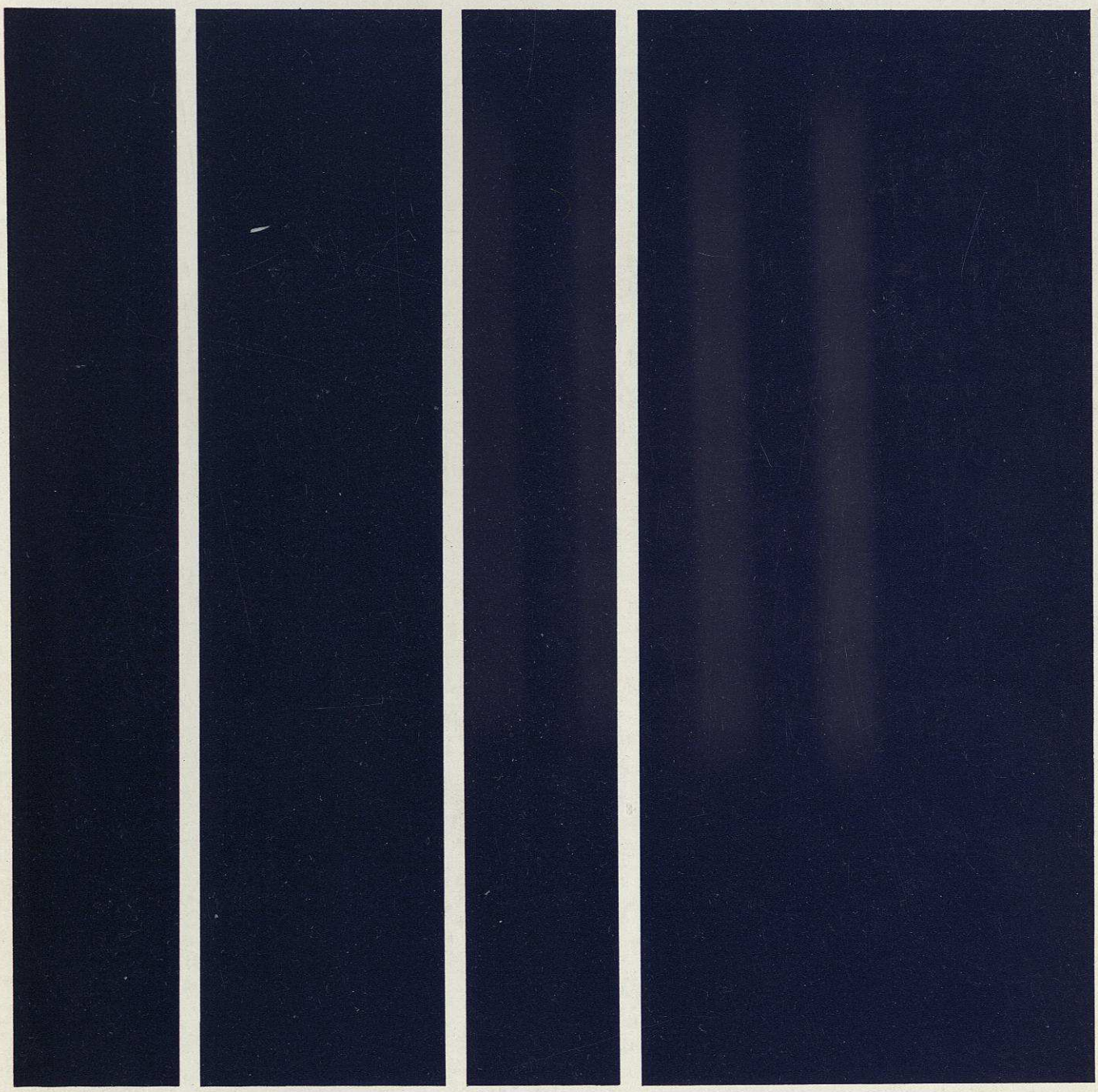
Report Series
No 24

Investment in Systems

August 1981



The Butler Cox Foundation

Abstract

Report Series No 24

Investment in Systems

by George Cox

August 1981

As information systems have grown in size, scope and influence over the past twenty years, so the related decisions on investment have grown in both importance and complexity. This report examines those decisions.

The report is written specifically for the guidance of senior management. It therefore concentrates on the issues with which senior management needs to be concerned, and it presupposes a general understanding, but no technical knowledge of today's information systems.

The report starts by examining the factors that give rise to complexity and create uncertainty. It then examines the ways in which overall investment can be assessed and controlled. It then turns to the subject of individual projects and it examines the way in which these can be appraised at the outset and monitored subsequently.

The subject is treated very much along practical lines. The research leading up to the report examined the most recent experience and the current practices of over fifty large organisations in both the public sector and the private sector. To support and illustrate the findings, the report contains a number of case histories.

The Butler Cox Foundation is a research group that examines major developments in the fields of computers, telecommunications and office automation on behalf of its subscribing members. The Foundation provides a set of 'eyes and ears' on the world for the systems departments of some of Europe's largest organisations.

The Foundation collects its information through its office in London and also through its associated offices in Europe and the US. It transmits its findings to its members in three main ways:

— Through regular *written reports* that give detailed findings and substantiating evidence.

— Through *management conferences* for management services directors and their senior colleagues, where the emphasis is on the policy implications of the subjects studied.

— Through *working groups* where the members' own specialist managers and technicians meet with the Foundation research teams to review their findings in depth.

The Foundation is controlled by a Management Board whose members include representatives from the Foundation member organisations. The responsibilities of the Management Board include selecting topics for research and approving the Foundation's annual report and accounts, which show how the subscribed research funds have been employed.

Report Series No 24

INVESTMENT IN SYSTEMS

by George Cox

August 1981

Butler Cox & Partners Limited Morley House 26 Holborn Viaduct London EC1A 2BP

Photoset and printed in England by Flexiprint Ltd., Worthing, Sussex

CONTENTS

CHAPTER 1

INTRODUCTION

THE SUBJECT OF THIS REPORT

As information systems have grown in size, scope and influence over the past twenty years, so the related decisions on investment have grown both in importance and in complexity. This report examines those decisions, looking at them from the viewpoint of the senior management involved.

Today's systems no longer simply replace routine administrative procedures that justify their introduction by straightforward cost displacement. They also affect the efficiency, the flexibility and the controllability of many organisations. In some commercial organisations, the effectiveness of the information systems can even have a considerable influence on whether the business is able to remain competitive.

Under these circumstances, the simple form of cost-benefit analysis that most organisations previously used to justify their computer systems is no longer adequate for, or pertinent to, the investment decisions that have to be made.

Both the costs and the benefits have changed in nature. Although the cost-performance of computer-related equipment has improved dramatically, the total expenditure on systems has increased. The difference now is that, on new projects, an increased amount of the expenditure on a system relates to the software, the people and the support for the system — and these are all items that usually do not have a clearly-defined price at the outset. And as the benefits have changed from simple cost savings to, perhaps, more important but less easily defined gains to the organisation, the relationship between the level of investment and the level of return on that investment has become less straightforward.

This is not to imply that the return is any less real or any less worthwhile. In fact, the reverse applies. As we have pointed out in earlier Foundation reports, in today's universally difficult economic climate, developments in information technology represent one of the few counter factors that can offset the rising costs of energy, labour, transport and money, and also the increasing complexity of the business environment and all the difficulty that that entails.

But, fully exploiting this technology poses some difficult decisions for senior management. The potential returns may be highly attractive, but the penalties for under-investing or for investing either in the wrong type of system or in systems aimed at the wrong objectives, can be both severe and difficult to rectify in anything other than the long term.

This report examines the nature of the decisions that have to be made, and it explores the ways in which they can be tackled.

SCOPE OF THE REPORT

We have deliberately kept the scope of the report wide. The subject is many-faceted, and

we have avoided concentrating on selected aspects. The subject calls for a sense of perspective, and an appreciation of where individual decisions fit into the total investment picture.

Essentially the report is concerned with the way in which organisations make decisions to spend money on information systems.

We use the term 'information systems' in this report in a wide sense that covers all automated forms of information processing and communication, other than process control and scientific data handling. As we use the term here it covers commercial computer systems, telecommunications and office technology. However, we make no attempt to isolate these items or to deal with them separately.

TREATMENT OF THE SUBJECT

The subject is a complex one. In this report we make no attempt either to disguise this complexity or to reduce matters of judgement to sets of rules or procedures.

Rather, our aim is to identify and clarify the issues involved, to identify where past practices are proving inadequate for today's demands and to look for guidance from the best available experience.

The subject warrants being examined at two levels. At one level, the basic nature of the problems involved needs to be explored and defined, and the underlying principles need to be established. At the other, the practical considerations need to be examined by looking at the way in which organisations can — and do — deal with the problems. We encompass both levels in this report.

To maintain the necessary practical bias to what is basically a practical subject, we started our research with a survey of the views and experiences of over fifty large organisations. We followed this survey by examining more deeply some specific aspects of the experience gained in selected organisations. Our research embraced both the public sector and the private sector.

In the former, we were able to draw upon the information contained in "Investment Appraisal and Monitoring Procedures for Administrative Computer Projects" published by the United Kingdom's Civil Service Department in 1980.

As part of our investigations we examined specific aspects of the investment problems that different organisations have. In particular, we examined several organisations as case histories, and in some of those organisations we were able to examine in detail the historical pattern of the organisation's expenditure on data processing. For interest, we include five of these case histories as Appendix 1 to this report. These five case histories illustrate both the individual variations from the oft-quoted industry norms, and the detail of information that an organisation should have readily available before it seeks to control its expenditure and to direct its investment.

We also include, in Appendix 2, selected case histories that provide practical examples of the ways in which some organisations have tackled some different aspects of the investment decision process.

STRUCTURE OF THE REPORT

We start, in chapter 2, by examining the issues involved in making decisions on invest-

ment in systems, and in what way and for what reasons these decisions are becoming more complex. We then explore, in chapter 3, the overall problem of determining total investment strategy.

In chapter 4 we discuss the different bases on which information systems are provided, and we consider the effects that these different bases have on investment and, in particular, the influence they have on the direction of investment. Then, in chapter 5, we examine the question of the way in which decisions can be made, and are made, about individual projects.

We then look, in chapter 6, at whether and in what way organisations, in practice, monitor the results. Finally, in chapter 7, we give some points of guidance.

INTENDED READERSHIP

This report is intended to be of value to all managers involved either in taking decisions on investment in systems or in preparing information on which such decisions could be taken. Although the report will be of value to the specialist manager, it is primarily aimed at those general executives outside the technical area who carry the responsibility for investment, who authorise the expenditure on systems and who also ensure that the organisation fully exploits the opportunities that systems present.

We have therefore avoided technical expressions as far as possible, and, where appropriate, we have explained the various technical considerations.

CHAPTER 2

THE ISSUES AFFECTING DECISIONS ON THE INVESTMENT IN INFORMATION SYSTEMS

Before we consider the way in which investment decisions can be made it is necessary first to define the term 'investment'. If we restricted the report to the use of the word in the formalised accounting sense — with investment being something that results in capital assets — then the report would be concerned only with the acquisition of equipment. This is an important issue, but it is not necessarily the most crucial one.

We therefore use the term more widely. Furthermore, in looking at expenditure in total it is not always easy to distinguish between investment in future systems and expenditure on the provision and support of existing systems. Consequently, we cover both.

Before we examine the decisions themselves, we set out the background against which they must be taken, and we identify some of the factors that make those decisions so complex.

CONTROLLING THE INFORMATION SYSTEMS FUNCTION

We commented in earlier Foundation reports on the remarkable development of basic computer technology. Over the past fifteen years the price-performance of processing power has improved a hundred-fold, and over the same period the cost of storing data electronically has dropped thirty-fold. These improvements represent milestones along a path of development that is still a long way from any foreseeable end. But, far from leading to ever-diminishing expenditure on systems, these developments have opened up opportunities for new systems on a scale that has commanded increased total expenditure.

Furthermore, the new technology has pushed out the boundaries of automated information systems. The nature of data processing is changing from being concerned with the remote handling of bulk data to being interactive and dealing with transactions when and where they occur. In this way, data processing is becoming more attuned to the style in which people and organisations naturally operate.

In addition, information technology now has the potential capacity to handle not just coded and quantified data (which has traditionally been the computer's prerogative) but also voice, text, video and graphics.

To cope with this rising importance of information technology over the past fifteen to twenty years, a new function has become established, and has grown in importance in every large organisation. Whether the function is known as management services, the computer department, information systems or data processing, and whether or not it is distributed or centralised, the function is that of providing systems.

It is a function which has a staff role but which, unlike other specialist areas, integrates directly with the day-to-day work of almost every part of the organisation. In addition, it uses complex and ever-changing technology, but yet it is deeply involved in everyday tasks. This means that it cannot be controlled as an isolated specialist function.

Moreover, because of its relatively recent rise to importance and its constantly-changing nature, the overall control of this function presents several difficulties.

Most other functions within an organisation (for example, sales, production, finance, and even areas such as research and marketing) are more readily understood by senior management. The roles of those functions are clear, their performance can usually be judged by well-proven criteria, and the effects on the organisation generally of increasing or decreasing expenditure can usually be assessed. This is not to imply that decisions on these functions are easy, or that they do not require considerable management judgement. It implies rather that the nature of, and the basis for, the decisions affecting those functions are at least clear. The wisdom of either cutting back or increasing expenditure in any of those functions can be judged on the basis of past experience.

The criteria for assessing the contribution of the information systems function are less clear. The 'right' level of investment must be decided with little guidance available either from the past or from the experience of others. The consequences of cutting back or stepping up investment are seldom readily apparent. And, except by using the simple expedient of approving or cutting budgets, a satisfactory mechanism for exercising control over the investment in systems often does not exist.

Furthermore, many organisations have still to determine precisely the way in which the function fits within the corporate structure. This is not so much a reflection of indecision, but more a reflection of the fact that the technology itself has demanded, and continues to demand, changes in the way systems are developed and provided. For example, the early types of hardware compelled organisations to consider economies of scale and hence centralisation, whereas more recent trends have led to distributed computing and a measure of decentralisation. The rising importance of telecommunications, and its dependence on advanced technology, raises new corporate-wide considerations. In addition, the current promise — but uncertainty — of office automation raises further organisational questions.

THE CHANGING RELATIONSHIP BETWEEN THE INFORMATION SYSTEMS FUNCTION AND ITS USERS

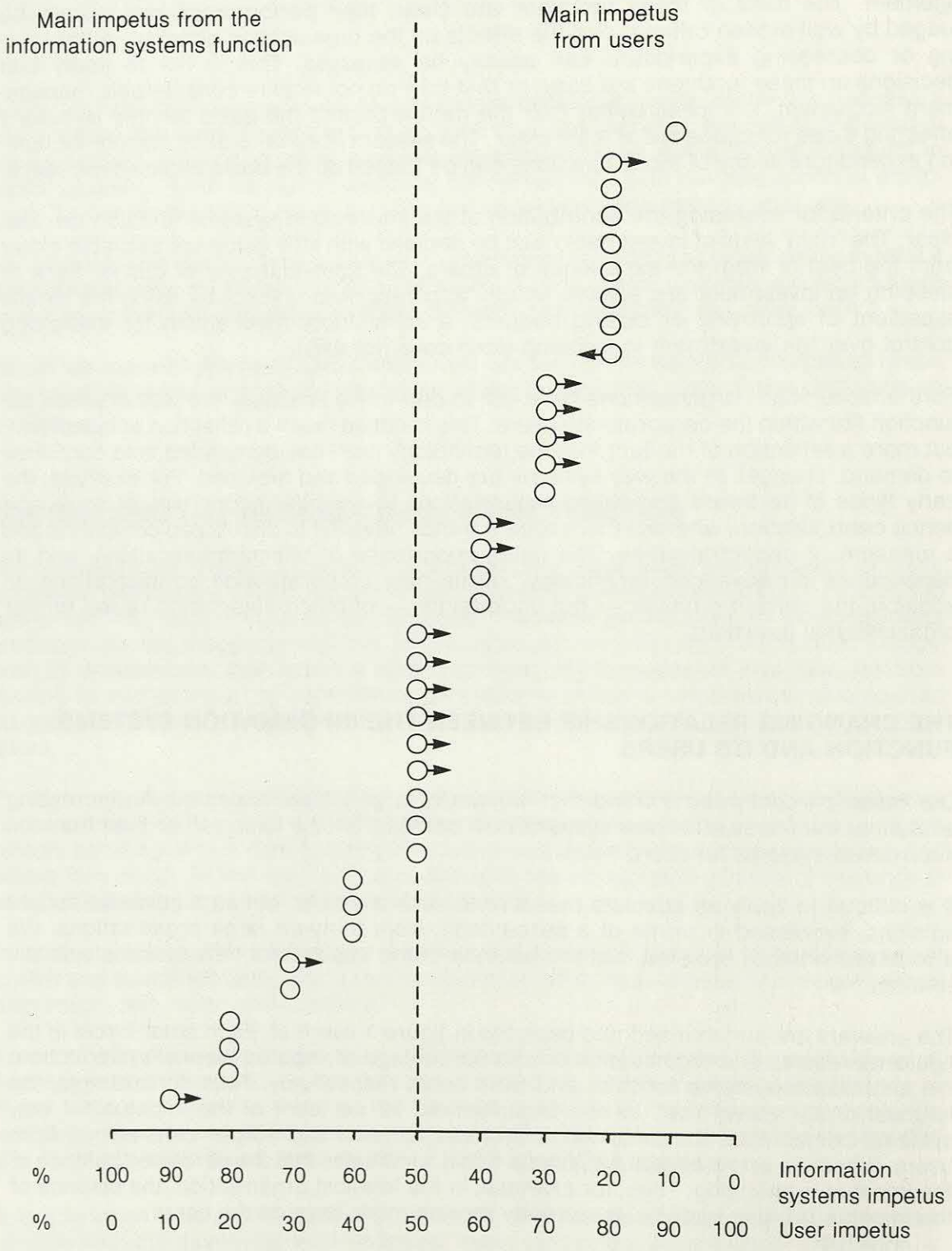
Our research confirmed a trend that we would largely have expected. An increasing amount of the impetus for new systems now comes from the user, rather than from the information systems function.

It is difficult to apply an absolute measure to such a matter, but as a guide we sought opinions, expressed in terms of a percentage, from thirty-six large organisations. We also asked whether they felt that the balance of the impetus for new systems was still shifting.

The answers are summarised and depicted in figure 1 overleaf. Each small circle in the figure represents one organisation and its percentage of impetus for new systems from the information systems function and from users respectively. Thus, for example, the leftmost circle shows that, in one organisation, 90 per cent of the impetus for new systems comes from the information systems function and 10 per cent comes from users. Where an arrow appears against a circle it indicates that the perceived balance of the impetus is changing. Thus, for example, in the leftmost organisation, the balance of the impetus for new systems is currently moving more towards the users.

The trend may not be surprising, but the swing to date is probably greater than might be expected. We believe that there are two reasons for this. Firstly, there is an increasing

Figure 1 The origin of the impetus for new systems (based on a sample of thirty-six organisations)



awareness amongst general managers of the potential for new systems. Also, coupled with this there is a recognition that continuous change is now a permanent feature of life today, and that it is something to be encouraged and directed, rather than resisted. Secondly, the move in technology towards end-user computing and distributed systems puts more power directly into the hands of the user. Within the context of this report it means that more of the decision-making on new systems falls naturally into the hands of those who both pay for and exploit the systems.

Whilst this trend is generally to be welcomed, it is not without its dangers. It may well be correct to say that the user should play the major role in evaluating and authorising new systems, but this can be done safely only if the implications are fully understood, and only if the user is really equipped to make the necessary decisions.

Over the years, the information systems function has learned many lessons. These include the way in which to evaluate suppliers and equipment, the way in which to manage projects, the need for and the way in which to document both the requirements and the system, and the need to consider longer-term issues such as flexibility, compatibility and systems maintenance. Many of these lessons have been learned only as the outcome of painful experience. The possibility that they might be relearned by enthusiastic but inexperienced users throughout the organisation is not an attractive one.

FACTORS THAT NEED TO BE CONSIDERED

There are several factors that currently add to the complexity of the task of making decisions on investment, and these need to be understood. They include:

— The increased use of shared facilities.

— The changing balance of costs.

— The changing nature of benefits.

— The difficulty of assessing the 'life' of a system.

The increased use of shared facilities

The problems of properly justifying new systems and of making someone accountable for the results are made more complex when the investment decision involves the provision of a shared facility.

An obvious example of a shared facility might be a private communications network. The justification for the investment might be relatively straightforward because it is largely based on cost displacement, but it might still be difficult to attribute benefits to individual parts of the organisation or even to identify the individual responsible for taking the decision. Where the shared facility is an entirely new one, the task of justifying it presents additional difficulties. An example might be the provision of end-user computing facilities, where an investment needs to be made to provide a system on the assumption that many users will subsequently derive value from its use, but where the extent of this use is entirely outside any unified control. An electronic mail system might well fall into this same category.

It is interesting to reflect that if we did not have a telephone system today, it would be impossible to justify its introduction according to the rules applied to most computer systems.

The changing balance of costs

As we remarked upon in earlier Foundation reports, research has shown that as hardware costs have fallen (in price-performance if not necessarily in total) so an increasing amount of the expenditure on any system goes on the people involved, on the software and on the associated costs of installing and running the system. Furthermore, the extent of the subsequent 'maintenance' costs — keeping the system aligned with changing requirements — is now recognised as being a major item, rather than a mere supplement.

Any advance assessment of systems costs must necessarily be totally reliant on estimates, and those costs are very difficult to establish accurately at the outset. Throughout the years, organisations have been notoriously bad at providing reliable estimates for computer projects. Generally, the figures have been grossly over-optimistic rather than uncertain. Many of the more experienced organisations have gone a long way towards establishing a more realistic and more professional approach, but the problem of producing reliable estimates still remains widespread. The old adage that estimates are "the highest figures likely to be accepted" still holds more than a grain of truth.

The changing nature of benefits

Increasingly, new information systems either replace an existing computerised system or give the organisation an entirely new facility. As such, the reasons for introducing a new system have changed from being simple matters of cost displacement. Instead, they have become matters of either compulsion or the pursuit of complex benefits that are difficult to quantify.

In many organisations, this change has completely invalidated the organisation's earlier approach towards the justification of new systems.

The difficulty of assessing the 'life' of a system

Any methodical evaluation of a proposed new system must be based on its expected life. But this begs the question of what the life of a system is, and what determines it. Is it the mechanical life of the equipment? Or is it the equipment's life as determined by the support policy of the supplier? Or is it the economic life (that is the period over which it is likely to be uneconomic to replace)? Or, finally is it the period over which, with modification, the system is likely to fit the needs of the organisation?

