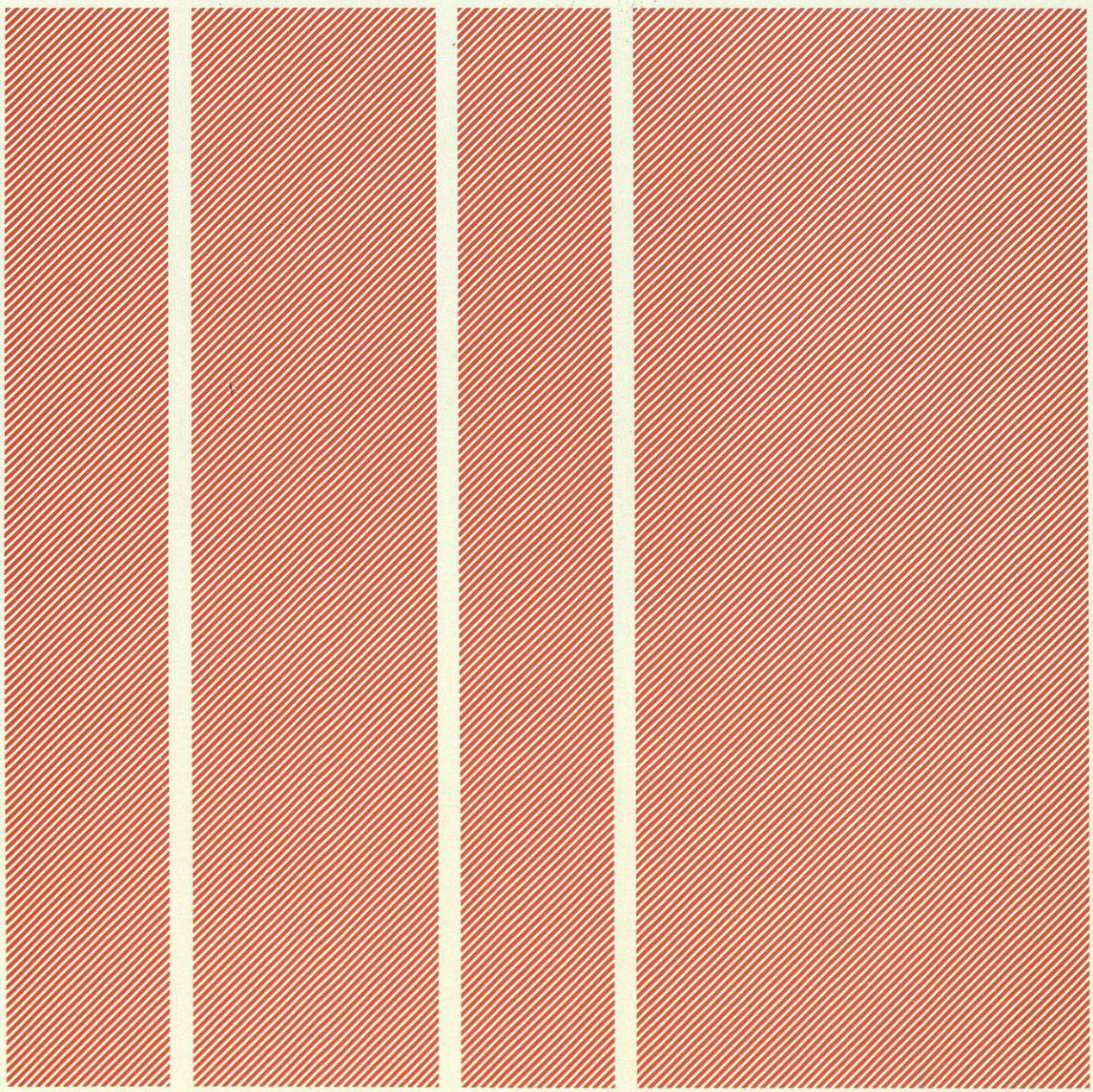
Escaping from Yesterday's Systems

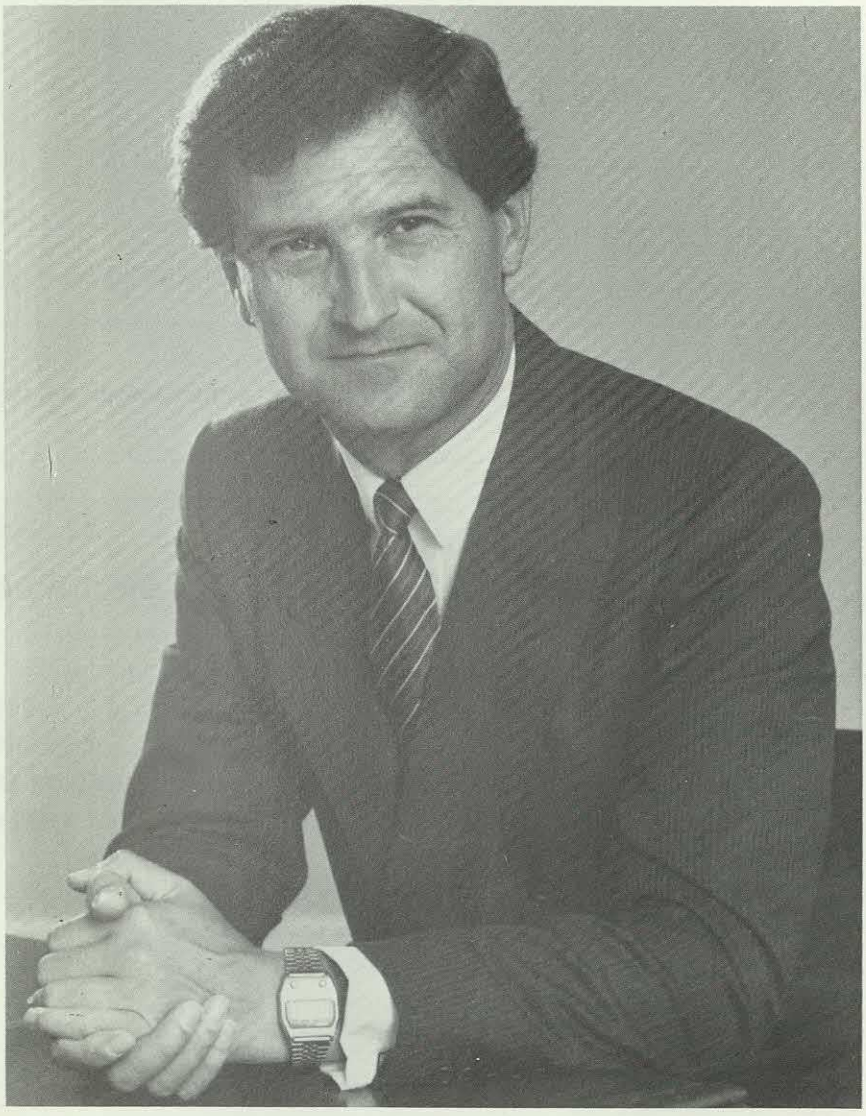
A Paper by George Cox



The Butler Cox Foundation

ESCAPING FROM YESTERDAY'S SYSTEMS

GEORGE COX



George Cox is the Managing Director of the Butler Cox Group.

In October 1984 he was asked to address a conference of the members of the Butler Cox Foundation on the topic of "Escaping from Yesterday's Systems". His presentation reviewed the trends in information technology and what he believed were the — not always recognised — implications.

The talk was aimed at heads of information systems departments in major organisations, but many of the messages are equally valid for senior general managers.

In preparing for the presentation George Cox sought the personal view of about 20 senior managers, each of whom is concerned with managing information systems in a large organisation. Many of their responses were quoted verbatim and are identified clearly in the text by the italic typeface.

His presentation is produced in full in the following pages.

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ESCAPING FROM YESTERDAY'S SYSTEMS

CONTENTS

ESCAPING FROM YESTERDAY'S SYSTEMS

During the past 25 years, virtually every large organisation has built up extensive computer-based information systems. The pace of development, propelled by staggering technological advances, has never slowed and it has brought continuous enhancements in computing capability. Despite this, most corporate systems currently in use are based on yesterday's ideas and yesterday's technology. The extensive base of installed systems, with its attendant equipment, software, procedures and design philosophy creates a massive barrier to exploiting tomorrow's — and even much of today's — technology.

