size for the cost of implementing an agreed annual work plan. This plan would have to be settled in the previous year by eight County Managers and three senior civil servants meeting monthly on behalf of the entire user base. The eight County Managers are appointed at an annual convention of all County Managers.

The accent on training.

The Board, which possesses its own Honeywell mainframe, develops software for local authorities as its principal function and subsequently trains staff throughout the country in its use. The training function also entails raising the competence and awareness of local authority staff in all grades regarding IT and data processing. These courses cover the pre-implementation phase of a project, data preparation, specialist training, refresher courses, new packages, office automation, database management, spreadsheet packages, word processing, operations etc. The specialist courses include COBOL programming, systems analysis, project leading, data communications, fourth generation tools and technical courses concerning Honeywell equipment. The Board places a great deal of emphasis on training, but due to staff shortages has had to secure this service in part from outside agencies -- IPA, IMI, FAS, and a private firm providing microcomputer package training. This policy has the twin merit of concentrating in-house DP expertise on on-going development work while encouraging local authority personnel to mix with their peers from other organisations. In 1983/84 the Board took an important step when it encouraged the National Computing Centre in Manchester to enable the IPA to run its certified NCC Systems Analysis course. The primary objective was, not the production of systems analysts per se, but the promotion of good systems skills among general managers.

Structure and functions of the Board.

The Board employs some 65 staff in the two main divisions: Technical (engineering) and General Administrative Accounting (systems design). The operational structure of the Board is not immutable but is shaped and re-organised over time to match its changing requirements. To this extent the Board is striving to identify the optimum structure.

The Administrative Division has developed 12 of the 13 main local authority systems: Payroll, Payments, Receipts, Expenditure, Bank Reconciliation, Rates, Housing Loans, Housing Rents, Services Charges, Register of Electors, Traffic Fines, Planning Applications, and Stores. Only one system, the Stores System, was based on a purchased package, modified to meet local authority requirements. These systems were initially developed through concentrating on the specific needs of a representative pilot site, with the Finance Officer being the typical local contact. This approach was changed in 1982 to allow for greater flexibility in the longer term, with a working party of about 9-10 representatives of the board and local authorities meeting to define the features of a system and its level of integration into the overall system development plan drawn up by the Board. All the main systems to end-1986, except Stores and Planning, were designed as batch systems. The total number of installed systems in the 33 sites around the country at that time stood at 256 (averaging eight systems per site).

On the scientific and technical side, the Board has installed Sord micros to meet local authority engineering needs. Board staff bought in a wide range of packages covering many application areas -- CAD (mainly for roads, bridges and roundabouts), water distribution network analysis, traffic management etc.

By setting and maintaining installation standards the Board can, amongst other things, promote a greater local awareness of data processing technology. The rapid growth in DP capability in local government since 1983 has seen an expansion of local expertise beyond the purely financial area into the attainment of more clearly defined regional objectives. Some sites have adapted more smoothly than others to the transition. The pace of change and the more widely varied nature of the applications now available require a disciplined set of installation standards. The Board has found that the best operations are in sites with independent IT units, where staff have clearly defined responsibilities which they are allowed to fulfil without the distraction of being involved in the work of other units, e.g. Accounts. Clearly defined staff structures and functions very significantly determine the quality of performance of a computer unit. The Board recommends that all local authorities have a separate, self-contained computer unit with its own staff, preferably without non-IT responsibilities, and reporting directly to a member of senior management. In addition, the Board has recommended to all authorities that greater emphasis be placed than hitherto on computer training. According to the Board, the unsatisfactory results in some sites are almost

certainly attributable to a poor appreciation of the need for adequate training. The computer unit would have responsibility for ensuring that adequate training is supplied. The staffing structure of a computer unit, as recommended by the Board, should avoid unnecessary grading disparities between staff carrying out broadly identical functions at different sites. However, the Board, perhaps unwisely, stops short of recommending the grading structure to apply.

Functions of an IT unit in a local authority.

The functions of an IT unit in a local authority are:

(a) To provide computer services for all sections of the authority as agreed with local management;

(b) To provide all necessary training, manuals, or other information required by user units to properly fulfil their functions where all or some of these are computerised;

(c) To provide any assistance required by users for the day-to-day running of these systems and particularly in cases of difficulty or error;

(d) To ensure that good operational practices are applied in the running of systems, thus guaranteeing secure, timely production of the appropriate outputs;

(e) To guarantee the security and integrity of all files and data entrusted to the unit by users;

(f) To maintain good communication with user units so as to be aware at all times of their requirements;

(g) To maintain good communication with appropriate Board staff so as to be aware of the proper method of systems operations and thereby keep Board staff informed of the requirements of users.

A key objective of this set of responsibilities is to ensure good communication between users, the unit and the Board. Since the Board has adopted a general policy of concentrating as much expertise as possible in local sites, with a full realization in time of "end-user computing", good communication is recognised as being essential. Otherwise, they fear, IT could slip back into an isolated corner of the administration and fail to fulfil its potential as a tool of management.

The administrative division of the Board is broken into four functional units or teams: the development team, which co-ordinates the activities of the Board; the customer service team, which handles system support, training and implementation; the planning team, which carries out research into such areas as software development tools, fourth generation languages etc; and the end-user computing team which deals with office automation. These teams are, in practice, fairly loosely constituted so as to allow for the changing priorities imposed by both users and the technology. The main guiding principle is that of greater

user participation in and control of the resources and utilities to meet his requirements. The Board are pursuing a policy of using microcomputers to ease the processing pressure on the larger machines and to download data for local modelling and analysis.

As a large customer, the Board maintains close contact with Honeywell on system performance around the country based on monthly fault logs submitted by local authorities. The Board also keeps in touch with the Honeywell Computer Users Association. It is very important for a large user such as the Board to continually represent its interests to ensure the vendor's policies in a competitive market are sympathetic to its needs. The Board is well satisfied with its policy of choosing a compatible range of mini and micro computers to cater for the requirements of large and small organisations, with the same applications software running on all local authority Honeywell machines.

Conclusion.

Since its inception in 1975, the Board has faced much the same kind of problems as other computing organisations: how to maintain an adequate level of expertise in the face of high staff turnover; how to settle on a reliable hardware strategy to meet changing long-term needs; how to widen its user base while enforcing high standards; how to develop problem-free applications for over thirty sites; how to steer a steady course towards greater long-term integration between systems, and so forth. The decision to switch from ICL to Honeywell was a brave one since it involved converting all their existing systems into a Honeywell format. The Board took the sensible course of converting "batch-to-batch" rather than trying to clear two hurdles at once by attempting to convert the ICL batch applications into on-line ones for Honeywell (The Board is currently converting these to on-line).

The Board appears to have had success in maintaining order and direction in an area which could very easily have grown in a disorganised, haphazard manner, with much duplication of effort and waste of resources. Some other countries, including the UK, have had little success in streamlining computing in the local government area despite the common factors which invite standardisation of systems and policy across local authorities -- common statutory framework, the similarity of activities, the high cost of developing new systems, and the increasing pressures on local authorities worldwide to maintain existing services with shrinking allocations.