Whichever term is taken, the answer still represents a prediction both of the particular factor that will determine the life of the system and of the period in question.

With the more methodical approaches to investment, the life of the system has a critical bearing on the result of the quantified cost-benefit analysis. This adds a further dimension of uncertainty and a further factor for manipulation.

These, then, are some of the factors that complicate decisions on new systems. They need to be recognised before considering the way in which decisions should be made.

CHAPTER 3

DETERMINING THE OVERALL LEVEL AND DIRECTION OF THE INVESTMENT IN SYSTEMS

The first issue that needs to be explored is whether it is actually possible to determine the overall level and direction of expenditure, and, if so, in what way.

OBTAINING AN OVERALL MEASURE OF THE INVESTMENT IN SYSTEMS

According to our research, very few organisations, if any, can actually say what they spend in total on their information systems. However, this lack of a single overall figure is not necessarily an obstacle to determining or controlling investment.

In the earlier days of computer use, faced with a decision on what they ought to spend on data processing, many organisations sought external guidelines. They looked for norms. They sought ratios, such as the ratio of data processing spend to either turnover or total administrative costs, trying at the same time to ascertain norms within their particular industry. Computer suppliers often quoted figures such as these, usually trying to reassure the customer that his apparently heavy expenditure on this new area was neither abnormal nor out of line with what other organisations were spending. Many organisations still seek such figures in an attempt to see just where they stand in comparison with others.

Although any form of self-comparison is always of interest, we believe that in the particular area of investment in systems such figures are largely meaningless. We have three reasons for this belief. Firstly, although the figures might provide some sort of guide to an organisation's commitment to acquiring new systems, they give no indication of how sensibly or how effectively the money is being spent. And, with systems, there is no simple relationship between what an organisation spends and what it gets for its money.

Secondly, reliable information is difficult to obtain, simply because of the fact that what is, or is not, included in a given set of figures can vary enormously. This has always been a problem with user-related costs like data entry. But it becomes even more of a problem with the move towards distributed processing and with the inclusion of office automation in the information systems function. The costs in both those areas either are often spread across several different budgets or are not even identified separately from other administrative overheads.

Thirdly, it is difficult to make useful comparisons, even between two organisations in the same industry, unless a considerable amount of background information is available. For example, the fact that one organisation is spending less on systems than another may indicate one of several things. It may indicate that the organisation is reaping the benefit of earlier investment, or that it is extremely efficient in the way it provides systems, or that its financial state is not permitting it to do what it really knows to be necessary. Our experience shows that when any such comparison is made, it requires a great deal of analysis to establish whether the difference gives cause for satisfaction or concern.

It is fair to say that specially-researched comparisons can be illuminating, and that the examination of trends in specific areas of expenditure (such as specialists' salaries or

basic equipment costs) can be useful. But there is, regrettably, no convenient external yardstick against which an organisation can judge its overall level of either investment or expenditure. There is no norm to provide comfort or reassurance — at least not on any rational basis.

It is interesting to note from the case histories given in Appendix 1 — none of which represents an organisation in particularly unusual circumstances — the way in which, in practice, costs can differ from the popularly-quoted norms.

In particular, the case histories show that the proportion of expenditure on hardware and operations is not decreasing rapidly towards insignificance, as might be implied from some current interpretations of technical trends. There are two reasons for this. Firstly, the examples show total annual systems expenditure as represented by the expenditure within the control of the information systems department (or departments), and so they omit user-related costs. Secondly, systems have a life of many years, and therefore most of the systems that are running today were designed for the facilities available some time ago. For these two reasons also, there is likely to be a great deal of difference between the composition of the costs for any newly-proposed project and the total current running costs of the information systems function. And that is something that is often confused when people quote norms and trends.

In practice, the right level of expenditure for any particular organisation depends on:

— The extent of the opportunities there are for new systems.

— The return that these opportunities represent.

— The importance that these opportunities have for the business.

— The penalties for either delaying investment or under-investing.

— The organisation's financial position.

— The competing alternatives for investment.

— The practical constraints there are on either cutting back or increasing the expenditure on systems.

Of equal importance too is the fact that to allocate expenditure in the right way depends on:

— The correct identification of opportunities for new systems.

— The correct allocation of priorities.

— The capability and the efficiency of the information systems function.

In view of what has just been said, it might be asked whether an overall figure has any meaning, and whether it is even worth trying to compile. We believe that it certainly does have meaning and that it is well worth trying to compile. It does not matter in practice whether all items are actually included in such a figure, provided that there is consistency from one time to the next. Nor does the figure itself have any significance in isolation. What does matter is the way in which the figure is made up and the way in which both the total cost and the component costs are changing, and also the way in which these changes are likely to, or are intended to, affect the organisation.

Within any organisation it is possible to compile the required information, but what is often lacking is any perspective or sufficient understanding of its significance. Many organisations do not even have to hand the level of information given by the examples in Appendix 1.

INFLUENCING THE OVERALL LEVEL OF THE INVESTMENT IN SYSTEMS

There are three different ways in which senior management can influence — or even decide — the overall level of the investment in systems. Firstly, in sufficiently centralised organisations, they can do it by determining the systems budget. Secondly, they can do it by determining systems strategy. Thirdly, they can do it by creating an environment that encourages, restricts or directs investment as required. These are not mutually exclusive approaches. They all represent mechanisms that can be used, although the appropriate balance between them depends on the particular organisation and its management structure.

We examine each of these approaches in turn.

Controlling the annual budget

In many organisations, the budget for the information systems function is agreed and approved by the board or an equivalent senior management body. This procedure might, therefore, be seen as a direct mechanism for exercising effective control over both investment and expenditure. In practice, however, it often proves of value only in keeping a rein on total costs.

The basic problem in agreeing and approving budgets is that the exercise is often approached without the effects being examined sufficiently. The exercise becomes one of short-term decision making — controlling costs and setting priorities — without the factors involved being part of any long-term strategy. As might be deduced from the views expressed in the following pages, it could well be argued that, faced with a choice, many organisations would do better to determine a systems strategy, rather than to determine the budget.

One reason why the budget-setting process is so often ineffective is that senior managers in far too many organisations are never confronted with the necessary information on which they can make rational decisions on the future direction of the investment in systems. They receive the budget for the coming year, they perhaps receive outline budgets for the following years, and they also receive information on forthcoming major projects. But what they do not receive is the wider picture, with its analysis of trends and its identification of longer-term direction. The question of a strategy does not arise, often because the information systems function does not have one. The budget-setting procedure therefore becomes an isolated exercise, carried out with neither a perspective on trends nor a view towards long-term goals.

All too often the budget is decided on the basis of an extrapolation of the past, rather than on any real assessment of the future. The type of line that is often taken is that last year's total budget was, say, X and that this year the information systems function submits a figure of, say, X plus 15 per cent. The authorising body then cuts this back to, say, an increment of 12 per cent, and in this way sets the new budget. Costs are 'contained', in the sense that pressure has been applied to stop them from rising too far out of line with the rest of the organisation. But no real examination of either the possibilities or the long-term direction has taken place. Moreover, all the emphasis has been on what has to be spent, rather than on the reasons for spending it. The control is on input (the expendi-

ture on resources and facilities) rather than on output (what the systems are expected to achieve for the organisation).

There are more constructive ways of determining budgets and we encountered several examples in the course of our research. The case histories of companies F and G in Appendix 2 illustrate different approaches. However, for such approaches to be effective they all require a careful analysis of the general pattern of expenditure and of where it is intended to lead.

For example, a very tight constraint on equipment costs (which is easily enforced by way of capital-sanction procedures) can lead to steadily increasing software costs and development costs that go unrecognised. They are not recognised because they do not create a jump in any immediate budget: they simply push back project timescales and gradually absorb more 'maintenance' effort. This result is particularly well illustrated by the case histories of companies F and H in Appendix 2.

It thus becomes clear that even if annual budgets are the main mechanism for controlling investment and expenditure, a longer-term systems strategy is required.

Board level determination of strategy

The second way in which senior management can exert its influence is in the formulation of the systems strategy.

The term 'strategy' as used here needs to be explained. The word nowadays tends to get overused, and so undervalued. All too often the adjective 'strategic' is added to the discussion of a topic just to give it importance. But used, as here, in the sense of a systems strategy, it really reverts to its proper meaning of taking a long-term view within which individual plans and individual projects can be assessed.

The development of new information systems needs to take place within a clear, long-term framework. Many of the decisions that are required before embarking on the development of any individual system cannot be taken in the light of the requirements of that project alone.

For example, an organisation might have a large central computing facility, with spare mainframe capacity. The marginal cost of using this capacity is very low. Consequently, the most economic way of satisfying a particular new requirement is to use the central computing facility, and to design the new system around the capability of the machine available. This approach also has the advantage that it operates within the existing skills and experience of the staff concerned. Quite clearly this represents the most efficient approach to the problem in hand. A distributed system that employed local interactive computer facilities might provide a more elegant solution, but, viewed within the requirements of the project, the solution would not be anything like as cost-effective.

As a result, the existing line of systems development is perpetuated and the spare capacity is absorbed, until such time as the machine becomes fully loaded or is rendered obsolete by its direct successor. Then, at that point, the company invests in a new mainframe, which, thanks to advances in technology, has a greatly improved performance. This means that it can accommodate the existing load whilst leaving a considerable amount of spare capacity. And so the cycle is perpetuated.

On a project-by-project basis, the correct steps in themselves do not necessarily tread the right path from the long-term viewpoint of the organisation. If an organisation insists on a rigid procedure for approving projects, outside a long-term framework, this merely exacerbates the problem.

An organisation also has to take many other decisions on a wider basis than that of either the short-term needs or the needs of individual projects. One example of this might be where an organisation chooses to adopt a database to organise and store corporate data for subsequent use by many systems. The initial project to introduce the new database might well produce little or no benefit in its own right.

Another example might be where an organisation chooses to introduce standards to ensure future compatibility between terminals, computers or systems, and so restricts or dictates the choice for individual projects in order to facilitate wider gains.

A strategy needs to define the right balance between the use of microcomputers, minicomputers and mainframes. It also needs to define the right balance between standalone systems and communicating systems.

Within a strategy, an organisation needs to take decisions on the extent and the way in which its systems will fit together. It also needs to take decisions on the required extent and balance of skills available within the organisation. It must take decisions on matters such as its policy on preferred suppliers, on the provision of corporate-wide facilities and on the degree of autonomy it gives to users.

Even in cases where senior management does not normally set or control budgets, or does not normally get involved in individual systems, there are situations in which board-level intervention in defining a strategy can be appropriate and effective. The case history of company H in Appendix 2 gives a very clear illustration of this.

In emphasising the importance of a systems strategy we must point out that a prerequisite for a clear systems strategy is a clear corporate strategy. It is difficult to build a long-term framework for systems, well suited to the requirements of the organisation, when these requirements can only be guessed at by those responsible for planning systems.

We are not talking here of detailed requirements such as those that apply to individual projects. Instead, we are talking of items such as the planned growth of the organisation, contemplated changes in organisational structure, potential changes in either products or services, and possible changes in the priorities allocated to the organisation's objectives.

Furthermore, the process of matching systems strategy to corporate strategy should not be viewed as a one-way process. Although it is perfectly correct to state that systems must serve the organisation and not vice versa, there are many instances where the capability of the systems clearly opens up, or potentially restricts, corporate opportunities. Banks, with their earlier moves towards credit cards and their current progress towards electronic funds transfer, contain several such examples.

However, we should add a further note of warning. The unavailability of a corporate strategy (either because a strategy has not been set or because it has not been communicated) should not be used as a reason for abandoning any attempt at formulating a systems strategy. In our opinion, it is far better to have a systems strategy based on assumptions, than not to have one at all.

Controlling the environment

There is a third, and perhaps less obvious way in which senior management can influence investment. Given the existence of a systems strategy, the level and the direction of investment can be determined not only by setting budgets directly, but also

by controlling the way in which budgets are set, and by determining the rules by which individual projects are evaluated.

For example, an organisation's insistence on a rigid cost-justification based on tangible benefits and a short-term pay-back can have an immediate effect on both costs and corporate performance, albeit perhaps to the slightly longer-term detriment of the organisation. But if this is what the organisation requires to serve its short-term corporate needs, the effect can certainly be achieved.

On too many occasions, an information systems function can be seen to be out of step with the rest of the organisation simply because the rules are either not set or not communicated. The rules for assessing systems opportunities are not recognised as a way of orienting priorities towards improving liquidity, minimising or maximising investment in future facilities, enhancing control, facilitating the containment of costs, permitting staff reductions, facilitating growth, reducing vulnerability, rationalising a disparate group of companies, or whatever.

The systems environment can be influenced not only by the determination of the rules for project appraisal, but also by senior management pressure on selected aspects of the organisation's performance. For example, in the current climate, the cutting or the restricting of permitted numbers of staff can create, intentionally or otherwise, a compelling demand for new systems.

The environment can also be affected by the organisation-wide provision of facilities, irrespective of whether these take the form of capital, or expertise, or even a shared technical facility such as a data communications network.

The case history of company I in Appendix 2 gives an interesting illustration of a corporation that has created the desired environment for investment in information systems without intervening in individual budgets or projects. The overall systems budget results from the individual business plans of the different divisions of the business, and there is an in-built mechanism to assess the gain, rather than just the expenditure.

In any multi-divisional or multi-company organisation that allows a high degree of autonomy, the control of the environment often represents the only way in which the investment in systems can be influenced.

This begs the question of whether such influence is really desirable. There are three main arguments for believing that it is — provided of course that the influence is backed by good judgement on its direction.

The first argument is that, in an age of fast-changing technology and a shortage of genuine skills, a central pool of expertise can provide both stimulus for change and guidance on its direction. It is wrong to expect the necessary skills to be spread throughout an organisation. However, having a central pool of expertise does not necessarily mean having large numbers of staff, nor necessarily providing systems development resources centrally.

The second argument is that in some areas of development, such as communications networks, corporate investment as opposed to local investment is required to establish the facility.

The third argument is that, even in a highly autonomous group, there are penalties for adopting a laissez-faire attitude to the quality of systems. As one organisation put it, "Bad systems take far longer to replace than bad management". It can be argued that

even an organisation that allows extensive operating autonomy should no more allow poor systems than it would tolerate, say, inadequate financial controls. As another organisation put it, "In our group nobody has the right to have bad systems". This does not argue for organisation-wide standard systems, nor necessarily for interference in individual projects. It does argue, however, for the need to create the right environment for well-considered decisions on investment.

The foregoing discussion has shown that there are many instruments that can be used to influence and direct the overall level and direction of investment within an organisation. And these apply no matter how large and how complex the organisation is. What is often lacking is sufficient understanding on the part of senior management of these instruments and their potential use.

CHAPTER 4

THE BASIS FOR THE PROVISION OF SYSTEMS, AND ITS EFFECT ON INVESTMENT

It is not the purpose of this report to explore the complex issues of where and in what way the systems function should fit within the management structure of the organisation, nor to examine at any length the various merits and ways of charging for systems. These are topics which would justify substantial reports in their own right. However, it is pertinent to consider the effects that the different bases for the provision of systems might have on investment, and to consider also whether they either encourage or discourage investment or have any influence on its direction.

THE POSSIBLE BASES

The natural uncertainty about where and in what way the systems function should fit into the organisation has been complicated over the years by changes in computer technology. The initial move towards larger and larger mainframes created a natural pressure for centralisation, whereas the more recent availability of powerful minicomputers and intelligent terminals has led to a spread of both stand-alone and communicating local facilities. More recently still, the subject has become complicated by considerations of what other information facilities and communications facilities should come within the domain of the information systems function.

However, the only aspects that are of concern within this report are the basis for the provision of information services and the way in which the costs are determined or met.

Basically, the information systems function can operate in one of the four following ways:

— As a shared overhead, with no charge being levied against individual users.

— As a cost centre which recovers costs from its users.

— As a profit centre.

— As a separate company serving the organisation (and perhaps the outside market).

We confined our examination of this aspect of the information systems function to large organisations in the private sector and to selected public utilities and local authorities. We therefore excluded both central government organisations and smaller commercial companies, where, for different reasons, the choice of basis is less open. The current approaches adopted by the organisations we surveyed can be summarised as follows:

	Percentage
Shared overhead	18
Cost centre, recovering costs	32
Profit centre	4
Separate company	16
Mixture of the above	30

This information is not statistically significant, but we present it here for interest and for background reference.

The normal migration pattern for an organisation is from the first to the second category, and any subsequent movement to the third and the fourth categories is dictated by the organisation's nature and style.

Our research also showed that the basis on which information services are provided is nowadays relatively stable. The average length of time that the function had operated in its current manner in the organisations we surveyed was 6½ years, and only a few of those organisations were contemplating making a change in the near future. In those organisations where change has occurred in the last few years, or where change is currently under consideration, this tended to reflect general corporate restructuring, rather than an isolated change in the role of the information systems function.

However, it was interesting that, although the basis of the function might be firmly established, the types of systems and the categories of equipment that it should embrace were not always well defined.

In many of the organisations that we surveyed there is uncertainty as to who is responsible for authorising an investment in the areas listed below. The percentage figure against each area represents the proportion of the organisations within our survey that felt that responsibility for the area in question was uncertain.

	Percentage
Mainframe computer operations	2
Computer systems development	8
Data communications	8
Voice communications	8
Process control	8
Corporate data	10
Distributed processing	10
Office automation	30

Largely this means that where it is obvious that a decision has to be made on responsibility — such as for the acquisition and the use of mainframe computers — then the decision is made. Where, however, the investment may (eventually) be large, but can be made in small unit steps, then the decision on who has responsibility for authorising the investment goes by default. Where this occurs, strength of interest is then often allowed to dictate the process.

THE EFFECT ON INVESTMENT

We examined, in our research, the apparent effects that the basis for the provision of the information systems function has had on investment. Our findings can be summarised as follows.

The recording of costs attributable to individual systems or projects is an important part of a more methodical, more professional approach to investment in systems. However, to be effective, the recording of costs does not necessarily depend on these costs being recharged against the user department. Assessing, monitoring and providing information on systems costs does not mean the same thing as recharging costs.

Whether or not recharging is appropriate depends on two things. Firstly, it depends on whether full departmental budgets and operating statements are a serious and important part of the organisation's normal method of management control. Secondly, it depends on how mature the organisation is as a user of systems. So far as the first of those two points is concerned, if users are not normally held genuinely accountable for the whole of their operating costs, it is a largely meaningless procedure to present them with computer systems charges. Moreover, it is a procedure that gives grounds for argument and contention without actually enhancing any feeling on the part of users of being accountable for the use of systems, or of being responsible for decisions on introducing them. Furthermore, irrespective of the nature of the organisation, a premature move towards recharging systems costs can simply inhibit investment in systems.

The case history of company J in Appendix 2 gives an interesting example of an extensive recharging procedure that is designed to meet the needs of a particular organisation.

In deciding whether and, if so, in what way to recharge the costs of developing, running and supporting systems, organisations would do well to bear in mind that there are only two valid reasons for doing so. One is to enable an organisation to define more clearly the accountability for the delivery and the performance of systems. The other is to motivate user action in a particular direction. With the latter, 'price' has an effect on 'demand' as in a market economy. We encountered many instances in our research where these reasons appear to have been forgotten, and this has led to situations where resources are unevenly utilised, money is spent unnecessarily on external facilities (the latter appearing artificially 'cheap'), or investment is constrained to the overall detriment of the organisation.

Where, in order to fit the style of the organisation, the information systems function is treated as a profit centre, the same arguments apply even more strongly.

A further step, beyond that where the information systems function recharges costs or even acts as a profit centre, is to set up the information systems function as a separate operating company. An organisation's move in this direction is often motivated by its desire to put everything on a "more commercial footing". Occasionally, and not unnaturally, it is initiated by the management directly involved, because of the attractions of running a self-contained unit, and of being judged by commercial criteria. Occasionally, too, the move is made with the wider aim of exploiting the skills or facilities within the organisation in order to generate a new source of corporate revenue.

There are some striking examples of success where the information systems function has been set up as a separate company. However, these were situations where either it was necessary to provide services across a wide and diverse group of companies or there was exceptionally strong expertise in the organisation that could be offered to the market at large.

Whether or not it is appropriate to treat the systems function as a separate company depends, therefore, both on the organisation's nature and style and on whether a separate company — charging real money for its services — can stand up to competition in the open market.

Whether or not such a company can do that does not rest entirely on its technical capability. It depends also on both the range of services it offers and the commercial skills and the sales and marketing capability that it has. At the present time, it is not easy to achieve success, and setting up to offer external services is not a venture to be embarked upon without all concerned being clear both on the real goals and on the ob-

stacles to success. Certainly, it is neither an easy nor necessarily an effective route towards controlling investment within an organisation.

In summary, to provide systems 'free' as an uncharged corporate overhead creates the opportunity for the fastest progress by concentrating planning and investment decisions at a single point. But this approach carries with it the danger of lack of accountability for individual systems. To provide systems on a charged basis — perhaps, with real money crossing individual company boundaries — leads to clearest accountability, but it has two dangers. Firstly, the mechanism can easily become self-defeating, in that too much attention is paid to the procedures themselves, rather than to examining both the intended and the actual effects. Secondly, it can, somewhat surprisingly, lead to poor evaluation of opportunities, particularly where a separate company is involved. The reason for this is that if someone is prepared to foot the bill for a new system, the onus on the information systems function to seek out and provide the most effective answer can easily disappear.

It must be emphasised that, irrespective of charging procedures, the recording of costs attributable to both the development and the operation of individual systems is an important step towards the more methodical control of investment. Also, whatever basis is used, it is essential to assign both clear responsibility for decisions and explicit accountability for performance. But, within these principles, we have observed systems being provided completely satisfactorily under a variety of structures. In other words, there is no neat structural move which will, of itself, bring about better decisions on investment.

CHAPTER 5

DECISIONS ON INDIVIDUAL SYSTEMS PROJECTS

Having looked at the question of controlling the total investment in systems we now turn to the subject of decisions on individual projects, and we examine where and in what way decisions are made on the investment in specific systems.

THE DECISION POINT

Primarily our research investigated the experiences and the viewpoints of large organisations that make extensive use of computer systems. This sample reflects the composition, and hence the interest, of Foundation member organisations.

As might be expected after fifteen to twenty-five years of experience of using computers, most of the organisations we researched have learned the basic lessons of project management. Almost without exception, the organisations we examined adopt a staged approach to the development of new systems. The procedure they follow for authorising and making a final commitment to new projects is, by and large, formalised.

Of the organisations we researched, 85 per cent claimed that they have a clear-cut point of decision on all new projects. The point in time is specified, as are the individuals responsible for making the decision.