Whether they fully recognise it or not, many organisations face a major problem in escaping from yesterday's systems.

To appreciate fully the current situation and the potential future that faces large organisations, it is necessary to understand the process of change as it affects corporate information systems. Moreover, there is little point in drawing a map of the future unless the past and the present can be seen in their true perspectives.

My talk therefore examines the following issues:

—The pace of change.

—The process of change.

—The big changes during the past seven years.

—Today's position.

—What the future holds in store.

THE PACE OF CHANGE

Information systems managers have grown used to living with constant change in their information systems, and there is a temptation to think that the subject of change is now well understood. After all, most of those concerned with developing or managing information systems have spent the majority, perhaps all, of their working lives in this environment.

As a consequence, change is taken for granted; it is perceived as a way of life. Regular advances in technological capability and ever-improving price performance are accepted as the norm. Information systems managers have grown accustomed to instability and uncertainty, and expect tomorrow to be different from today.

The danger comes from failing to realise that change on this scale does not apply to other areas of business life in industry, commerce or government. It applies to no other function of the business. Even in other high technology areas, nothing changes with either such pace or so relentlessly.

Let me give you an example. Aerospace is thought of as an industry driven by successive and dramatic advances in technological capability. At the start of this century man had never experienced heavier-than-air flight; by the quarter century he had flown the Atlantic; by the half century he had travelled faster than sound; by the three-quarter century he had been to the moon. By any measures, these are very impressive achievements. Yet today, one of the most immediately recognisable airplanes is the Boeing 707, which first flew a quarter of a century ago. The 707 is not by any means the last word in air transport, but it is still a very common airplane.

Today very few people would recognise a picture of an IBM 1401. The 1401 holds a special place in the history of computing. I think it is fair to say that it was the machine that heralded the widespread commercial use of computers in the sense that we currently know them. Amongst other things it had the interesting innovation that you could not actually walk round inside it!

The difference of course is that, today, you still see 707s everywhere, whereas the 1401 is a museum piece, along with the generation of computers that succeeded it (and many of the next generation as well). What is more, they are speedily being joined by the next.

Whereas the 707 can still fly you across the Atlantic at much the same speed as today's 747s, albeit not quite so efficiently, the equivalent power and storage of a 1401 can today be provided by a single chip, as can the much more powerful 360 which replaced it.

So why am I comparing a fairly modern airplane with a very ancient computer? Quite simply, because the 707 was in regular passenger service the year *before* the first 1401 was delivered to a commercial customer. The technological 'life' of an aircraft is much longer than that of a computer.

The example just quoted is not isolated. Today, an intruder over the skies of Britain might well be intercepted by a Phantom, flying at twice the speed of sound. Last year the Phantom celebrated 25 years of flight.

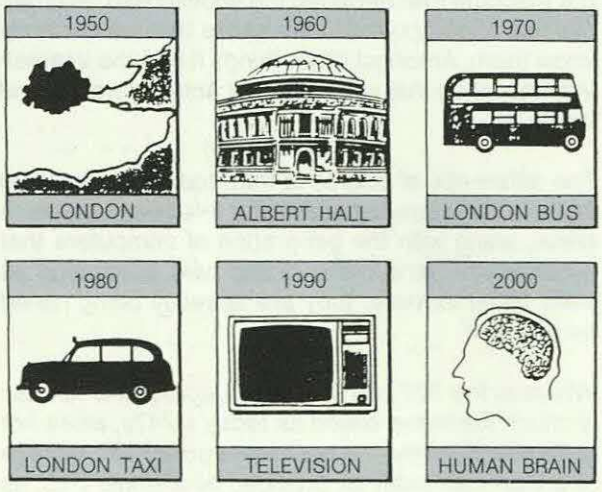
I cite these examples not to belittle in any way the advances of the aerospace industry, but rather to illustrate that technical change, as it affects the daily lives of information systems managers, has moved at a pace that is without parallel in any other aspect of business life. The mind-boggling advances in computer technology make it difficult both to see the changes in perspective and to evaluate their future effects.

Everyone has grown accustomed to the staggering pace of change in computer technology. Just ten years ago the 2k memory chip was news, but within the next year or so 1,000k chips will be available. Nobody here will be surprised to hear that.

My current favourite, global, example of computing progress was that given recently in the Sunday Times, and reproduced here as Figure 1. It illustrates the size of computer that would equate to the power of the human brain, using the technology available at particular points in time (past and present).

The progress depicted by the figure is stunning. In not much more than half a generation, mankind will have advanced in technological capability from an impossibly complex device that would have been the size of a major city to an equivalent practical device whose size is measured in inches. The implications of this progress are all the more dramatic when Clive Sinclair's projection of the associated cost is considered as well. Those of us expecting to be working at the turn of the century can take comfort from the fact that, although the artificial brain may be no more than human-sized, it will cost around $10,000,000. That should make you and I still pretty good value to our employers.

Figure 1 Size of a computer with the same power as a human brain



But (says Clive Sinclair), by 2020 its cost will have reduced to $10,000. Moreover, because it will transmit internal messages electronically rather than physically, it will operate about six million times faster than the human brain. That is a very interesting scenario to speculate about. Quite frankly, I do not know what that implies, and fortunately it is beyond the scope of my presentation.

The point I want to emphasise is that there have been tremendous advances in our information systems over the past 25 years, but all the capability made available still has not been exploited. Moreover, the capability is increasing year by year; there is far more technical innovation and vast new capability yet to come.

These developments will open up tremendous new opportunities, but careful thought, and organisation, is needed to exploit it.

I believe that, unless there is a fundamental upheaval in our society or economic structure, technical change will continue, virtually unending, for the foreseeable future. Looking forward, I can see no respite from the pace of change. Indeed, the vested interests of major companies and whole new industries guarantees there can be no respite.

Any substantial manufacturing industry can only be sustained by continuous, and hopefully growing, demand for its products. The demand can be created by a combination of three things: limited product life, fashion and technical innovation. The automobile industry, for example, depends almost exclusively on the first two — rust and the special social status of a new motor car.

But the information systems industry is different. Computers do not rust, and we are not too concerned about their physical appearance. An organisation like IBM therefore must keep innovating simply to protect its revenue. The computer suppliers are on a giant treadmill, which requires a lot of effort to keep it turning because each round of innovation improves the price/performance ratio of the product. The net result is that a supplier needs to ship substantially more

Figure 2 Cost of memory

Working memory Valve, transistor or chip		*Back-up memory* Tape or disc
£1m.	1950	—
£30,000	1960	£5,000
£5,000	1970	£1,000
£1,000	1975	£100
£100	1980	£6
£30	1983	£1
£3	1985	30p
50p	1990	5p

(Cost per 350-word page of information)

units of basic computer power just to maintain its revenue.

There has never been any other product whose basic price has reduced so much in such a short period of time. Look, for example, at what has happened and is forecast to happen to computer memory costs (see Figure 2).

Technical innovation, at a sustained high pace, is therefore an assured part of the future of information systems. However, the results of the changes do not flow directly, continuously or smoothly into corporate information systems. There is a time lag; systems move forward in uneven surges; occasionally they go up blind alleys.

With the benefit of hindsight it is tempting to rationalise the historical development of corporate systems, seeing it as evolutionary, a series of natural, progressive steps. But that is not the way it is in practice.

THE PROCESS OF CHANGE

To determine how best to face up to the future, its opportunities and problems, it is necessary first to look more closely at the process by which changes in corporate systems are brought about. There are many forces that promote or oppose these changes and they can be depicted as shown in my next slide.

Clearly, fundamental advances in technology, offering startling new capability and changing economics, are a major force moving systems forward.

But the real driving force that turns the technology into practical products and persuades us to invest in its use comes from the suppliers — primarily computer companies, but also office equipment companies, telecommunications suppliers and software houses. As mentioned above, these companies have to keep innovating and have to keep extending their markets. In this context, it is significant that much of the focus of their sales drive in recent years has turned from the specialist manager within the information systems department, to the general manager within the business.

The third force for change is, or certainly should be, the information systems department itself. It should be providing the link between understanding the business and understanding the technology, and looking for ways to exploit new developments.