However, we found that in practice such procedures were not always followed in quite such a clear-cut manner as this finding might indicate. Nevertheless, the principle that there should be a formal decision point is well understood and accepted. The decision point is reached when sufficient work has been done to identify the match of the requirements, the proposed system, and the associated costs.

Increasingly, organisations also recognise that although much of the information on which to base the decision must be provided by the information systems function, the decision itself must, in most cases, rest with the user.

Earlier in this report we discussed the growing role of users in determining their own systems, and it is quite clear that accountability for the investment in systems must increasingly rest in their hands. An interesting example of this principle being put into practice is given in the case history of company K in Appendix 2.

However, there are dangers in pursuing this line of user-accountability even though it is unquestionably in the right — and indeed inevitable — overall direction. As already explained, if an organisation adopts the approach that the user can have any system he desires provided that he bears the cost, there is a danger that this will cause the removal of the obligation of the information systems function to help identify and explore alternative solutions to any given requirement. There is also a danger that the user can be left to appraise a project in any way he thinks fit, with little or no guidance. As we point out in the following pages, there is always a need for skilled and balanced project appraisal, and it must be remembered that a particular user or user department would probably be called upon to appraise a major computer project no more than once in every few years. In contrast, the staff of the information systems function are likely to be involved in such

exercises month in and month out. Their role is not to take the decision, but to supply information and give guidance in the appropriate appraisal process. This role needs to be understood and accepted by both sides.

It must also be recognised, as we have already stressed, that certain innovations cannot be left to being justified within individual projects. The introduction of certain corporate-wide facilities can only really stem from the initiative of the information systems function, and such projects must be the subject of corporate appraisal at a higher level than is usual with individual user systems.

As our research showed, when these principles are recognised and applied there is no real problem as far as the decision point itself is concerned.

THE DECISION-MAKING PROCESS

However, on the decision process, our findings were less reassuring than were those on the decision point.

On the evidence of both our survey and our deeper investigation of specific organisations, it is clear that the decision process is by no means as methodical, or as rational, as most people would like to believe.

We examined carefully the way in which organisations actually make decisions on major projects, and we drew on several cases in our own recent experience to augment the wider research. Our basic conclusion is that, in this matter, both the understanding of the problems and the procedures that are used, have not kept pace with the changing demands.

No organisation likes to admit, or even to feel, that it is making an important financial decision based on anything other than a methodical, thorough and objective appraisal, or that it bases an appraisal on anything other than established facts and reliable estimates. In practice, however, most computer-related decisions (and indeed many other business decisions) are not made in this way. However, the procedures that organisations adopt allow a necessary level of self-deception.

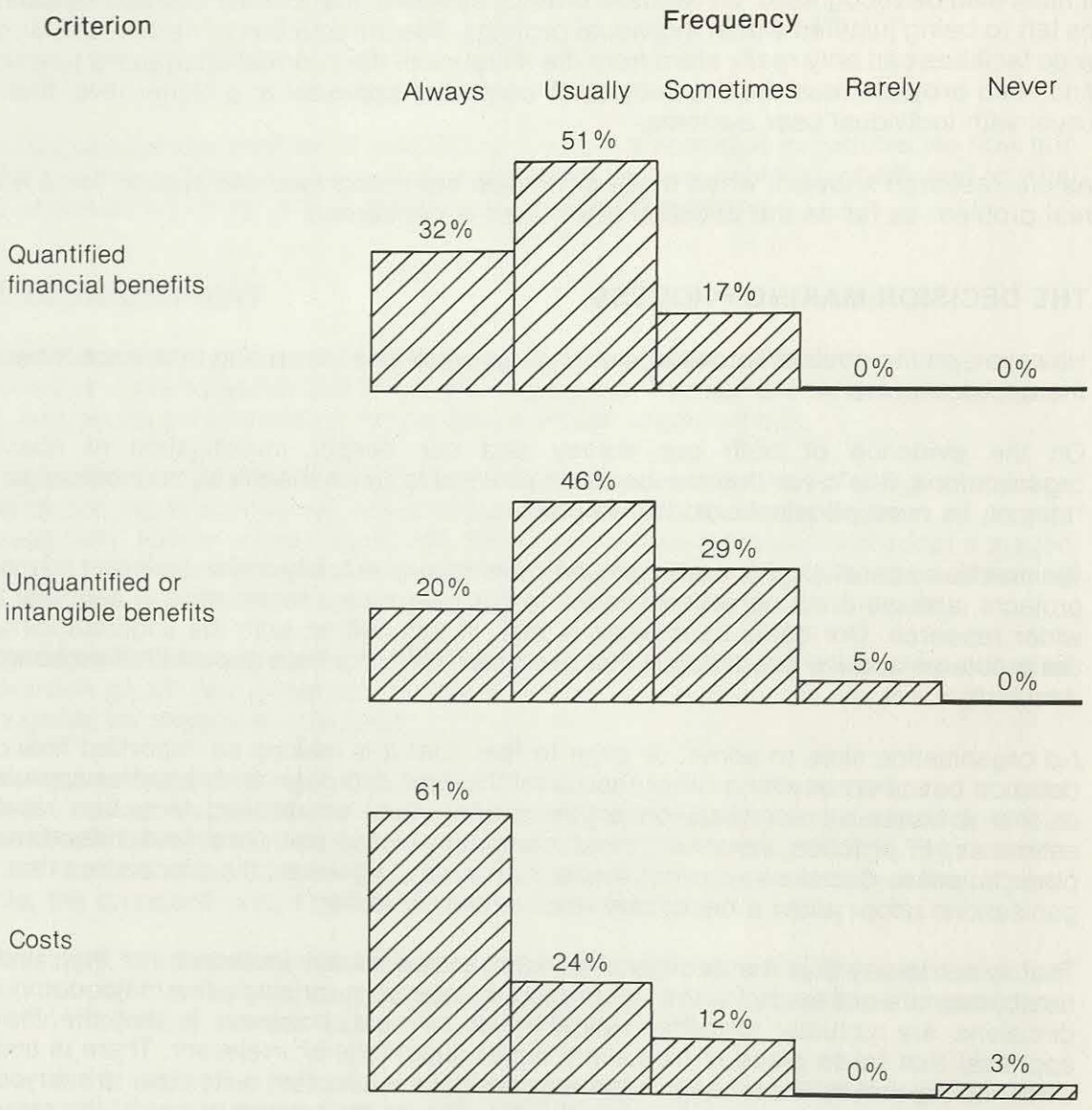
That is not to say that the decisions themselves are usually incorrect, nor that, underneath, they are not made for the right reasons. Indeed, surprisingly few major computer decisions are actually regretted. What must be said, however, is that the formal appraisal that takes place is frequently either superficial or irrelevant. There is ample evidence too that by the time the appraisal takes place it is often quite clear to everybody concerned that the project will go ahead. We discuss the consequences of this later in this chapter.

THE CRITERIA USED IN THE DECISION PROCESS

In our survey of more than fifty organisations we found that the three criteria they most commonly apply are those that might be expected. In figure 2 overleaf we show the proportion of those organisations that apply those criteria with different degrees of frequency.

We also show in figure 3 on page 23 the frequency with which the organisations apply three other less common, but nevertheless important, criteria. As the figure shows, the organisations apply those three criteria less regularly than they apply the three criteria in figure 2.

Figure 2 **The frequency with which organisations use the three most common criteria in making investment decisions**

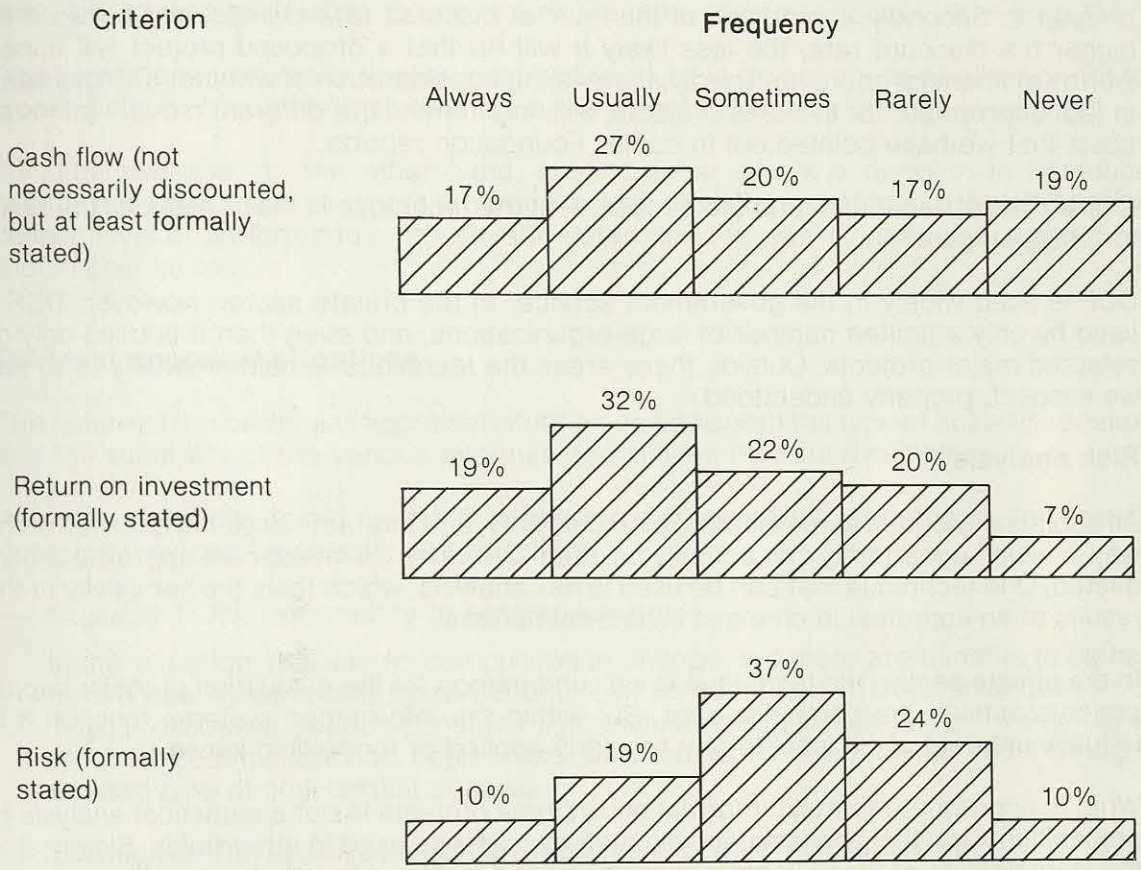


There is no contesting the fact that organisations attempt to assemble the necessary information on which to make an investment decision. However, in carrying out a sound appraisal, organisations have problems in first recognising the issues involved and in then identifying the basis on which the decision really needs to be taken.

APPRAISAL TECHNIQUES USED IN MAKING INVESTMENT DECISIONS

There are two formal appraisal techniques that are worthy of consideration within the scope of this report. The first is discounted cash flow, the second is risk analysis.

Figure 3 The frequency with which organisations use three other criteria in making investment decisions



Discounted cash flow

Discounted cash flow (DCF) takes into account not only the costs and the quantified financial benefits of a project. It also takes into account the times when the costs and the benefits are expected to arise (on the grounds that the later the costs and the benefits arise, the lower their value at present-day rates).

A discount rate is selected, in terms of an annual percentage, and this rate is applied successively to those costs and benefits that will arise in each of the years of the projected life of the system. If the total discounted benefits over the life of the project exceed the total discounted costs, the project can be said to have a Net Present Value (NPV). To that extent, the project can be considered to be financially justifiable. The NPV can also be used to rank competing projects in order of priority.

Discounting, therefore, involves applying a discount rate to reduce to a present value the costs of the proposed new system and also (where an existing system is being replaced) the costs of the present system. The present values of any alternatives can then be compared, and it is then possible to see whether the requirement could be fulfilled more economically by the proposed system than by other means. Where several solutions appear to be feasible the technique can also be used to establish which of these is, in effect, the least expensive.

DCF is a standard and well-understood technique, widely adopted for major capital projects outside the computer area. However, when it is used for appraising systems projects it presents some special complications. Firstly, there is the question of the expected life of the system, which brings with it all the uncertainties discussed in chapter 2. Secondly, the choice of the level of discount rate is important because the higher the discount rate, the less likely it will be that a proposed project will appear worthy of financial approval. Thirdly, there is the consideration of whether a single rate is in fact appropriate for systems projects, bearing in mind the different movement in real costs that we have pointed out in earlier Foundation reports.

Overall, the attraction — and the danger — of the technique is that it reduces the result to a single figure.

DCF is used widely in the government service. In the private sector, however, DCF is used by only a limited number of large organisations, and even then it is used only on selected major projects. Outside these areas the technique is neither widely used nor, we suspect, properly understood.

Risk analysis

All appraisals contain some element of uncertainty, and this fact raises the question of the way in which uncertainty can actually be dealt with when an investment appraisal is conducted. One technique that can be used is risk analysis, which tests the sensitivity of the results of an appraisal to changes in its assumptions.

In the private sector, the technique is well understood for the evaluation of major capital projects outside the computer area. But within the information systems function it is virtually unheard of, at least in any regularly applied or formalised sense.

What is appropriate to most information systems projects is not a statistical analysis of probabilities and their consequences, such as might be used in other fields. Simply, it is the identification of those items whose variance has a significant effect on the outcome of the project, and an examination of their degree of uncertainty and possible range of values.

THE BASIS FOR CARRYING OUT AN APPRAISAL

In our opinion, it is not a lack of a clear decision point nor the unavailability of techniques that leads to a poor evaluation procedure. The problems lie elsewhere.

One of the most important obstacles to the regular, sound evaluation of proposed systems is the general lack of awareness that there are different types of situation, and therefore that the appraisal procedure must vary accordingly.

Far too many organisations persist with the traditional 'cost-benefit' analysis when often it is not appropriate. The exercise then is no longer a genuine appraisal exercise, but rather a procedural hurdle that has to be cleared on the way to authorisation.

The difference between cost-benefit and cost-effectiveness

An important point that needs to be clarified is the difference between cost-benefit and cost-effectiveness.

Most of the organisations encompassed in our research carry out, or at least claimed

that they carry out, some form of 'cost-benefit' analysis as the normal basis for evaluating their systems projects. In our opinion, organisations often try to do this when it is not really appropriate to the particular situation. There is a failure in the minds of those concerned to appreciate the difference between cost-benefit and cost-effectiveness, and to recognise when to use one or the other form of analysis, or even both.

Cost-benefit analysis really applies only where there is an option on whether or not to proceed. Its use is primarily to determine the extent to which a change is justified.

Cost-effectiveness, on the other hand, applies either where a decision to introduce change has been made or where a particular task or requirement has to be fulfilled to a defined level of performance. Its use is to determine the way in which the requirement should best be met.

Different appraisal situations

The nature of the particular appraisal situation dictates both the type of analysis required and the suitability of the various appraisal techniques that are available.

Appraisal situations do not always fit neatly into any one particular category, but broadly speaking they can be categorised as follows:

— *Situation 1: The opportunity to achieve savings*

In this situation, there is no compulsion to change, but there are benefits to be had from a new system, and those benefits can be quantified in clear, financial terms. Typical examples of such benefits might include staff savings, lower inventories or reduced communications costs. This situation lends itself to the most straightforward type of cost-benefit analysis.

— *Situation 2: The opportunity to obtain quantified non-financial benefits*

This situation is similar to the first, but although the benefits may be quantifiable, they require expertise outside the information systems function to translate them into financial terms. One example of such a benefit is an improved level of service. It might be possible to define exactly what improvement might be achieved (for example, by handling either an order or an enquiry in a time of X as opposed to a time of Y), but to express that improvement in terms of increased volume of business requires an examination of the market's sensitivity to service level.

Provided that this commercial analysis can be performed, then a cost-benefit analysis can be used as a basis for the decision. If the commercial analysis cannot be carried out, then someone has to make a judgement as to whether the improved facility is worth the proposed expenditure.

— *Situation 3: The opportunity to obtain unquantifiable benefits*

In this situation, the benefits may be clear-cut but they simply cannot be expressed in any quantified form. Several systems whose main purpose is to supply management information fall into this category.

This does not mean that the decision needs to be any less clear or formal. It simply means that management judgement carries the full burden. Expressed simply, management is told: "This is what can be provided and this is what it will cost". Management then has the responsibility for deciding whether the proposed investment is justified.

— *Situation 4: The compulsion to change because the existing systems demand replacement*

In this situation, a change is compelled because, through problems of growth, or changes in the environment or difficulties in continued maintenance, the existing systems have to be replaced.

In this situation, then, the question is not whether to go ahead, but how best to proceed. This means that there needs to be a cost-effectiveness evaluation in which the different options, their respective pros and cons, and their associated costs need to be evaluated one against the other.

— *Situation 5: The compulsion to change because the external factors demand new facilities*

The compulsion to change in this situation is demanded by external requirements, such as changes in legislation. As with situation 4, the appraisal must be concerned with the most cost-effective approach.

— *Situation 6: The strong need to change because of competitive pressures*

In this situation, there is, strictly speaking, no compulsion to change, but competitive pressures demand that a new system be considered. In such a situation, an organisation may take the line that it cannot afford to be the only one in its industry that is not offering the particular required facility. It might be a computerised reservation system, it might be a customer information system.

The appraisal needs to recognise, and possibly to validate, this motivating force, and it must be concerned with obtaining the most cost-effective solution.

In practice, of course, as we indicated earlier, there are situations that do not fall neatly into one or other of the above categories. For example, an enforced change might also represent an opportunity for new benefits. However, the key to success lies in recognising the real basis for the evaluation. For example, organisations often attempt to 'cost-justify' a proposed new system when everyone involved is fully aware that the project must go ahead. The consequence of this unnecessary exercise is that it diverts attention from the real issues and options involved.

Many organisations have standard appraisal procedures which fail to recognise the variety of situations that need to be handled. As a consequence, new projects are sometimes forced through a procedural exercise that is quite unrelated to the real decision. Alternatively, if it is recognised that the standard procedures do not fit the particular situation, then they are largely ignored. Either way, not only is the organisation deprived of any rational evaluation procedure, but senior management is deprived of one of its instruments for effecting an investment strategy.

STRUCTURING THE APPRAISAL

Our research revealed that there is a range of approaches to the appraisal process itself. At one extreme, there is an approach that insists on a formalised procedure, using standard techniques to demonstrate a clear, quantified case for a project before it can be authorised. At the other, there is an approach that says that, provided someone is prepared to meet the cost against his own budget, then the way in which the cost is justified is his affair.

Because these two approaches are so far removed from each other, although both, in

our opinion, are capable of resulting in good and bad decisions, it is worthwhile examining their respective merits and drawbacks.

In looking at them, it is pertinent and interesting to examine the respective experience of the public and the private sectors, where, broadly speaking, the two approaches predominate.

The contrasting approaches of the public and the private sectors

We consider first the public sector, looking particularly at central government. In recent years, as a result of the stringent financial demands of the economic climate, there has been increasing pressure both to examine carefully and to justify fully all proposed expenditure of public money. In the computer systems area, this pressure has been exacerbated because those projects that have overrun their planned costs or that have failed to deliver their promised benefits have been held up for public scrutiny. Although almost every major organisation in the private sector has its own horror story of a computer system that went badly off course, the details (and particularly the true costs) are seldom exposed to the world at large. Within the public sector, in contrast, similar failures are exposed to public examination. As a result, increasingly detailed and increasingly comprehensive processes for investment appraisal have been introduced.

In much of the private sector, however, systems projects are often carried forward mainly on a tide of rising enthusiasm or user pressure, unconstrained by formal appraisal processes. The necessary investigation of requirements and possibilities may well be carried out very thoroughly, but a genuine and methodical investment appraisal is often omitted.

This omission might be considered surprising in an environment that is supposedly dominated by commercial pressures. It reflects, however, a desire for uncluttered decision-making and a tendency to view rules and procedures (when applied at a senior level) as bureaucracy. It also reflects the fact that accountability for the success of systems is actually quite vague in most organisations.

The respective merits of the two approaches

Because there is such an extreme difference between the two approaches, it might be asked whether it is simply a case of one being right and the other wrong, and of project appraisals being carried out correctly and effectively on one side and badly and ineffectively on the other.

We believe that, in practice, the answer is more complex than this, and that there are some useful lessons to be drawn from observations of both approaches.

The great merit of a formalised, quantified approach is that it compels consideration of facts and issues that might otherwise be passed over or be dealt with at only a superficial level. The mere existence of an appraisal process means that the areas of cost, risk, and options have to be examined in advance, and the areas of criticality or weakness have to be identified. Figures have to be presented, and those figures can be challenged at the time. They can also be monitored subsequently.

A formalised quantified approach has, however, three fundamental weaknesses. All of these are related to the oft-associated tendency to attempt to reduce the decision — and its element of judgement — to a mechanistic procedure.

Firstly, there is a danger that once numbers have been ascribed to an item they take on a

reality that is not warranted by the assumptions and the estimates that were used in producing them. As the document "Investment Appraisal and Monitoring Procedures for Administrative Computer Projects" (Civil Service Department 1980) puts it: ". . . the mechanistic application of techniques to indifferent data can be a distinct impediment; the mere fact that recognised techniques have been used may have the effect of creating a spurious degree of confidence in it".

Secondly, if the decision to proceed is to be judged largely on the resulting bottom line of figures, or even, with NPV, on a single figure, there is considerable and natural pressure to re-examine and re-adjust estimates and variables if the initial draft provides the wrong result.

Thirdly, a completely mechanistic approach is largely unsuited to dealing with the type of unquantifiable benefits that can arise from the technology that is now becoming available. Benefits such as enhanced service, improved control, increased flexibility, capacity to cope with growth, reduced vulnerability — and, in government projects, consideration of social responsibility — can be difficult or even impossible to interpret as specific financial gains. That, however, does not make those benefits any less real or any less worthy of being pursued.

There are dangers at the other extreme, where no formal appraisal is carried out or where, as more often occurs, a token exercise is carried out merely for the sake of propriety. This approach runs counter to all the wisdom that is preached in the area of project management. There is, after all, nothing to be gained by carefully controlling progress down a path, if that path has been conceived in haste and leads to a questionable destination.

The main danger, in terms of consequences, might appear to be the danger of taking a bad decision, with the result that a project is launched which, in the light of better information or more considered judgement, should never have been authorised. But in terms of likelihood, that is not actually the biggest danger. The more realistic concerns are those of failing to examine alternatives, failing to assess timescales and resources realistically, failing to identify those points of uncertainty or criticality that influence success, failing to identify and assign proper priorities, and failing to fit the project properly within any long-term strategy.

Furthermore, if the staff within the information systems function accept either a non-existent appraisal process or at best a cursory one, this can only help constrain their role to that of making a purely technical contribution to the organisation.

In practice, the choice between a structured, quantified approach to appraisals and an informal approach is not a straightforward option. What is required for any particular project is the right blend of basic data, appropriate appraisal techniques and management judgement. And the composition of this blend will vary from one project to another.

In our opinion, what is needed for every substantial project is a formal, thorough appraisal — even where it is recognised at the outset that the decision will rest on a judgement which can only be partly buttressed by a quantified financial case.

PRESENTING THE INFORMATION FOR AN APPRAISAL

No matter what approach is adopted, and no matter what analysis techniques are used, a sound appraisal requires all the information affecting the decision to be properly compiled and clearly presented. Normally we would expect this information to include:

— A restatement of the objectives of the project.

— A restatement of the basis for the decision (in other words, the grounds on which the decision will rest).

— An identification of the options closed or remaining.

— A statement of the benefits and an explanation of the assumptions on which they rest. Where appropriate, these should be quantified. They should also, where appropriate, be expressed in financial terms.

— A cash-flow projection with explanations of the assumptions contained in it.

— An assessment of the risk involved (even where this only confirms that there is no significant risk).

— An analysis of the effects of deciding either not to proceed or to delay.

— An analysis of the effect of the decision on other priorities.

— An analysis of the way in which the project fits the systems strategy and of where it leads.

Our research showed that, in practice, this information is seldom presented as clearly and fully as it might be. Moreover, the impact of that information is often further diminished because it is submerged in a substantial document whose main purpose is to describe the new system and the way in which it will operate. Many pages describing the detailed requirements of the system are followed by full and careful descriptions of files, transactions, procedures and equipment. These are then followed by a description of the benefits and a table of costs which, by comparison, are almost cursory. Not surprisingly, the subsequent discussion tends to focus on specific aspects of the system, rather than on the real appraisal of the project.

That observation is not meant to imply that a careful examination of the way in which a new system will perform is out of place. Rather it means that there is much to be said for extracting the arguments for the project, and also the information on which they rest, and presenting them in a separate document specifically written to provide the basis for a management decision.

THE CASE FOR IMPROVING THE APPRAISAL PROCESS

We have identified in the foregoing pages a number of major weaknesses in the way projects are currently appraised. At the same time it must be recognised that a great deal of good sense normally goes into the selection and authorisation of new computer systems. Our research uncovered few decisions which on the surface were blatantly bad. It could therefore be argued that since the present general approach does not produce great disappointment, it is adequate to the requirement. We believe, however, that it is not. We believe that the present general approach is inadequate in that:

1. It inhibits the application of a strategy, because it is difficult to effect a strategy if projects are justified piecemeal and there is no means of setting, and where necessary changing, the basis on which they are appraised.

2. It inhibits dialogue — and indeed, understanding — between the information systems function and the users.

3. It leads to inefficient systems and missed opportunities, because the analysis concentrates mainly on whether a system is justified. It pays too little attention to whether a system is really needed, to whether the best solution has been adopted, to where it leads in the long term, and to whether it represents the best use of resources.

Having an effective appraisal process is partly a matter of having the right high-level standards and procedures, partly a matter of communicating a policy, and partly a matter of both the users and the systems staff genuinely understanding what is involved in carrying out a sound appraisal.

CHAPTER 6

MONITORING THE RESULTS OF AN INVESTMENT

We have discussed earlier in this report the question of monitoring the overall investment in, and the expenditure on, systems. We now turn to the question of monitoring individual projects.

In theory, it might be expected that organisations would take great care in keeping track of the results of an investment in a particular new system. It might reasonably be expected that costs would be accumulated and examined as a matter of normal management discipline, and that benefits would be monitored for several good reasons. These reasons might include ensuring that the benefits are fully realised, identifying further benefit opportunities, learning from experience, and ensuring that realistic attitudes are adopted when estimating and claiming benefits in the first place.

The arguments for monitoring both the investment and its results are undeniably sound. But in practice it simply does not happen. We found that very few organisations monitor the outcome of their investment decisions in any regular or systematic manner.

We look first at the question of the monitoring of costs. Virtually every large information systems function records — and normally tightly controls — its total expenditure. However, what we are concerned with here is not the controlling of the total costs, but the monitoring of the costs of individual systems.

As we pointed out in chapter 5, almost every organisation requires that the costs associated with any new system should be assessed early in the project. No less than 87 per cent of the organisations that we examined normally establish costs when reaching a decision on whether to proceed with a proposed system. However, this initial assessment of costs is based very largely on estimates, and these estimates are composed of figures that are neither fixed nor necessarily reliable.

This dependence on estimates is now increasing as the relative importance of the various cost elements changes. Not only are manpower costs and software costs increasingly outweighing hardware costs for new projects, but the proportion of these costs that are incurred for maintenance, rather than for initial development, is also increasing. The true cost of a system is therefore something that emerges only slowly over its full life.

Under these circumstances, monitoring procedures might be expected to reflect this trend. But in practice they do not. It is true that organisations generally record development costs and keep them under review, and we found that 56 per cent of all the organisations we surveyed always monitor such costs. However, fewer organisations routinely monitor running costs, and fewer still monitor maintenance costs. What is important here, though, is not whether organisations actually record those maintenance costs but more the use to which they put the information. We found that organisations mainly collect the data with a view to charging for the resources used, rather than for the purpose of monitoring the total cost of the system over its life.

Generally speaking, then, organisations do record and control costs, but very few organi-

sations relate those costs back to the original investment decisions. Moreover, the total cost of a system over its life is a figure that organisations seldom compile or examine.

If most organisations were asked to state the total amount they spend on developing, running and supporting any particular system, they would probably be able to compile the figure by undertaking a special exercise, but they almost certainly would not have that figure available already. Nor would it be an item of information that they would already be familiar with.

The position with regard to the monitoring of benefits is even more pronounced. It might be expected that because organisations are anxious to ensure that they extract full value from introducing a new system, they would keep a close watch on the benefits they achieve, if only for the first two or three years after the system is introduced. It would be natural to find both users and the information systems staff eagerly scrutinising the outcome of their investment and labours respectively. In practice, though, this does not happen, at least not in any methodical fashion.

Almost three-quarters of the organisations that we approached indicated that they rarely examined the actual benefits they achieved. If they did so it was only as an occasional exercise.

We believe that there are two reasons why organisations do not generally monitor both the costs and the benefits of their systems. The first arises from the practical difficulties of doing so. For example, one valid difficulty is that circumstances change. With a large project, in which development and implementation are spread over a long time, it is often extremely difficult to compare the outcome with the original expectation. Circumstances change, and the more valid comparison would need to be between the present situation and the situation that would have developed had the new system not been introduced.

The second, and possibly more important reason is the sheer lack of incentive. Generally speaking, except where a project has gone badly wrong, those concerned with a systems project do not want a post mortem. They would generally consider that there is little to gain from investigating the past, especially where such an investigation would involve diverting effort from the arguably more productive task of developing systems for the future.

As one organisation put it: " We cannot recover the original money so what would a review produce but ill-feeling and accusations?"

We found that although many organisations prescribed a post-implementation review in their standards manual, in practice this requirement was largely ignored. Some organisations have an internal audit function that is equipped to carry out such a review independently. However, the function tends to be effective only in organisations like financial institutions where such audits are an accepted and everyday part of the running of the organisation. In other organisations, the internal audit function seems to be defeated in its purpose by a lack of both experience and genuine competence in the information systems area.

If the purpose of any post-implementation review of an operational system is regarded as being fundamentally negative, then such a review really has no part to play in ensuring a more effective approach to investment. Its role is inevitably circumvented or its findings disregarded by both the user and the information systems function.

We consider, however, that if only these obstacles could be overcome, much more could be gained from systematically examining the results and the lessons of major projects.

The examination does not need to be conducted on any continuous basis, nor should it be conducted only in response to events and problems. Instead, it should be conducted at predetermined points in the life of a project. If the examination is to be effective, however, it requires discipline, a willingness to expend valuable resources on the task and the prospect that management attention will be paid to the outcome.

CHAPTER 7

CONCLUSIONS

With technology advancing so rapidly on the one hand, and the economic climate remaining so uncertain and demanding on the other, information systems will undoubtedly play an increasing role in both the efficiency and the effectiveness of every large organisation. On all current evidence, the total investment in information systems is likely to increase, even though it may be spread and dispersed (and often concealed) under various departmental headings.

The penalty an organisation pays if it fails either to direct or to control this investment is not just that it spends unnecessary money, important enough though that might be. What is worse is that it produces inefficiency and inflexibility in the organisation — and it wastes opportunities.

The opportunities, in our opinion, are real and exciting, and all the techniques and all the tools necessary to control investment are available now. What is missing is sufficiently widespread understanding by senior managers of the fact that they need to exercise this control, and also a knowledge of the means by which they can exercise it.

THE PROBLEM FACING SENIOR MANAGEMENT

The basic problem is knowing the way in which senior managers outside the specialist area should exercise the right degree of control over a complex, technology-based function. And related to this is the problem facing managers of the information systems function of knowing exactly in what way they should communicate with and involve the organisation's senior management.

What is required of senior management is not an occasional interest, reacting to proposed budgets or problems, nor inconsistent interference in the running of the function. Instead, senior management needs both to set a clear policy for investment and expenditure and to ensure that an overall systems strategy exists.

For years various people have preached the doctrine of 'senior management involvement' in systems. Computer suppliers have done so because they know that senior management takes the ultimate financial decisions, management consultants have done so because senior management represents their best level of contact, and information systems managers have done so because they have sought recognition and understanding. Everyone has a vested interest in high-level involvement.

The real problem is that the nature of this 'involvement' has rarely been properly defined. There have been innumerable computer appreciation courses for senior management, run both internally and externally. Those courses have played a valuable role in gaining attention for information systems, in giving senior management a good understanding of technology and its potential, in describing the steps in systems development, and in stimulating enthusiasm. Rarely, however, have any of these courses genuinely equipped senior management for the tasks of identifying and making the basic decisions on investment.

In this report we have described the underlying importance of these decisions, we have explained the difficulties there are in making them, and we have outlined several approaches that can be taken.

As we have already indicated, in the type of large and experienced organisations on which our research has been concentrated, very few really bad decisions are made nowadays on individual computer projects. However, that is not really the point of concern here. The problem is not really the problem of stopping the 'rogue project'. Instead, it is the problem of investing sensibly, and on an informed basis, in an aspect of the business that has growing importance, and in which the results of investment can be enormously variable. Viewed in this light, our research revealed that there is considerable scope for improving the decision-making process.

Reassuringly perhaps, the task of improving the decision-making process does not necessarily require complex or sophisticated appraisal techniques. However, it always involves establishing the point at which, and the level at which, an investment decision has to be made, defining the accountability of those who have to make the decision, determining the basis on which the decision must be taken, ensuring that the relevant information is presented, setting policies and priorities, and ensuring that the direction and the extent of systems within the organisation is not determined simply by the combined effects of innumerable unrelated decisions.

POINTS OF GUIDANCE FOR SENIOR MANAGEMENT

Based on our research and on our own experience, we believe that there are several points of guidance that can be drawn to assist senior management in formulating and applying an effective approach towards investment in systems.

Firstly, as explained in chapter 3, senior management needs to ensure that the organisation has a systems strategy. This strategy needs to be produced by the information systems function in response to the long-term needs of the organisation, but it needs to be fully understood and endorsed by senior management. Nowadays, a systems strategy forms an essential part of an organisation's long-term planning.

Next, to ensure a sound base for that systems strategy, we believe that it is important to recognise that one of the most common obstacles to a sound strategy — and hence to a well-founded investment programme — can be an understandable but misguided desire to protect past investment. This attitude is not so much a conscious decision as an unwillingness to examine the possibility that the existing systems or the existing equipment provide the wrong base on which to build for the future.

What we have just said should not be taken as an argument for continually discarding past work and starting again. Indeed, one of the arguments for having a strategy is that it should make it less likely that such circumstances will arise in the future. However, before a systems strategy is formulated senior management must ensure that the existing systems base is correct. If it is wrong, then, for the purpose of the longer-term investment, the sooner this is recognised and faced the better.

Next, as a prerequisite for defining systems strategy and for making sensible judgements on budgets, senior management both inside and outside the information systems function needs to understand fully the basic investment trends in information systems within the organisation. The information they require for this purpose needs to cover the past five years and the expected trends over the next five years.

This does not mean that senior management needs to pore over detailed budgets and detailed figures of past and future performance. It does mean that senior management needs to understand the basic composition of the costs and the way in which, and the reasons why, costs are changing. As we indicated earlier, few organisations even have to hand the level of detail given in the case histories in Appendix 1.

Next, as the opportunities for information systems are expanded by the new technology, senior management needs to recognise that if it fails to assign clear responsibility for new areas such as office automation, this can only deprive the organisation of the ability to control the overall investment.

Next, senior management needs to recognise that in certain areas such as office automation, electronic mail and end-user computing, little or no progress will be made if these innovations are left to piecemeal justification of individual applications.

Next, senior management needs to ensure that the rules for the evaluation of proposed systems are clear. Generally speaking, our research has indicated that the rules are not clear. The old form of cost-benefit analysis is increasingly inappropriate, but often it remains the only standard method of appraisal that exists in an organisation. Consequently, such an analysis is often enforced, which leads either to the manipulation of figures followed by a contrived outcome or to the inhibition of real innovation. Alternatively, it is ignored, with the result that there is little or no genuine evaluation.

The rules need to be responsive to short-term redirection according to the corporate circumstances.

Finally, the fact that a mechanistic approach to appraisals is inappropriate to many of today's decisions, and that those decisions must now contain an increased element of judgement, does not obviate the need for a formal, well-defined appraisal process. Indeed, quite the reverse.

APPENDIX 1

CASE HISTORIES RELATING TO THE EXPENDITURE ON DATA PROCESSING

In this Appendix, commencing on the next page, we present as five case histories the historical expenditure on data processing systems by five organisations. The five organisations concerned were from five different industries (retailing, local government, brewing, finance and public utility).

We refer to the organisations as companies A, B, C, D and E, and for each one we provide a series of three charts. The first chart for each company shows the change in data processing expenditure in terms of money spent in each of five years (including the budgeted expenditure in the current year for four of the case histories). The total expenditure has been subdivided into the three major constituent parts of labour costs, equipment costs and other costs. The first chart for each company also shows for each year the company's actual expenditure on each of these constituent parts, together with the percentage of the total costs that each constituent part represents. It also shows for each year the element of the total costs that is accounted for by inflation since the first year shown. Thus, the first chart for each company also shows the way in which the company's total expenditure has changed in real terms over a period of time.

The second chart for each company shows the way in which labour costs and equipment costs (and, for company B, accommodation costs as well) have changed in real terms during the period shown. These charts also show the way in which these items of cost have changed relative to one another.

The third chart for company A shows the way in which the number of the company's data processing staff has changed, and, for the other four companies, the third chart shows the way in which various cost elements have changed relative to the base year. In constructing these charts we have set the costs in the first year at a base of 100, and we have adjusted the costs for subsequent years for inflation, before relating them to this base of 100.

For consistency, all financial amounts are given in pounds sterling.

CASE HISTORY OF COMPANY A

The case history of company A is an interesting example of the first effects of a company's move towards using minicomputers and distributed systems. Overall expenditure reflects the initial surge of development in 1978 and the effects of the recession in 1980. During the period in which costs were reviewed (1977 to 1982), the costs have risen steadily, but they now show signs of flattening out.

What is most interesting is the way in which the mix of individual costs has changed, and this is not evident from the charts. The labour mix has changed dramatically. In 1977, 37 per cent of the labour costs were directed towards development, whereas in 1978 the figure was 53 per cent, and the budget for 1982 is 57 per cent. The increase resulted both from a massive development thrust and from the loss of data preparation staff and data control staff. Further staff of both these types will be lost when the company introduces additional distributed systems, and the proportion of labour costs directed towards development will probably then increase even further. In absolute terms, labour costs will be closely geared to the use of program development aids and purchased software, but the effect of these cannot yet be measured.

Company A's strategy to distribute systems has shifted the equipment expenditure from mainframe computers towards minicomputers. In 1977, all expenditure was on mainframes, whereas in 1979 the figure was 85 per cent, and the budget for 1982 is 67 per cent. This trend is likely to continue until 1983/84, when the mainframes will be replaced by smaller machines. The proportion of expenditure is then likely to swing even further towards minicomputers. It is interesting to note that, although the mix has changed, the proportion of equipment costs to overall costs has stayed very much the same throughout the period under review.

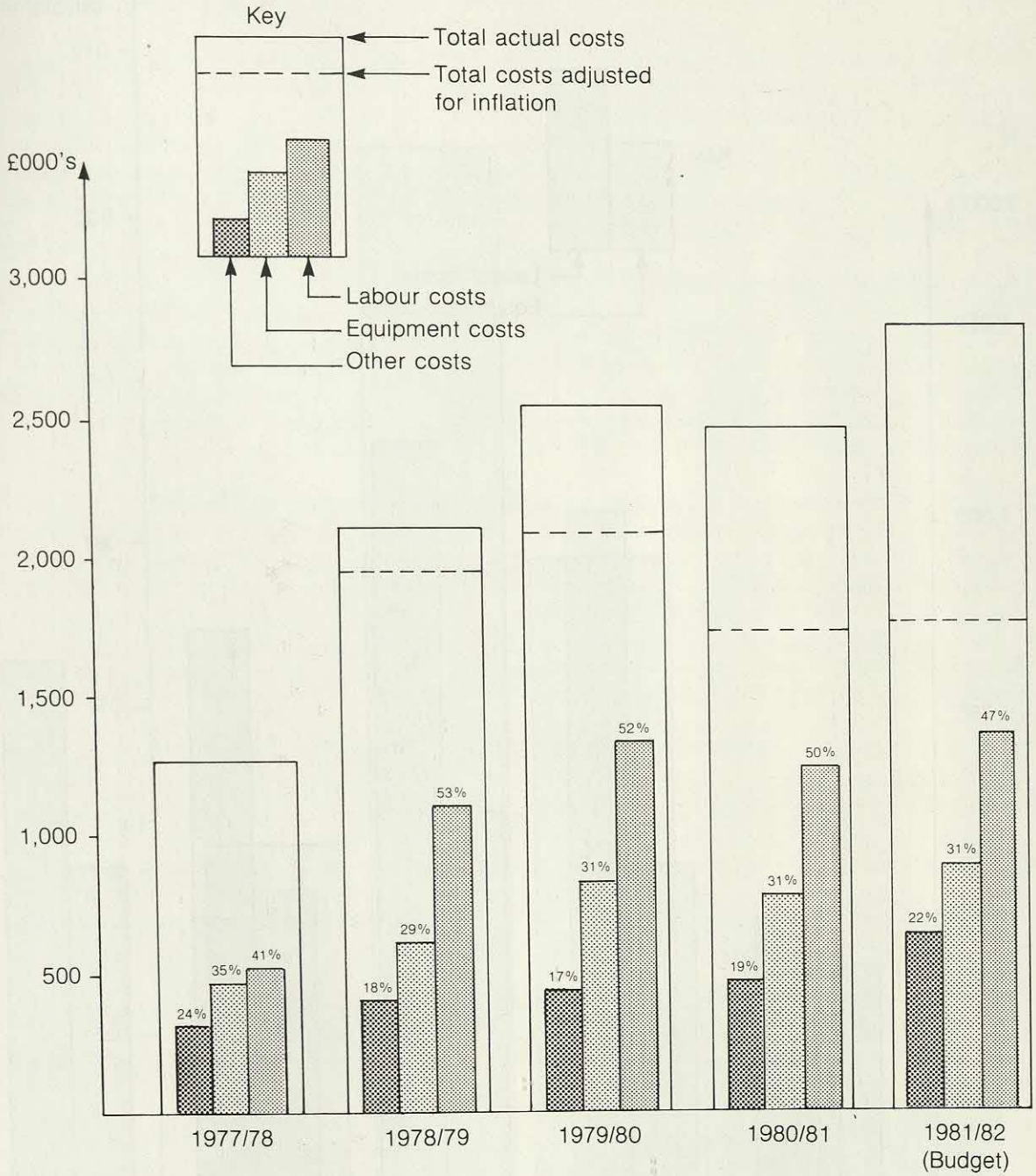
During the period, overheads have risen steadily in absolute terms and also in proportion to overall expenditure. The growth has been in proportion to both the office space used and the number of permanent employees, and this trend is likely to continue.

The two significant components of 'other costs' in company A are stationery costs and the costs of proprietary software. Whereas stationery costs are declining steadily with the increasing use of on-line systems, the use of purchased software is increasing. In 1977 and 1978, purchased software accounted for 0.4 per cent of total expenditure. The budgeted figure for 1981 is 3.8 per cent, which represents a remarkable increase. Purchased software will play an increasing role in systems development, and so labour costs are likely to be significantly reduced in the future.

The company is still in a transitional stage, and so long-term predictions are difficult to make. However, it is clear that the company's plans for using minicomputers, distributed systems and purchased software will all continue to have an effect on the key area of labour expenditure.

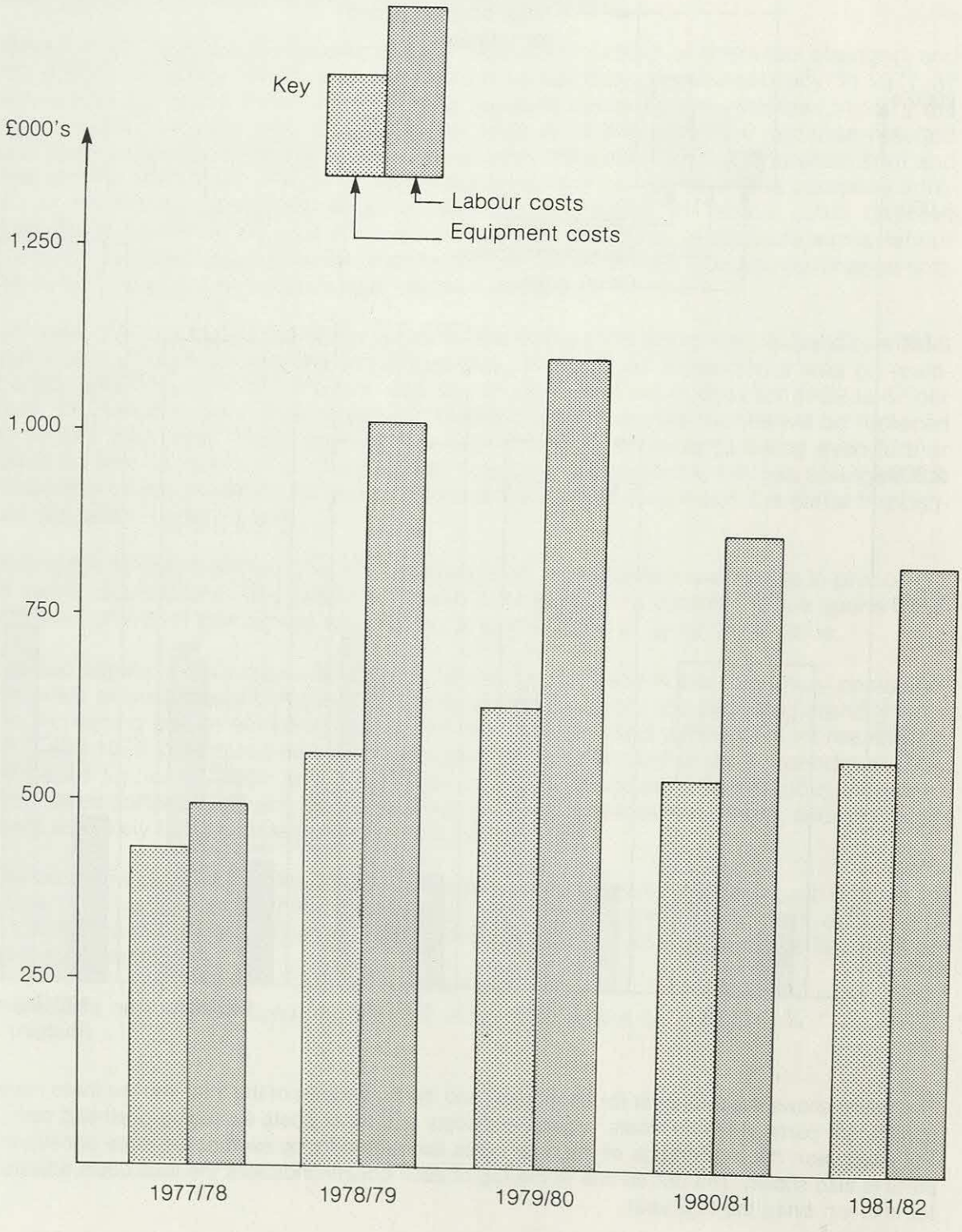
The charts on the next three pages show the relevant data for company A.

Growth in data processing expenditure in company A during the period 1977 to 1982

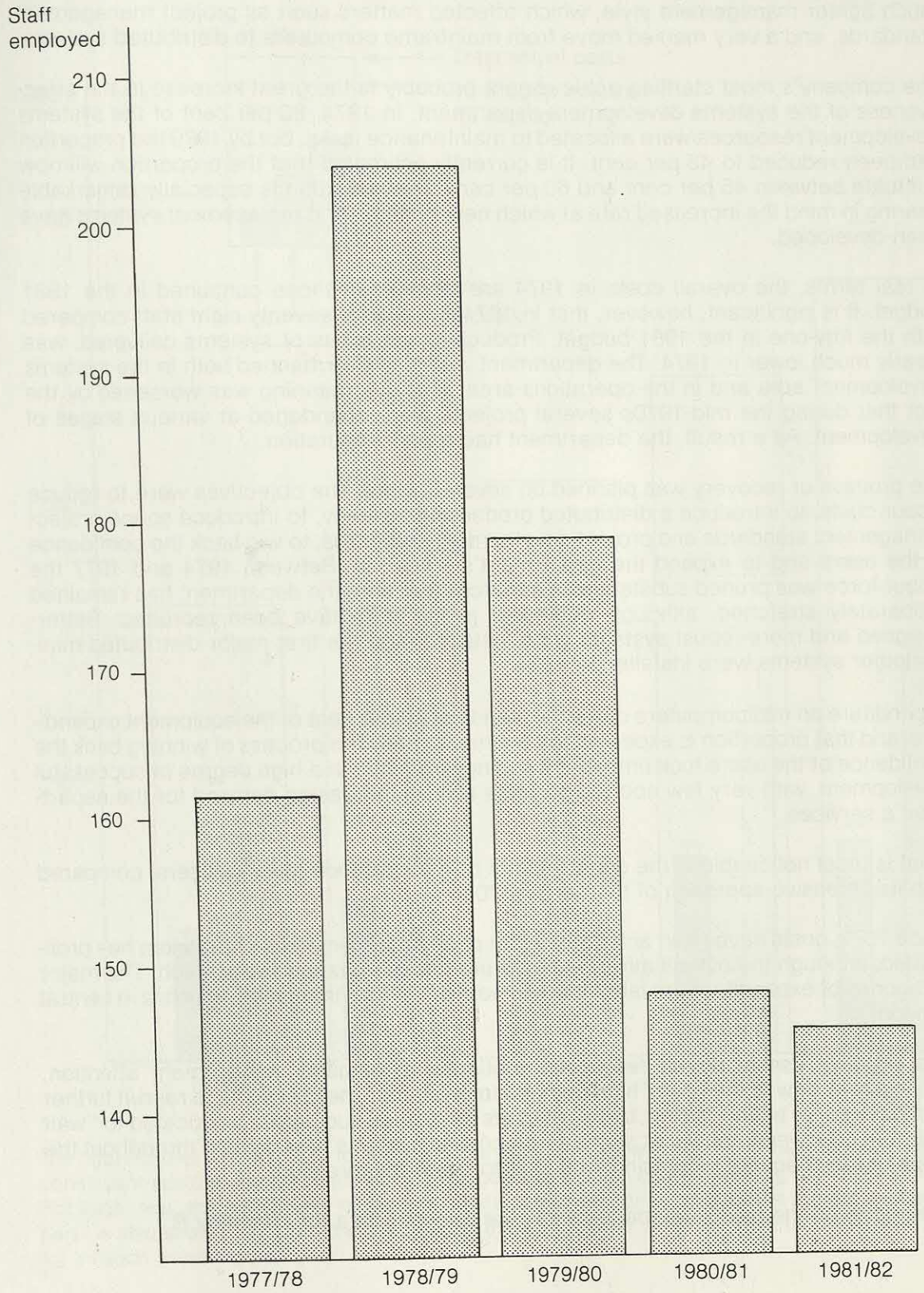


The figure shows the total cost for each year, and the breakdown of the total into the three major constituent parts of labour costs, equipment costs and other costs (including overhead costs). For each year, the percentage of the total costs accounted for by each of the three constituent parts is also shown. The dotted line at the top of each column indicates the total costs adjusted for inflation since the first year.

Labour costs and equipment costs for company A during the period 1977 to 1982 (shown at constant 1977 prices)



Number of data processing staff employed by company A during the period 1977 to 1982



CASE HISTORY OF COMPANY B

The case history of company B shows the effects of two factors: the introduction of a much tighter management style, which affected matters such as project management standards, and a very marked move from mainframe computers to distributed systems.

The company's most startling achievement probably is the great increase in the effectiveness of the systems development department. In 1974, 80 per cent of the systems development resources were allocated to maintenance tasks, but by 1979 the proportion had been reduced to 48 per cent. It is currently estimated that the proportion will now fluctuate between 45 per cent and 60 per cent. The reduction is especially remarkable bearing in mind the increased rate at which new systems and replacement systems have been developed.

In real terms, the overall costs in 1974 are lower than those contained in the 1981 budget. It is significant, however, that in 1974 there were seventy-eight staff compared with the fifty-one in the 1981 budget. Productivity, in terms of systems delivered, was clearly much lower in 1974. The department was also overmanned both in the systems development area and in the operations area. This overmanning was worsened by the fact that during the mid-1970s several projects were abandoned at various stages of development. As a result, the department had a poor reputation.

The process of recovery was planned on several fronts. The objectives were to reduce labour costs, to introduce a distributed processing strategy, to introduce sound project management standards and project development standards, to win back the confidence of the users and to expand the department's influence. Between 1974 and 1977 the labour force was pruned substantially, and from that time the department has remained deliberately stretched, although additional junior staff have been recruited. Better-designed and more-robust systems were installed, and the first major distributed minicomputer systems were installed in 1974.

Expenditure on minicomputers currently stands at 43 per cent of the equipment expenditure, and that proportion is expected to continue to rise. The process of winning back the confidence of the users took time, but it has now resulted in a high degree of successful development, with very few aborted projects and an increasing demand for the department's services.

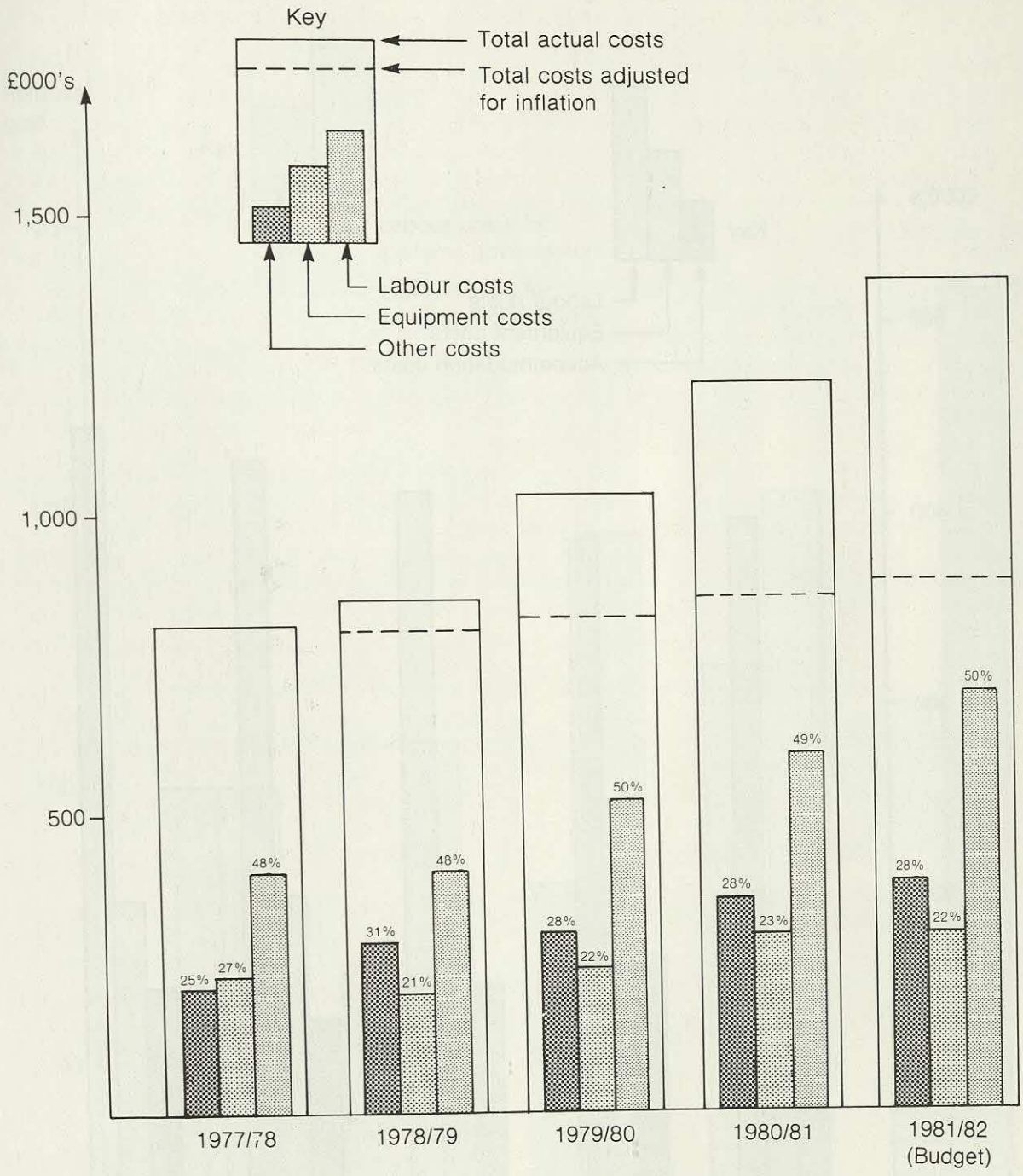
What is most noticeable is the department's positive attitude towards users, compared with its defensive approach of the early 1970s.

Since 1979, costs have risen and the amount of development work undertaken has proliferated, although the overall mix of expenditure has not changed very much. The major categories of expenditure are labour, equipment and accommodation, which is in central London.

The effective use of skilled resources continues to demand management attention, especially in view of the users' high demand for systems. The pressures to recruit further staff have so far been resisted, because users have been successfully educated to "wait their turn". However, now that so many successful systems have spread throughout the group, it may become increasingly difficult to resist this pressure.

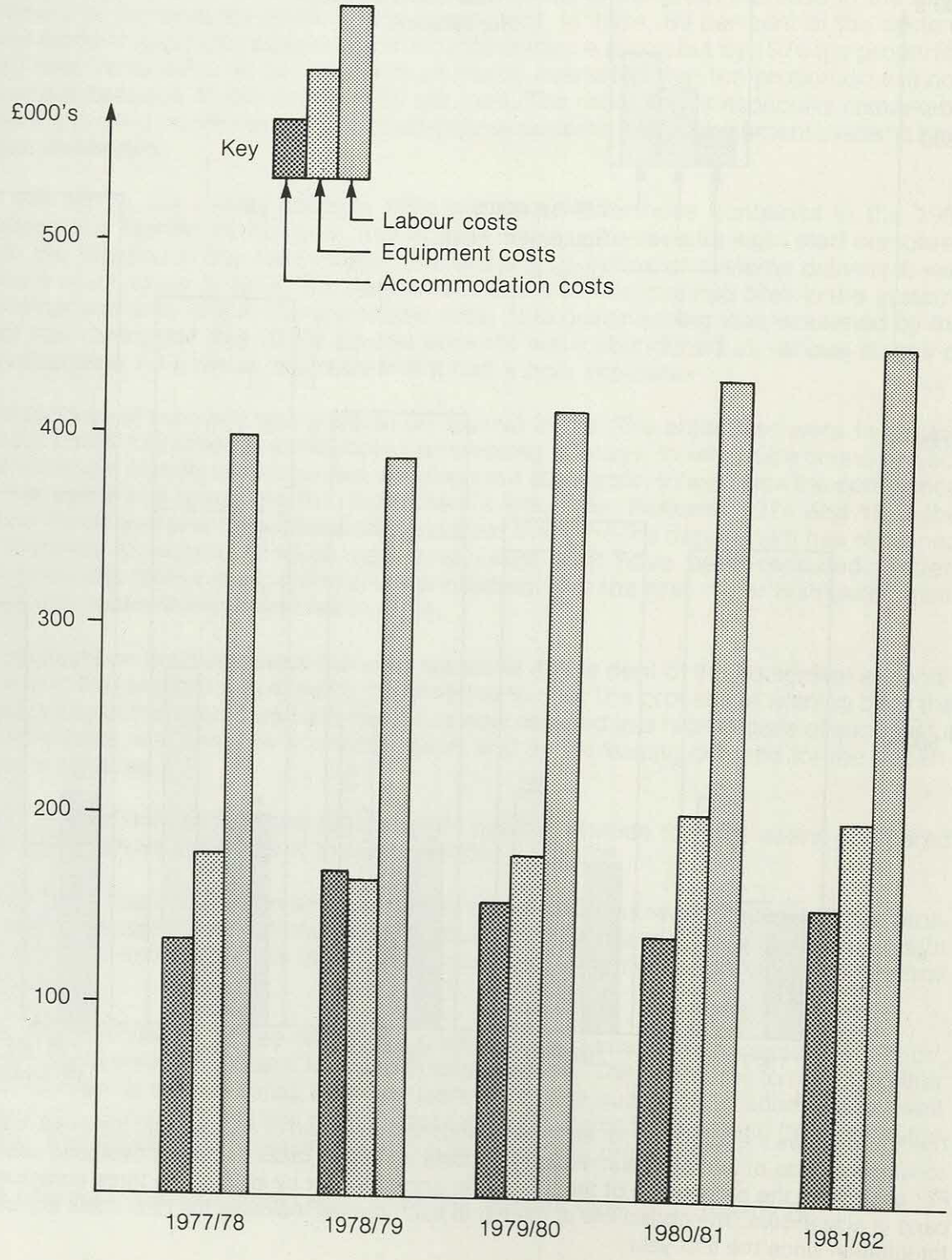
The charts on the next three pages show the relevant data for company B.

Growth in data processing expenditure in company B during the period 1977 to 1982

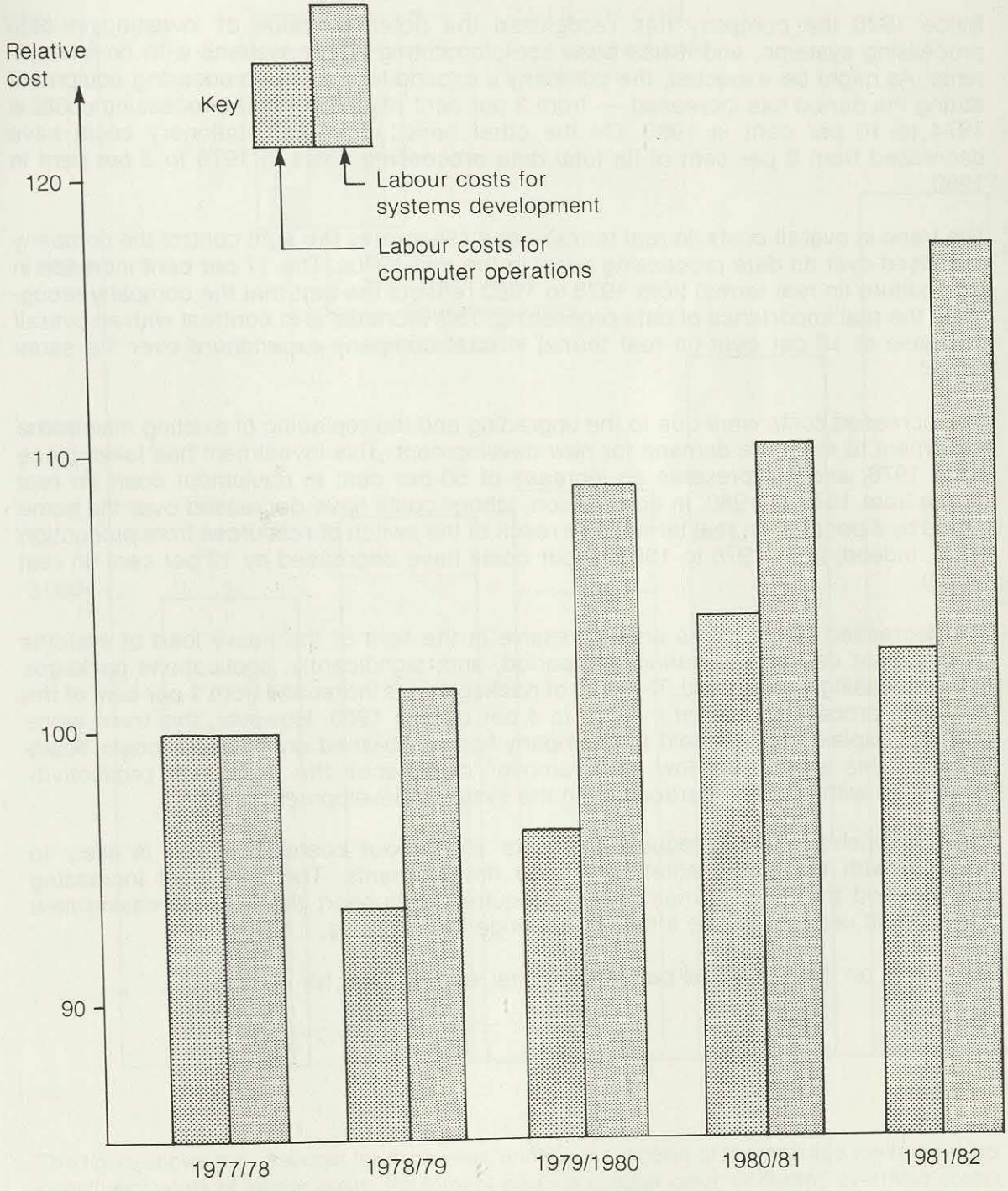


The figure shows the total cost for each year, and the breakdown of the total into the three major constituent parts of labour costs, equipment costs and other costs (including overhead costs). For each year, the percentage of the total costs accounted for by each of the three constituent parts is also shown. The dotted line at the top of each column indicates the total costs adjusted for inflation since the first year.

Labour costs, equipment costs and accommodation costs for company B during the period 1977 to 1982 (shown at constant 1977 prices)



Labour costs in company B for systems development and computer operations during the period 1977 to 1982



Note: All values are relative to the 1977/78 values, which have been set at 100. The values for subsequent years are shown on the basis of constant 1977 prices.

CASE HISTORY OF COMPANY C

Company C is centralised both in its style of management and in its approach to data processing. The company's expenditure on data processing in 1980 was £5½m compared with total company costs of £1,090m.

Since 1976 the company has recognised the potential value of investing in data processing systems, and it has been complementing batch systems with on-line systems. As might be expected, the company's expenditure on teleprocessing equipment during the period has increased — from 3 per cent of its total data processing costs in 1974 to 10 per cent in 1980. On the other hand, computer stationery costs have decreased from 6 per cent of its total data processing costs in 1976 to 3 per cent in 1980.

The trend in overall costs (in real terms) clearly illustrates the tight control the company exercised over its data processing costs in the mid-1970s. The 17 per cent increase in expenditure (in real terms) from 1978 to 1980 reflects the fact that the company recognised the real importance of data processing. This increase is in contrast with an overall decrease of 10 per cent (in real terms) in total company expenditure over the same period.

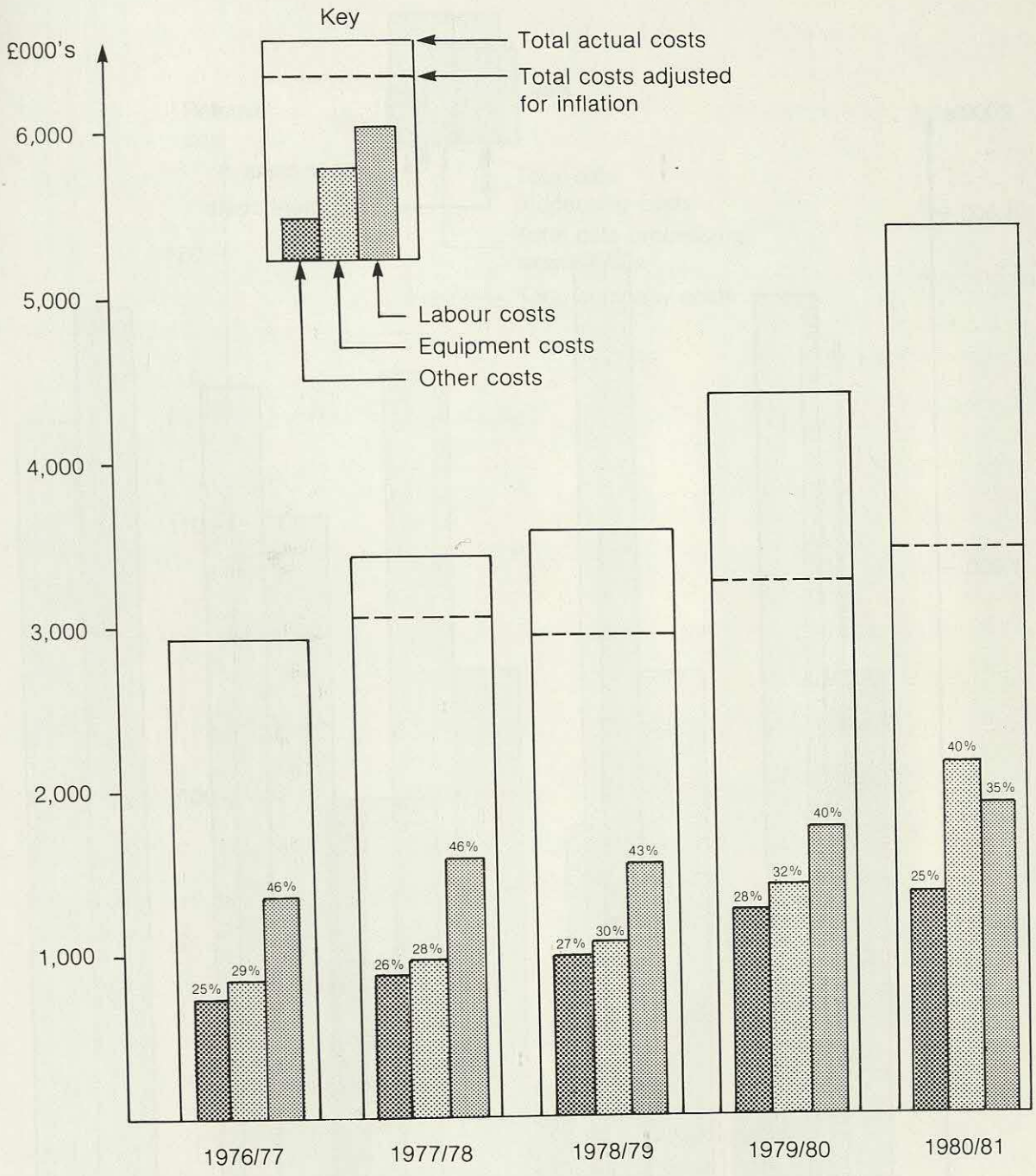
The increased costs were due to the upgrading and the replacing of existing mainframe equipment to meet the demand for new development. This investment has taken place since 1978, and it represents an increase of 50 per cent in equipment costs (in real terms) from 1978 to 1980. In comparison, labour costs have decreased over the same period by 6 per cent (in real terms) as a result of the switch of resources from production effort. Indeed, from 1976 to 1980 labour costs have decreased by 12 per cent (in real terms).

The decreased labour costs are impressive in the light of the heavy load of systems development carried out during this period, and, significantly, applications packages have increasingly been used. The cost of packages has increased from 1 per cent of the total data processing budget in 1976 to 4 per cent in 1980. However, this trend alone does not explain the firm hold the company has established on its labour costs. A key factor in this is the very low staff turnover, and hence the likely high productivity associated with stability, particularly in the systems development function.

The relationship between equipment costs and labour costs, however, is likely to fluctuate with the implementation of new developments. The effects of increasing salaries, and the level of maintenance required to support the ever-increasing new systems will undoubtedly be a major challenge in the 1980s.

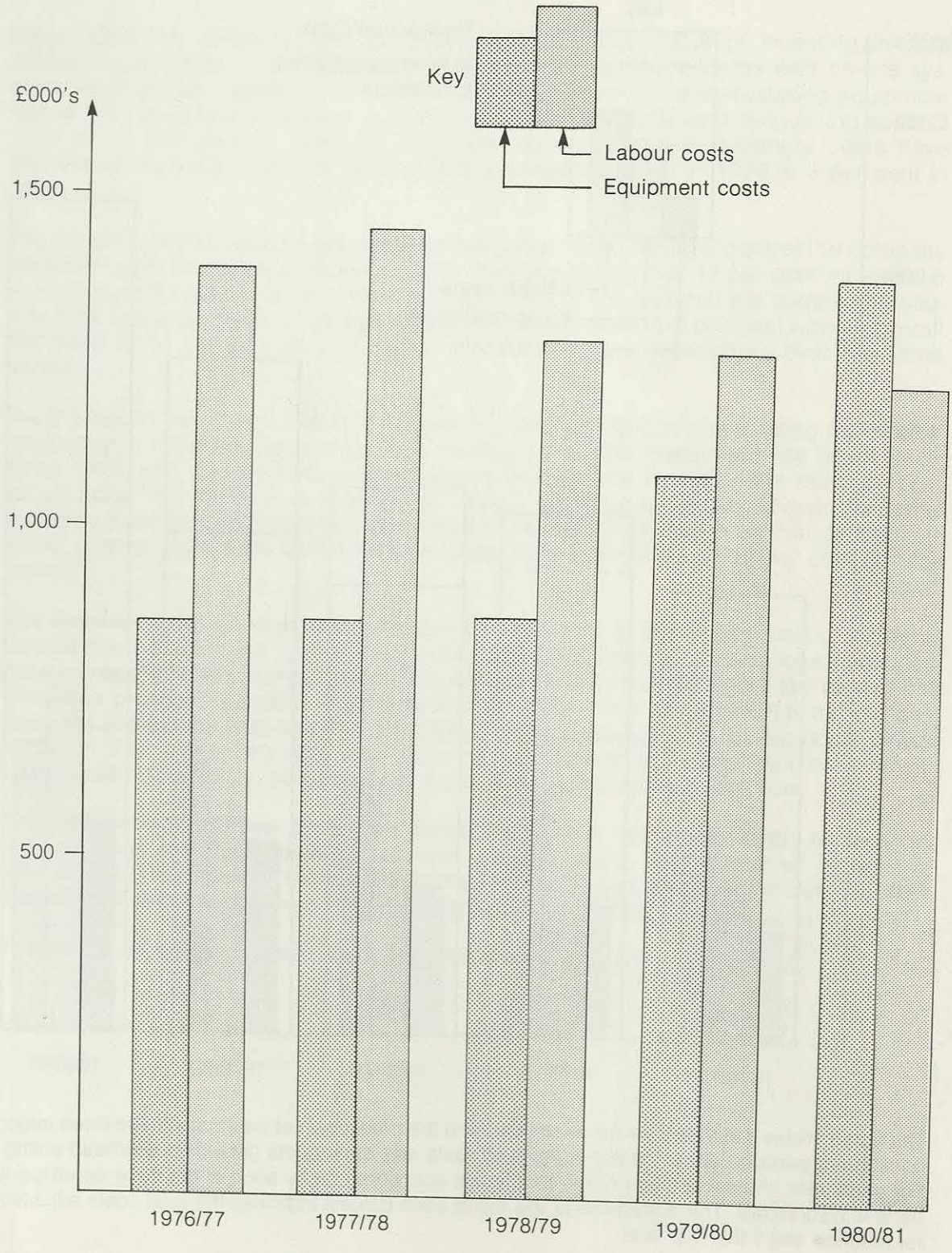
The charts on the next three pages show the relevant data for company C.

Growth in data processing expenditure in company C during the period 1976 to 1981

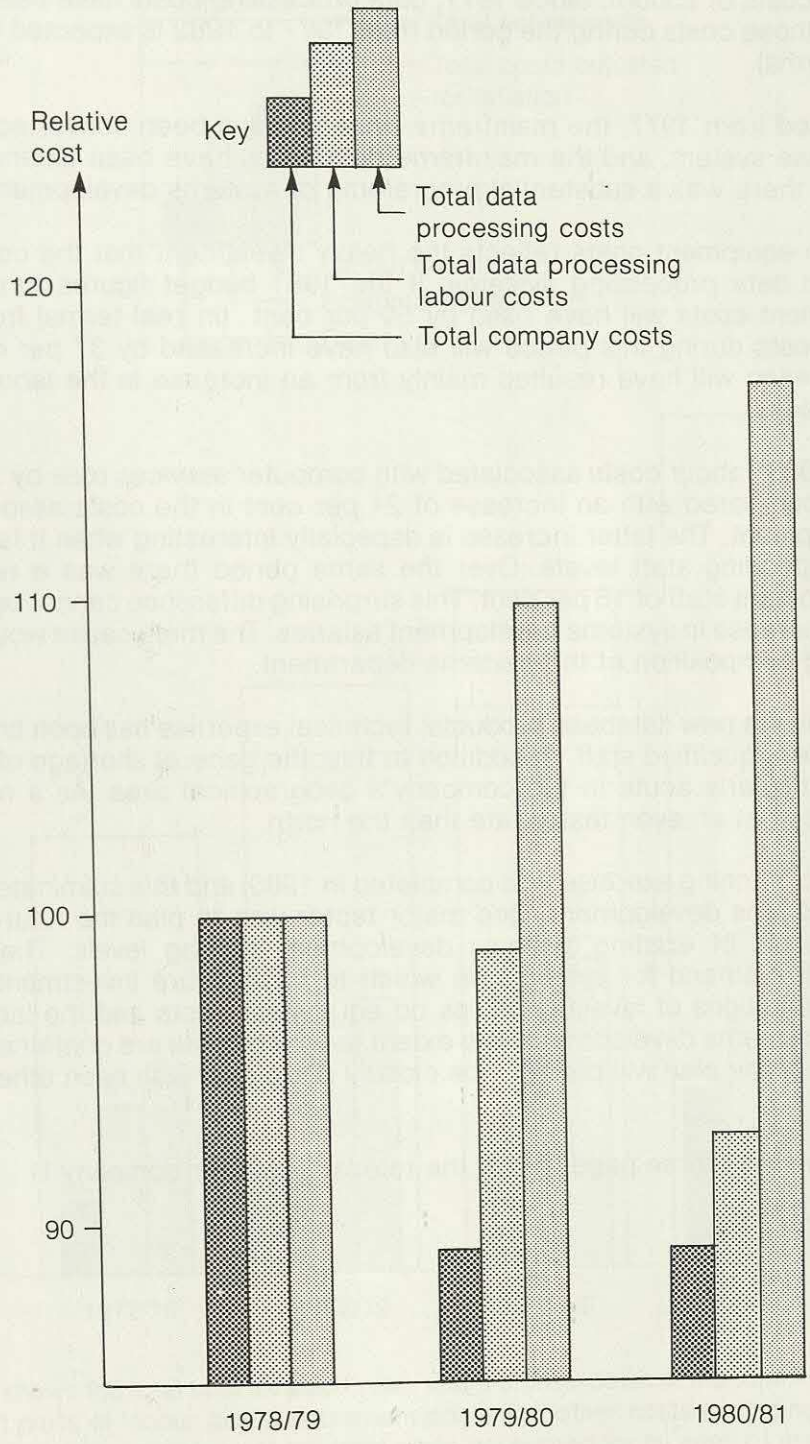


The figure shows the total cost for each year, and the breakdown of the total into the three major constituent parts of labour costs, equipment costs and other costs (including overhead costs). For each year, the percentage of the total costs accounted for by each of the three constituent parts is also shown. The dotted line at the top of each column indicates the total costs adjusted for inflation since the first year.

Labour costs and equipment costs for company C during the period 1976 to 1981 (shown at constant 1976 prices)



Total company costs, total data processing costs and total data processing labour costs in company C during the period 1978 to 1981



Note: All values are relative to the 1978/79 values, which have been set at 100. The values for subsequent years are shown on the basis of constant 1978 prices.

CASE HISTORY OF COMPANY D

Company D has had a very uniform pattern of expenditure in a centralised data processing environment. In 1979 the company spent £2¾m on data processing compared with total company costs of £500m. Since 1977, data processing costs have risen gradually, and the rise in those costs during the period from 1977 to 1982 is expected to be 46 per cent (in real terms).

During the period from 1977, the mainframe systems have been converted to operate under a database system, and the mainframe operations have been extended. During the period also there was a substantial programme of systems development.

The increase in equipment costs reflects the heavy investment that the company has been making in data processing systems. If the 1981 budget figures turn out to be correct, equipment costs will have risen by 50 per cent (in real terms) from 1976 to 1981. Labour costs during this period will also have increased by 37 per cent in real terms. The increase will have resulted mainly from an increase in the labour costs of computer services.

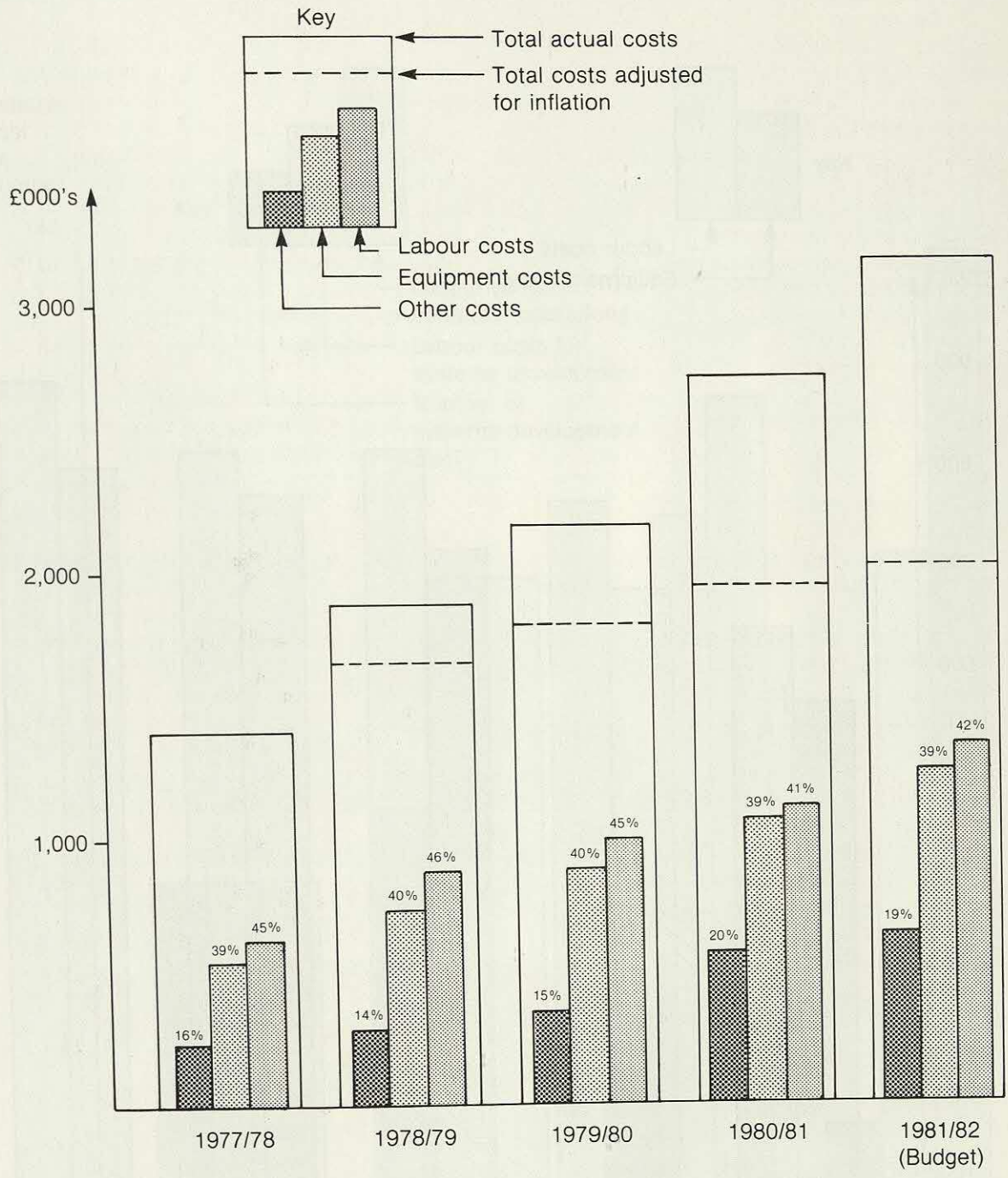
From 1977 to 1980, labour costs associated with computer services rose by 38 per cent (in real terms) compared with an increase of 21 per cent in the costs associated with systems development. The latter increase is especially interesting when it is compared with the corresponding staff levels. Over the same period there was a reduction in systems development staff of 16 per cent. This surprising difference cannot be explained by the general increase in systems development salaries. The main cause would seem to be the changing composition of the systems department.

In order to exploit the new database products, technical expertise has been brought in at the expense of less-qualified staff. In addition to this, the general shortage of computer expertise is particularly acute in the company's geographical area. As a result, staff salaries have risen at an even faster rate than the norm.

A major strategic planning exercise was completed in 1980, and this culminated in a five-year plan for systems development. One major factor was to plan the future developments on the basis of existing systems development staffing levels. The plan has provided a stable demand for systems on which to base future investment. Already, overall costs show signs of levelling off, as do equipment costs and the labour costs associated with systems development. The extent to which costs are contained, and the level of success of the plan will probably be closely correlated with each other over the next few years.

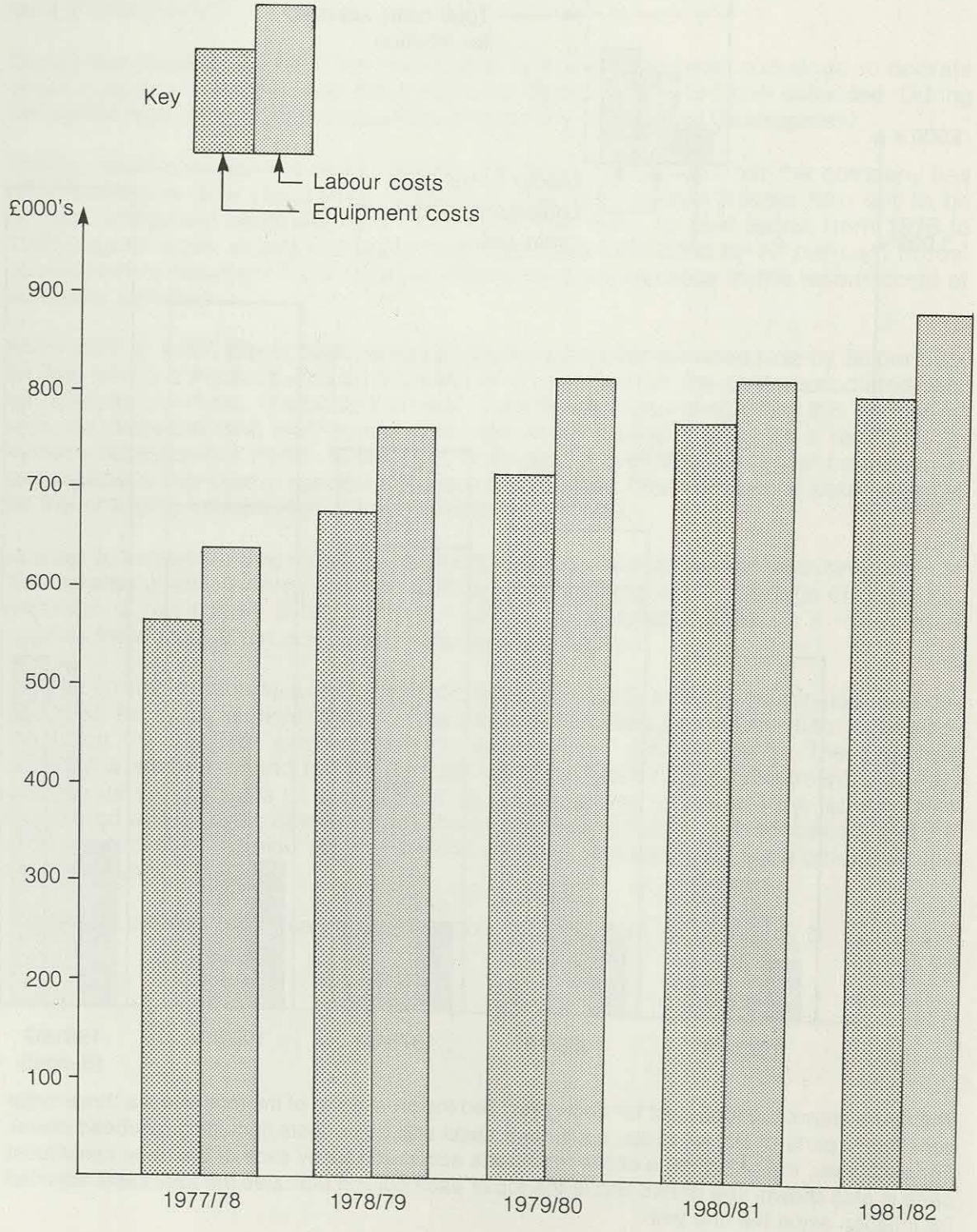
The charts on the next three pages show the relevant data for company D.

Growth in data processing expenditure in company D during the period 1977 to 1982

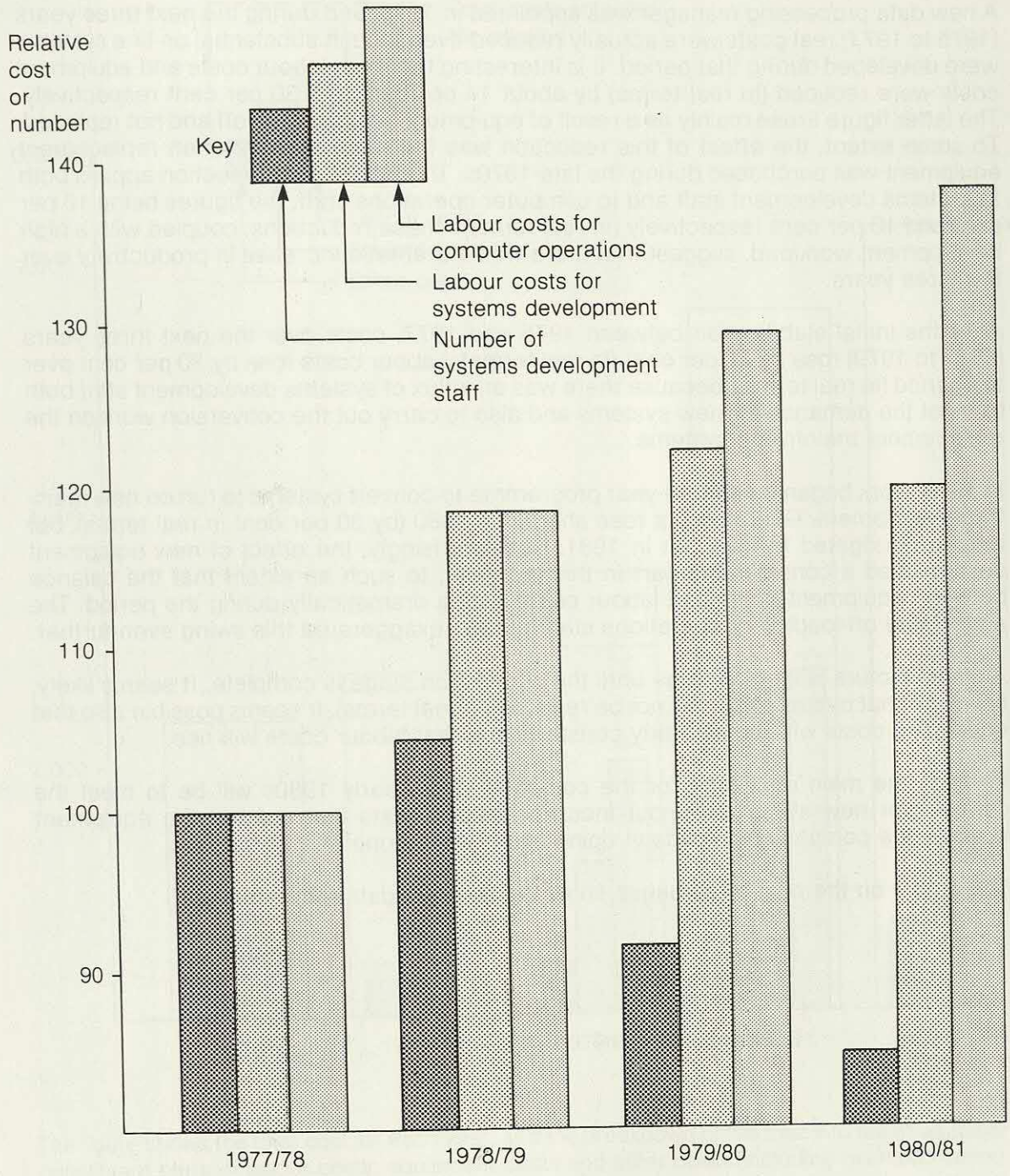


The figure shows the total cost for each year, and the breakdown of the total into the three major constituent parts of labour costs, equipment costs and other costs (including overhead costs). For each year, the percentage of the total costs accounted for by each of the three constituent parts is also shown. The dotted line at the top of each column indicates the total costs adjusted for inflation since the first year.

Labour costs and equipment costs for company D during the period 1977 to 1982 (shown at constant 1977 prices)



Labour costs both for computer operations and for systems development in company D, and the number of systems development staff employed in company D during the period 1977 to 1981



Note: All values are relative to the 1977/78 values, which have been set at 100. The cost values for subsequent years are shown on the basis of constant 1977 prices.

CASE HISTORY OF COMPANY E

The case history of company E shows the way in which costs have changed during a period of successful development and major systems conversion in a highly-centralised environment.

A new data processing manager was appointed in 1975, and during the next three years (1975 to 1977) real costs were actually reduced even though substantial on-line systems were developed during that period. It is interesting that both labour costs and equipment costs were reduced (in real terms) by about 14 per cent and 30 per cent respectively. The latter figure arose mainly as a result of equipment being written off and not replaced. To some extent, the effect of this reduction was felt more sharply when replacement equipment was purchased during the late-1970s. The labour cost reduction applies both to systems development staff and to computer operations staff, the figures being 16 per cent and 10 per cent respectively (in real terms). These reductions, coupled with a high development workload, suggest that there was a dramatic increase in productivity over the three years.

After the initial stabilisation between 1975 and 1977, costs over the next three years (1977 to 1979) rose by 20 per cent (in real terms). Labour costs rose by 30 per cent over the period (in real terms), because there was an influx of systems development staff both to meet the demands for new systems and also to carry out the conversion work on the replacement mainframe systems.

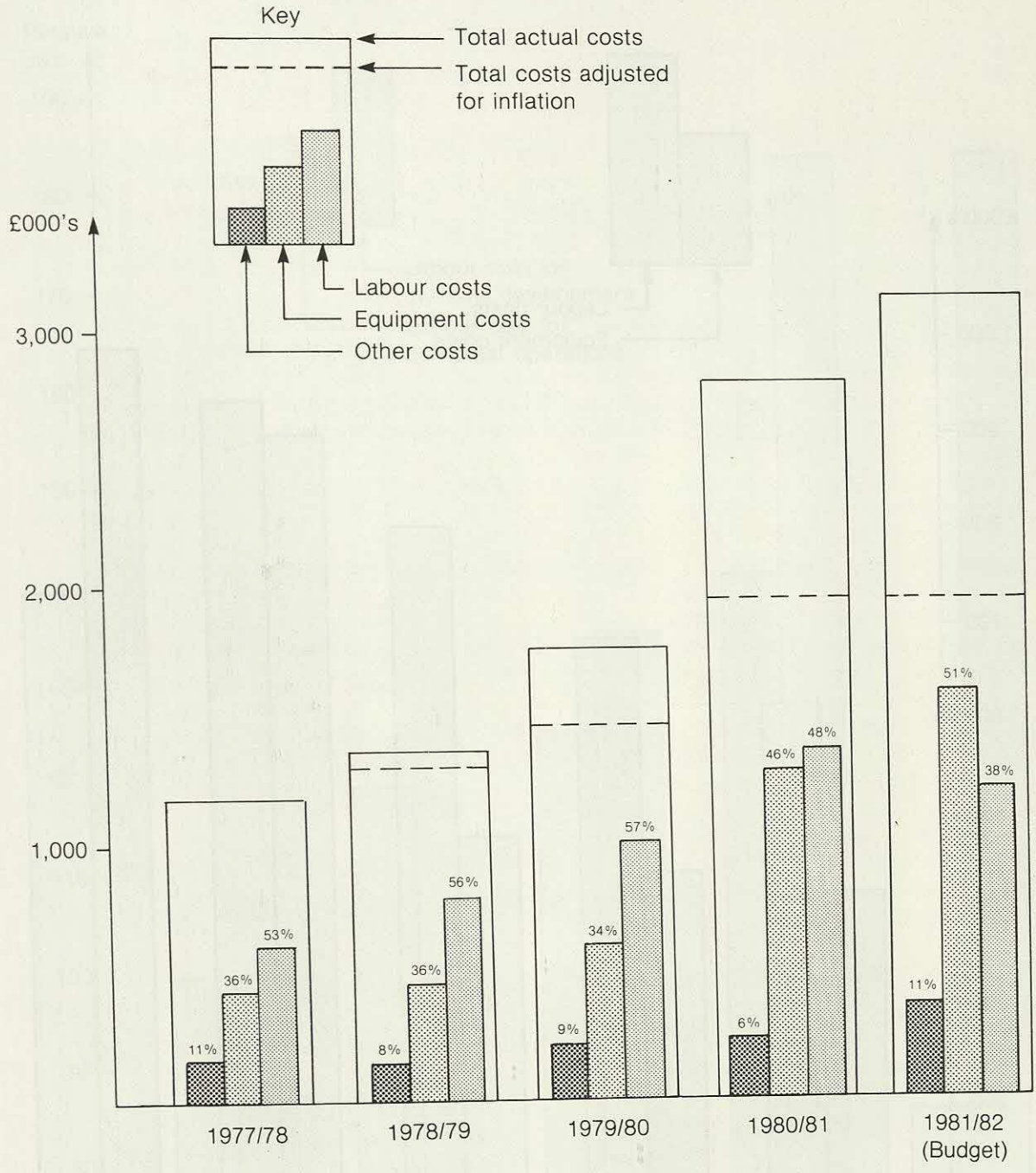
In 1979, work began on a three-year programme to convert systems to run on new mainframe equipment. Overall costs rose sharply in 1980 (by 30 per cent in real terms), but they are budgeted to level out in 1981. Not surprisingly, the effect of new equipment costs played a considerable part in this increase, to such an extent that the balance between equipment costs and labour costs swung dramatically during the period. The anticipated off-loading of operations staff in 1981 exaggerated this swing even further.

A stable picture will not emerge until the conversion stage is complete. It seems likely, however, that overall costs will not be reduced (in real terms). It seems possible also that equipment costs will remain fairly constant, and that labour costs will rise.

Perhaps the main challenge for the company in the early 1980s will be to meet the demand for new systems without incurring labour costs that outstrip the equipment costs. If the company succeeds in doing this it will be one of a select few.

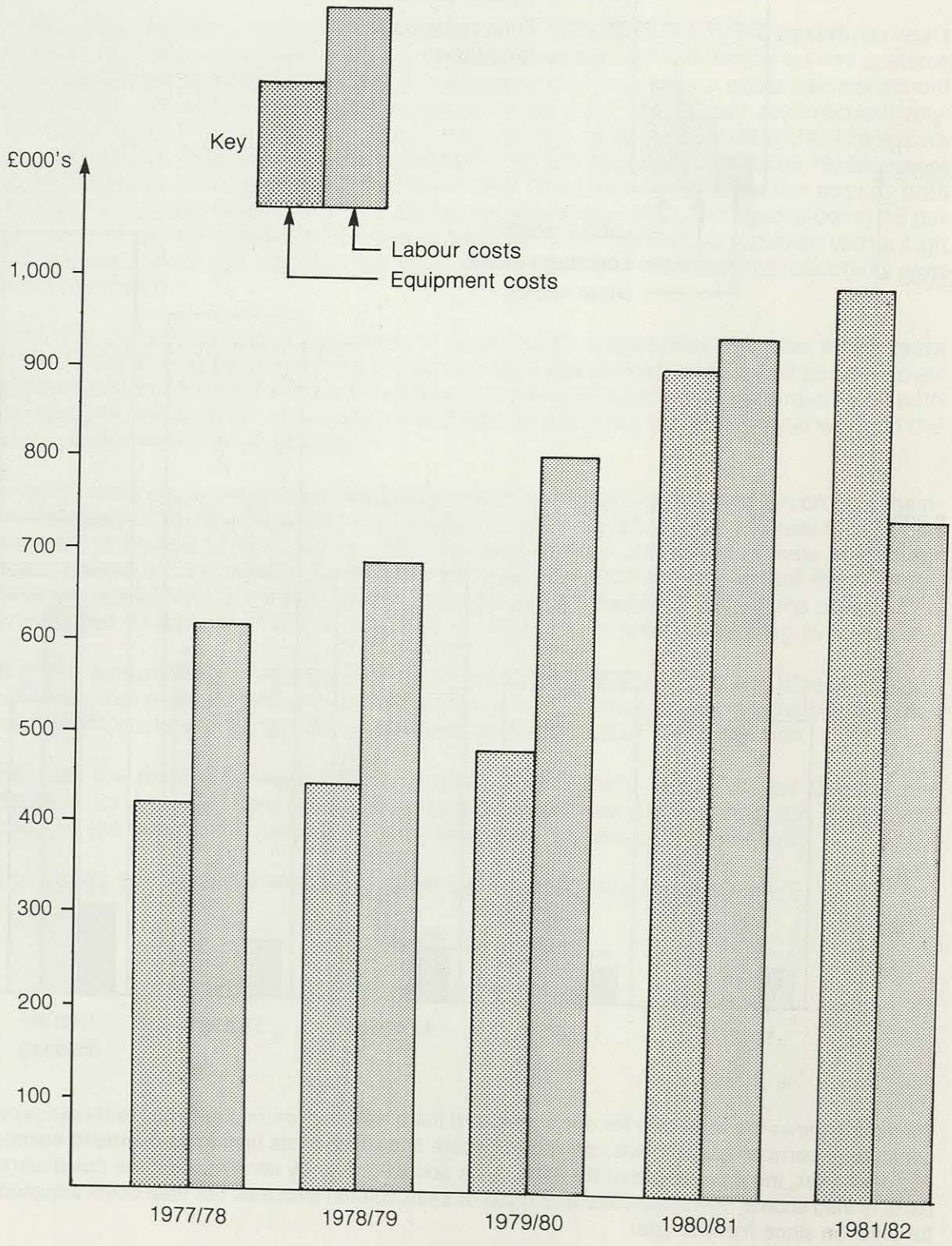
The charts on the next three pages show the relevant data for company E.

Growth in data processing expenditure in company E during the period 1977 to 1982

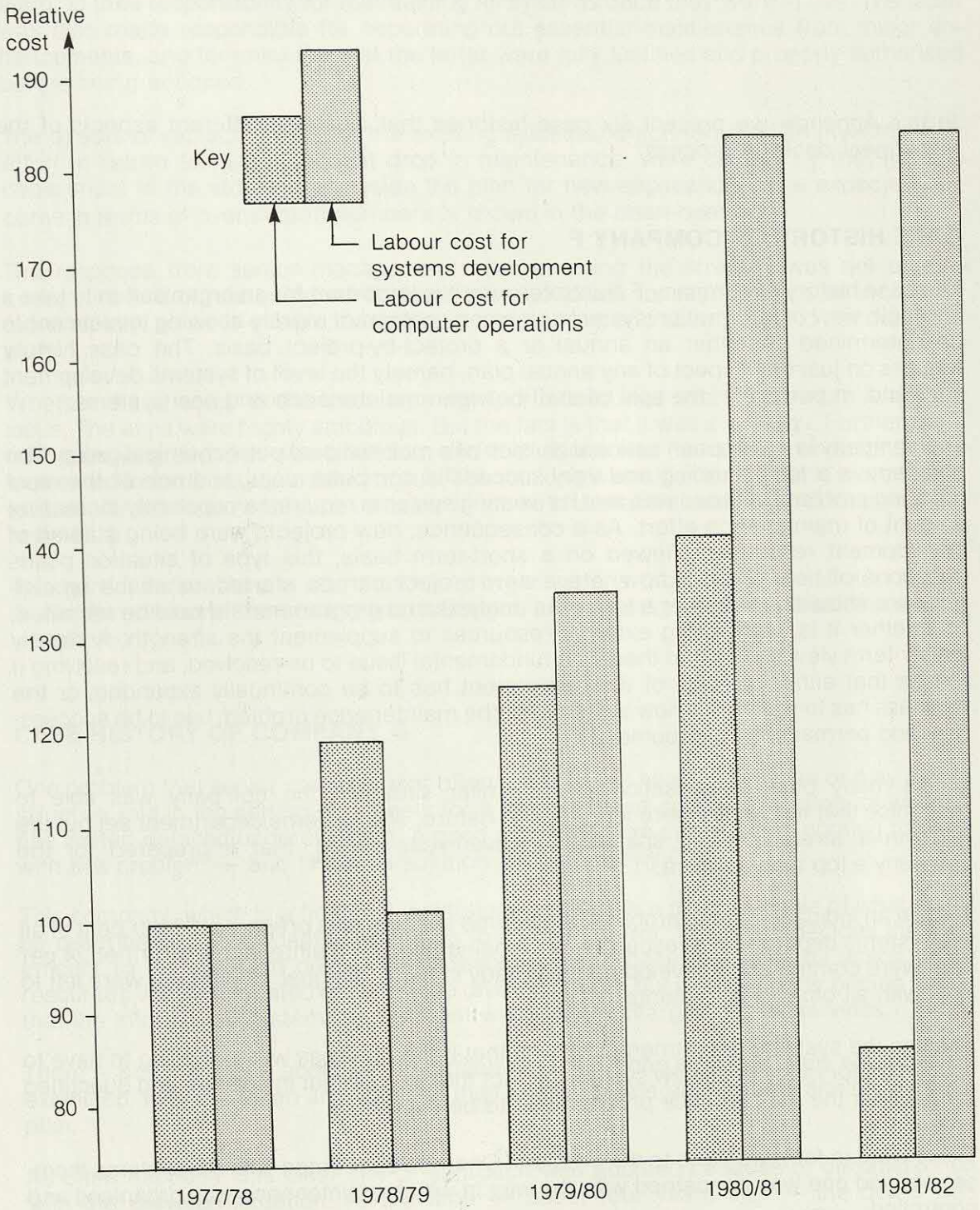


The figure shows the total cost for each year, and the breakdown of the total into the three major constituent parts of labour costs, equipment costs and other costs (including overhead costs). For each year, the percentage of the total costs accounted for by each of the three constituent parts is also shown. The dotted line at the top of each column indicates the total costs adjusted for inflation since the first year.

Labour costs and equipment costs for company E during the period 1977 to 1982 (shown at constant 1977 prices)



Labour costs in company E for systems development and computer operations during the period 1977 to 1982



Note: All values are relative to 1977/78 values, which have been set at 100. The values for subsequent years are shown on the basis of constant 1977 prices.

APPENDIX 2

CASE HISTORIES ILLUSTRATING DIFFERENT ASPECTS OF THE INVESTMENT DECISION PROCESS

In this Appendix we present six case histories that illustrate different aspects of the investment decision process.

CASE HISTORY OF COMPANY F

The case history of company F illustrates why it is important for an organisation to take a strategic view of information systems planning, instead of merely allowing investment to be determined on either an annual or a project-by-project basis. The case history focuses on just one aspect of any annual plan, namely the level of systems development staff and, in particular, the split of staff between maintenance and new systems.

The company is a European national division of a multinational petrochemical group. The company is a long-standing and very successful computer user, and one of the most pressing problems it faced was that its existing systems required a constantly increasing amount of maintenance effort. As a consequence, new projects were being starved of development resources. Viewed on a short-term basis, this type of situation poses questions of how soon or how late a new project can be started, what the relative priorities should be, whether a few more analysts and programmers should be recruited, or whether it is worth using external resources to supplement the strength. A slightly longer-term view shows that there is a fundamental issue to be resolved, and resolving it means that either the size of the department has to be continually expanded, or the business has to wait for its new systems, or the maintenance problem has to be successfully and permanently overcome.

Unlike many other organisations in a similar situation, the company was able to recognise that the issues were long-term in nature. The systems department set out the facts in a strategic plan, spanning a seven-year period, that it prepared for the company's top management.

To give an indication of the problem: at the time the plan was prepared, 63 per cent of all the systems department's resources were being used on maintenance, a further 24 per cent were committed to developments already in hand, and just 13 per cent were left to deal with all other requirements.

The line the systems department took was that if the business was not going to have to wait years for many of its new systems (a fact that was set out in specific and quantified terms) then the maintenance problem had to be overcome.

There were in fact two parts to the problem. One was concerned with the systems themselves, and one was concerned with the way in which maintenance was organised and controlled.

The existing systems were long-established and monolithically-designed. They had undergone successive minor modifications throughout their years of use. They functioned satisfactorily, but they would need to be completely replaced by more modern

systems if the maintenance burden was really to be eased. However, that approach would involve paying a heavy price for little immediate gain.

The control problem was resolved by establishing a small, highly-competent 'operational team' to take responsibility for maintaining all systems once they were in use. The team was also made responsible for separating out essential maintenance from minor enhancements, and for ensuring that the latter were fully justified and properly authorised before being actioned.

The effects of replacing most of the existing systems, which required an investment in effort in return for a consequent drop in maintenance, were set out by the systems department in the strategy alongside the plan for new applications. The expected outcome in terms of overall staff numbers is shown in the chart overleaf.

The response from senior management after studying the strategy was not only to accept the line of reasoning put forward but also to ask for resources to be increased more rapidly, so as to ensure that problems of training and absorption did not delay the plan.

Whether the strategy in this case was right, or indeed was even achievable is not the issue. The aims were highly ambitious. But the fact is that it was a strategy. Furthermore, the underlying situation was analysed, and the results and the recommendations were expressed in facts and quantified terms. The thinking was clear and, what is more important, senior management had a basis on which both to make a decision and to assess the results.

This particular problem is one that many organisations face. Sadly, most view it only within the context of the coming year's budget, and, consequently, the problems remain unresolved.

CASE HISTORY OF COMPANY G

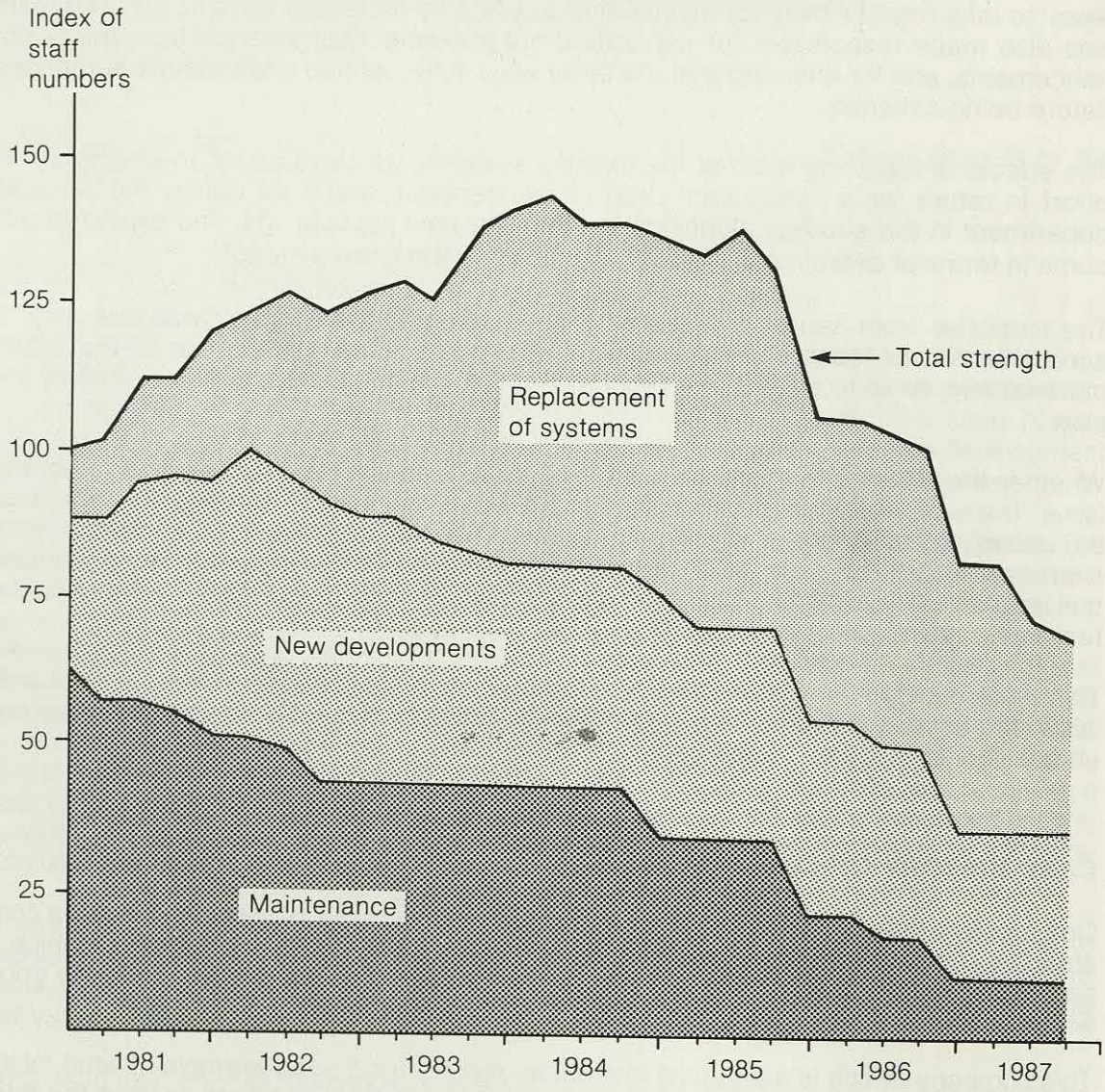
One problem that senior management often faces is just how to intervene or play a constructive role in the setting of budgets for a technical and complex function, of which it has limited detailed understanding. A good example of an organisation coming to grips with this problem — and finding a solution — is company G.

This company, which is a financial institution, represents a good example of what might be described as a segmented approach to overall control. The board decides the total amount to be spent on development resources, the basic priorities by which these resources will be allocated between the divisions of the business, and the pricing policy that the information systems department will apply in charging for its services.

There is nothing vague about this approach. The decisions are clear, they are carefully examined, they are taken annually and they are reconsidered quarterly against a rolling plan.

As often happens, this clear line of approach was adopted because of dissatisfaction with the previous situation. At the time — about four years ago — the board was unhappy about the performance of the information systems department. The department was perceived as being effective in telling the business what to do, but not particularly effective in delivering systems. However, there was no crisis. The board simply felt that it was not getting an adequate return on its expenditure. The department seemed to be properly controlled — it had budgets, plans and standards — but somehow, as far as the

Expected effect on overall staff numbers of implementing the seven-year strategic plan



Note: To maintain anonymity and to avoid quoting actual staff numbers the January 1981 level is taken as equivalent to 100.

business was concerned, expenditure was being increasingly incurred without any apparent major gain to the business.

This type of situation is, of course, actually quite difficult for senior management to tackle. Neither the extent nor the root cause of the problem is obvious. Inevitably the approach adopted is based on an attack on the one thing that everyone can understand, namely costs. Even then, though, senior managers face a dilemma in that it is risky for them to cut costs when they cannot be sure what the precise consequences of doing so will be.

Correctly, the senior managers in this company perceived that the problems lay in the development area, not in the running of the systems. The only aspect of development work that they believed they fully understood was organisation and methods, and on the basis of their understanding they decided that the O&M function could be dispensed with.

At about that time, they also appointed a new head of information systems, though not entirely as a consequence of their immediate concern. Although he was not appointed to perform a cost-cutting exercise, in the event he was given, as his first priority, precisely that task.

He decided, however, that instead of introducing a programme of random austerity measures — and forever be required to defend the remaining departmental budget against further questioning — he would adopt a line which put the onus firmly back both on the users and senior management. In doing that, however, he restructured the problem in a form that made it tractable.

His approach was quite simple. He excluded hardware from consideration and focused his approach entirely on the use of development resources. Effectively the company was asked what amount of money it was prepared to spend on the development of systems, and where, in terms of priorities, it wanted it spent. In other words, the board was asked to decide both the size of the cake and the size of the slices.

Initially, in line with the board's original wish, the head of information systems cut the staff numbers, so that, over two years, the development strength fell from fifty-one to nineteen. He coupled with this a determined drive for increased competence and for far more careful examination of the projects on which effort should be expended. Although the approach was introduced to deal with a specific situation it was subsequently retained as a standard element within the company's planning process.

Each year, in line with the board's decisions on overall expenditure, staffing levels and pricing policy, the head of information systems prepares a rolling budget and tries to accommodate the given priorities within a feasible plan. Within this plan the individual projects have to be justified entirely by the users.

If the user cannot get his requirements satisfied within the resources allocated within the plan, he has the option to ask the information systems department to bring in sub-contracted resources. However, the user then has to justify the full costs involved, and since this use of outside resources is regarded as involving the spending of 'real' money (as opposed to money the board has already allocated) the option is seldom exercised.

The whole process can be summarised as one in which the board decides both the size of the total resources cake and the way in which it is to be cut into slices between the main operating divisions of the business. The divisions themselves then decide the way in which their slices will be further divided between individual projects.

As already indicated, the procedure applies to development resources only. Hardware is excluded. Generally speaking, the policy of the company is to acquire further hardware only when this is dedicated to an individual system. That additional hardware therefore has to be fully justified by that system alone.

It is of interest that two years after the approach was introduced the direction of the pressure was reversed. That is to say, the insistence on cost cutting was abandoned, and the information systems department was instructed to expand its capacity to meet growing demands. But the control mechanism was retained.

Viewed from the outside, it is clear that, as far as this company is concerned, the approach works very well. It might have a drawback in that it could well squeeze out the small user. Overall, however, it does enable the company to determine what it will spend, and it does place the responsibility for allocating priorities where it truly belongs. The board is responsible for allocating total expenditure, and the users are responsible for allocating expenditure to individual projects. In practice, the approach has other advantages as well. It leads naturally to tighter cost control and it leads to better projects, because competition for resources means it is difficult for poor projects to gain authorisation.

Essentially, the approach represents a very efficient approach to computing, with the strength of the information systems department being deliberately kept slightly below the size justified by both the size of the business and the level of demand for the department's services. Consequently, the resources are kept fully stretched, and peaks in the work load are simply pushed back to fill subsequent troughs.

However, the company pays a penalty for this efficiency, because it is less able to respond quickly to new opportunities and changes in business requirements. Fortunately, the penalty is not of real significance for this company, but it could be a major drawback for any organisation that operates in a less stable and more entrepreneurial environment.

There seem to be four prerequisites for successfully adopting this line of approach. Firstly, it requires a stable environment. Secondly, it requires an information systems function that is self-evidently competent and well-managed. Thirdly, it requires a reasonable balance between the supply of resources and the demand for systems. And fourthly, it requires a board that is willing and ready to make decisions as required.

CASE HISTORY OF COMPANY H

This case history provides a very interesting example of the way in which one particular multi-company corporation examined the issues of investment and systems planning at a strategic level, which was a task it had never undertaken before.

The group is a very large organisation that is made up of autonomous individual companies operating in largely unrelated areas of business. The group can probably be best described as a 'managed conglomerate'.

Recently, and for the first time, the group decided to examine whether, in total, its systems would be able both to meet the group's requirements and to accommodate its business strategy over the coming decade. The group asked questions about the systems, such as whether they would be effective, whether they would help to contain costs, whether they would enable the group to stay competitive, and whether they would provide the required flexibility.

These questions were not prompted either by any perceived major failings of the current systems or by any sense of dissatisfaction with them. They arose merely because, for the first time in this group, systems planning was elevated to the same level as product planning, market planning, financial planning and organisational planning.

To tackle the issue, the group split the problem into the two separate parts of telecommunications and computing. It took a similar approach with both areas, and it set up two study groups whose members consisted mainly of senior executives drawn from within the operating companies.

The information systems function was represented by just one man, and he was a member of both groups. At the time he was appointed to them he was the management services manager with one of the companies, but he was relieved of all his responsibilities so that he could devote all his time to the two study groups.

The groups, which functioned quite independently, met regularly over a period of about six months. The groups not only collected views and information from within the organisation, they also sought the views of selected outsiders, such as management consultants and equipment manufacturers.

It is of interest that the telecommunications group found its main problem was a technical one, whereas the computing group found that its main problem was an organisational one. Both groups, however, eventually succeeded in arriving at firm recommendations.

Telecommunications strategy

Faced with solving a problem that affected a whole group of companies any investigating team would almost inevitably recommend a group solution to the problem. As might have been forecast, therefore, the telecommunications study group recommended that a group network should be created. The network would be based on electronic exchanges at four centres. The issue that caused the study group most concern was whether the exchanges should be digital or analogue, but it eventually recommended that the exchanges should be analogue. In making that recommendation the study group opted for availability and proven performance, rather than for potential longer-term advantages.

The study uncovered some interesting statistics. For example, the study revealed that 50 per cent of all the corporation's staff were office staff. It also revealed that, despite the diverse areas of business and the corporation's policy of local autonomy, over 50 per cent of all communications were internal to the group.

From the standpoint of this report, however, the most interesting point was not the facts that the study established, nor indeed the recommendation the study group made. Rather it was the way the study group perceived and presented the overall case for the group telecommunications network.

The study group decided that the main tangible savings would result from the reduced use of public lines and the reduced unauthorised use of telephones. The group used conservative estimates of the expected benefits but even so it seemed that the rate of return on the investment would be considerably more than was required to justify the investment.

The study group's reaction to this fact was clear and a little surprising. It decided to scale down the expected benefits below the original conservative estimates.

The study group's thinking was that the presentation of an overwhelming financial case would divert attention from what the study group believed actually to be the more significant gain, which was that the network would open the way for advanced communications throughout the group for the next decade.

The case, as the study group finally presented it, still safely met the organisation's standard capital expenditure criteria, even when it was based only on the benefits that would arise from using the network just for voice traffic. But the arguments for proceeding with the proposed project centred on wider implications. These were the importance of communications to the group in general, and the advantages of having facilities both for

increased data communications and for innovations like electronic mail over the coming decade.

The study group's carefully prepared presentation to the board went through these arguments thoroughly, and concluded with the near-throwaway line ". . . and by the way it gives a 21 per cent return on investment".

The board had no hesitation in accepting the recommendation.

Computing strategy

The problem of formulating a group computing strategy was quite different. As might be expected, much of the discussion centred on questions of autonomy and control. Up to that time there had been virtually no central function within the information systems function. Each company had its own computer and its own approach and, when purchasing new hardware, each company was required only to satisfy the group's capital sanction procedures.

There might have been an argument for making no change, had the study not revealed some interesting and disquieting facts on issues that are seldom analysed in large and diverse organisations. For example, the study revealed that:

— More than 80 per cent of all development effort was being spent on keeping existing systems running.

— Expenditure with external bureaux was expanding at the rate of 40 per cent per annum.

— Computer staff costs were increasing at about 27 per cent per annum (a rate well ahead of inflation).

— Hardware expenditure was growing at less than 15 per cent per annum.

These figures were regarded as so startling that the study group's initial reaction was to doubt them. However, the figures proved to be correct.

One of the study group's conclusions was that, as far as computers were concerned, the group had under-invested. Hardware was being exploited to its limits, whereas software costs were being largely ignored. Also, because the systems were restricted by the available equipment, they were being written or continuously rewritten to run on the machines available. Consequently, the additional constraints of the operating systems and software associated with those machines imposed an additional restriction on the systems.

Several of the study group's recommendations were concerned with creating a small central pool of expertise to support new systems and to authorise standards and plans. There were strong arguments for such innovations, and the board approved those recommendations without dissent.

However, the study group's recommendation regarding hardware was more radical. To overcome the existing constraining situation the study group recommended that the group should immediately raise the level of its investment. The study group argued its case in principle only, and made no attempt to present a financially-justified case.

The board's reaction to the recommendation was interesting. The board accepted the

recommendation, but rejected the proposed method of implementing it. The board decided, counter to the opinion of the study group, that the investment should be made and controlled centrally. The board felt that, if investment was left to the individual companies and to piecemeal justification by individual applications, the group would move neither fast enough nor widely enough. The board decided, therefore, that, in future, hardware would be provided at two data centres as a group facility. Companies would then be charged on the basis of their use of the hardware at those centres.

Many organisations have set up similar internal bureaux in recent years (though less so as minicomputers have gained ground), but this group's reason for doing so was certainly not the normal one.

Conclusion

Whether the actual strategies adopted for computing and telecommunications were and will be the right ones is not the issue we are concerned with here. The important point is that the questions of the overall level and direction of investment were tackled decisively and clearly on a group basis.

A wide and complex area, which previously had not been examined on this scale, was reduced to a set of commercial and policy issues on which the main board could — and did — make decisions.

The key points in this particular case were:

1. The initiative came from outside the information systems function and from the highest level.

2. The two studies were initiated not because a crisis had arisen, but because the group's board believed that the group's systems and communications facilities had become a matter for strategic planning.

3. The individuals selected to formulate and recommend the strategy were senior executives in the group.

4. The information systems function was represented at a senior level, by a man who had been relieved of his other duties for the purpose.

5. The case for each of the recommendations was argued on grounds similar to those applied to other areas of business strategy. They involved financial, commercial, organisational and policy issues.

6. The studies were launched with the intention that firm decisions and action would be taken on the recommendations of the two study groups.

CASE HISTORY OF COMPANY I

This case history is an interesting example of the way in which the level of investment in systems can be influenced without corporate-wide intervention in individual budgets, and also of the way in which the planning of information systems can be linked directly to corporate planning. The company is a fully international group that operates largely in a single, highly-competitive area of business.

The change in policy which introduced this approach came about not as a consequence

of any review of systems themselves, but as a result of a comprehensive and thorough examination of the structure and the total operation of the business. The several changes that were made included the adoption of a much more systematic approach to corporate planning, and this new approach had a direct impact on the information systems function.

The function was located as a single headquarters department in a single country. Until that time it had charged for its services. To all intents and purposes, however, its budget had been treated and determined largely in the manner of a central overhead. But with the change that was introduced in organisation structure and management style, the position regarding its budget changed dramatically. The budget became regarded as a consequence of the total corporate plan.

As the starting point for the first new budget the information systems function prepared a basic statement based on known and existing commitments. The remainder of the budget had to be taken as a direct consequence of the individual divisional plans that were compiled throughout the group. Every department was under severe pressure to improve results, either by cutting costs or by increasing revenue, and every department had hard and measurable targets. If any department considered that new systems would help it to improve its results it was free to discuss the requirement with the information systems function. If it agreed its requirement with the information systems function it was then permitted to add the agreed costs of meeting that requirement to the information systems function's budget, for subsequent charging back.

The outcome of this shift of emphasis was striking. At a time when, as with all other companies in the same area of business, the company's margins were being eroded, and there was tremendous pressure to restrain costs, the information systems function found itself being forced to increase its originally planned budget by considerably more than one million dollars.

It would be legitimate to question the commercial wisdom of this approach were it not for three factors. Firstly, the business clearly depends highly on its systems for both its efficiency and its competitive edge. Secondly, the commercial environment in the company is tough and tightly managed. Thirdly, and perhaps of most importance, accountability for results is a clear-cut responsibility.

If any section of the business reviews its forward plan for the next five years and considers that it can improve its forecast results by introducing new systems (and there is continual pressure to produce improved results), then it has the discretion to request those new systems. However, the budget then has to be adjusted by both the costs and the specific intended effects. Furthermore, this amendment to the previously-agreed plans is a one-off adjustment. The starting basis for the next year's planning cycle is the basis agreed at the beginning of the present year.

This type of approach is clearly at its most effective in a highly commercial environment such as exists with this company. Throughout the group, management's remuneration is linked directly to financial targets, and this makes the approach rather more realistic than it might otherwise be.

CASE HISTORY OF COMPANY J

It can be argued that if users are to be held more accountable for their own systems then they must be given proper information on costs. In practice this can be quite a difficult requirement to satisfy, particularly where a centralised function supplies services and systems to the rest of the organisation. It involves both policy and procedure.

Company J, a major insurance company and a very large user of systems, provides an interesting example. Many organisations have procedures for recharging costs, but, in terms of policy, company J goes further than most, and so its procedures are exceptionally comprehensive.

In effect, all of the costs of the company's central management services department are recovered by charges levied against the individual user departments. This recharging procedure has been in operation for some time, but a more comprehensive new system is currently being introduced. This will give more information, and it will relate the actual costs to the budgeted costs. It will therefore integrate directly with the project management system.

In due time, the system is intended to develop into a sophisticated planning and control aid that will give the following:

— 'What if' analyses (evaluating the effects of changed plans or priorities).

— Facilities for resource allocation and planning.

— Revised forecasts for budgets and resources.

The proposed development will take some time to implement but, in constructing the proposed system (which is of the company's own design rather than a proprietary product), a database approach has been used to give flexibility in reporting, and also to give scope for adding future data.

The procedures for identifying and recharging costs are as described below.

At the start of each calendar year, a budget is prepared for each project, and this is broken up both into weeks and into several items of data (as opposed to money). It is entered into the system at both project level and constituent activity level. The elements are:

— Manpower (by each of six grades).

— Data entry (by keystrokes).

— Central processing unit (CPU) use (by minutes).

— Tape mounts (in terms of numbers).

— Terminal connect time (by minutes).

— Disk space (in byte-days).

— Tape volumes (in character volume-days).

— Print lines (in terms of numbers).

The appropriate financial rates for each element are worked out, not by the management services department, but by the management accounts department. The rates remain fixed over the year. In constructing the rates, the intention is to recover all of the management services department's costs. Overheads (comprising floor space, office facilities, management costs, secretarial staff, research and development, and so on) all have to be recovered.

The rates are worked out as follows. Manpower is charged according to the grade of staff and there are six grades altogether. The standard cost per grade is the total estimated cost per productive employee-week. This total includes the normal direct costs (comprising basic salary, local allowance, bonus, pension contribution and national insurance), plus indirect costs such as floor space, departmental administration (including research and training) and a proportion of 'non-rechargeable' management time. It also incorporates a productivity weighting according to grade, which takes into account the estimated annual productivity bonus.

The productive employee-week takes into account estimated holidays, sickness, training and lost time.

The standard data entry cost is the total estimated cost per given volume of key strokes. This cost includes both direct costs and indirect costs. Direct costs include all the manpower costs of keyboard operators and supervisors, and all equipment costs.

Indirect costs cover the costs of floor space, departmental administration and a proportion of 'non-charged' data processing management. Costs are slightly reduced by the income received from a small amount of work that is done for outside bodies. Estimated key strokes for all current systems are based on last year's actual returns.

Computer operations costs are charged via charges for direct manpower, CPU time, tape mounts, tape volumes and disk space. Both the operations support group and the production control staff are charged directly against projects at their appropriate grade. All other manpower costs are apportioned over the remaining cost categories, except for the costs of decollating and bursting, which are included in the 'print lines' rate. Depreciation of equipment and maintenance are applied directly against each cost category. Software costs are allocated to 'CPU units'. Floor space cost is allocated proportionally to the space occupied by the particular equipment.

The standard rates worked out are also used by the systems analysts in preparing cost estimates for proposed new projects.

The procedure for monitoring actual performance and for recharging is as follows. Each week, the resources used against each project are fully recorded. Manpower details are entered manually, and data entry costs are collected automatically from the computer usage system. All costs are allocated against specific project/activity/task codes, the standard rates being applied throughout.

Although the system will supply reports at any time on demand, it produces standard reports monthly for data processing management, and quarterly for user management. The quarterly reports coincide with the automatic charging of users via the management accounts system.

Once the system is fully operational it will be possible to state precisely — and indeed it will be impossible to conceal — what any particular system is costing to develop, maintain and operate. It will also be possible to see how this cost compares with the cost that was agreed in the budget.

It requires a great deal of self-confidence for a management services department to open its books for all to see. Moreover, once a management services department discloses comprehensive information in this way it creates a precedent that it will probably not be possible to abandon subsequently.

In presenting this case history we must stress that the company concerned is both a

long-term and a large-scale systems user, operating in a relatively stable environment. It has been charging out its systems costs for some time, and it is clear on what it now believes to be appropriate to its requirements. If other organisations attempted a similar approach in a single step, many of them would find that approach too complex to operate and too difficult to control.

CASE HISTORY OF COMPANY K

Company K, in the banking industry, is an interesting example of an organisation that puts the onus for justifying new systems entirely on the user.

The responsibility for authorising projects therefore rests primarily with the user. However, the project management procedures have built-in safeguards. At the outset of a project all that can be authorised is a survey. The survey is then carried out by the information systems function, and the survey always includes (as a standard matter) an evaluation of several options for meeting the user's requirements. At the end of this survey (and assuming that the user decides that one of these options is worth pursuing), the next stage of preparing a 'business specification' is launched.

The business specification represents the key decision point. It is at this point that the information systems function gives a firm price for undertaking the project. Up to that time about 30 per cent of the total elapsed time of the proposed project will probably have passed, but, interestingly enough, usually no more than 5 per cent of the total costs will have been incurred.

The business specification describes precisely what the system will do. It also sets out the costs of developing, introducing, running and supporting the system. At the same time, the information systems function prepares a plan showing the way in which the project can be carried out, and also the way in which the system will be introduced.

But neither document makes any mention of benefits. These are regarded as being entirely the user's concern, and he must identify, quantify, and evaluate them. As the information systems function puts it: "We have absolutely no way of achieving benefits, therefore our staff are forbidden to claim them".

In practice, of course, the information systems function does give advice on what might reasonably be expected, but it makes no formal statement of any kind on this.

It is therefore left entirely to the user, knowing the cost and knowing what the system can do, to decide what effects his proposed project will have on the business. He, then, has to decide whether these justify the investment.

As far as the benefits are concerned, the company relies simply on the judgement of its managers. The company justifies this policy by stating that the best investment that it has ever made was in a system where the benefits were impossible to define in advance. As their representative put it to us: "We simply could not have measured them at the outset; the system tackled an entirely new area. We can measure them now, and they are enormous".

The approach appears to us to work very well in this particular company, but to be successful we believe the approach requires two things. The first is an ability to estimate costs with confidence, and the second is an environment in which users are keen, and also are prepared to apply pressure for new systems. If the pressure for new systems always had to come from the users we can envisage certain organisations in which systems development would dry up completely.

The Butler Cox Foundation

Butler Cox & Partners Limited
Morley House, 26-30 Holborn Viaduct, London EC1A 2BP
Tel 01-583 9381, Telex 8813717 GARFLD

Butler Cox & Partners Limited
216 Cooper Center, Pennsauken, New Jersey 08109, USA
Tel (609) 665 3210

Italy
Sisdoconsult
20123 Milano – Via Caradosso 7 – Italy
Tel 86.53.55/87.62.27

France
Akzo Systems France
Tour Akzo, 164 Rue Ambroise Croizat,
93204 St Denis-Cedex 1, France
Tel (1) 820.61.64

The Nordic Region
Statskonsult
PO Box 4040, S-171 04 Solna, Sweden
Tel 08-730 03 00, Telex 127 54 SINTAB-S