A growing new force comes from the users of information systems, generated both by a greater experience of using systems and by supplier and media pressure. Increased user demand is closely coupled with another force — competitive pressure. Businesses are increasingly turning to new systems both to improve efficiency and to counter competitive moves or stay ahead of competitors.

Note that none of these forces is diminishing. Supplier pressure is, if anything, increasing. User demand and competitive pressures are certainly increasing. To my mind, the only driving force shown in Figure 3 that is in danger of diminishing is that of the information systems department.

With such a powerful array of driving forces, new systems would race forward, going off in all sorts of directions, were it not for the restraining forces on the right-hand side of the diagram. Some of these forces provide a well understood inertia; the significance of others has yet to be fully recognised.

Meeting the cost of change has always been a constraint, but today this is often compounded by a desire

Figure 3 The forces driving and opposing change

to exploit further, and not write off investment in, yesterday's systems. The rate at which an organisation can absorb change has always been a constraining factor, even if this has not always been fully recognised. However, this constraint has become more severe as more and more systems extend out into the detailed activities of the organisation. The pace of change is also partly determined by the rate at which society in general is prepared to absorb change, particularly as systems begin to reach out into the marketplace and to the general public. Home shopping, credit cards, point-of-sale systems and cash dispensers are all examples where the pace of change is dictated partly by public habits and attitudes.

However, today there are also some new forces that, for good reasons or bad, hold back the rate of change in corporate systems. One is fear and uncertainty about the future. This leads to an unwillingness to commit to new concepts, new equipment, specific suppliers or specific standards. These fears are not groundless. The consequences are long-term, because the wrong choice of strategic direction is not easily rectified.

Fear and uncertainty causes decisions to be delayed (or even masks the need to make a decision). It also encourages organisations to 'play safe', by staying with the current or largest suppliers.

The next opposing force shown in the diagram is lack of sufficient skills and resources. This has always been a constraint and remains so, although I will demonstrate later that the situation is changing slightly.

The next force is new, or at least an awareness of its importance is new. It is the reactionary attitudes that now exist within some information systems departments — attitudes that are entrenched in yesterday's design concepts and systems, cocooned in yesterday's skills, protecting yesterday's position. Information systems departments used to be thought of as the visionaries, the disciples of new ideas, struggling to overcome the reactionary management and user attitude of "we have always done it this way". But that is not the way it is today.

Whenever change affects people personally by threatening their current position, their role or the value of their existing skills and experience, they react against it. That applies to computer people as much as anyone else.

The last, and perhaps strongest, opposing force shown in the diagram is that associated with the inertia created by today's installed systems base. The latest technology offerings may be well understood, but that, usually, is not what current systems are based on. Before systems can move forward, the current situation has to be taken into account. Moreover, it is not simply a matter of replacing yesterday's equipment with more efficient and more powerful facilities. Often the concepts are different. The use made of telecommunications might well be different. The data structures might be different. How the business operates and how it is organised might be different.

You might see quite clearly what you would now like to do, but as the old story about the village yokel asked for directions says "if I was going there, I would not start from here".

THE BIG CHANGES DURING THE PAST SEVEN YEARS

To understand today's position better, it is helpful to stand back and look at the changes of the past few years. I have chosen seven years because that is the period over which the Butler Cox Foundation has been monitoring trends and their implications.

If I could transport myself back in time, with the benefit of hindsight, what sketch of the future would I wish to have drawn?

There is a danger that with so much change taking place, and so many important developments to look forward to, any individual will see the position from a different — and highly personalised — standpoint. To prepare a balanced presentation I therefore decided to solicit the views of some personal contacts, each of whom is concerned with managing information systems in a large organisation. To collect their views I carried out a survey. It was narrowly targeted, and the results may not be statistically significant. But I believe it is better to ascertain the opinions of a selected few individuals, each of whom is highly experienced and has thought about the topics involved, than it is to analyse a large number of replies from uncertain sources.

I involved about 20 people in my survey. All of them were senior managers in large organisations. The information I received back was very informative, and sometimes surprising. I think their responses balanced, rather than fundamentally changed, my own views.

One of the questions I asked was "What do you regard as the most important changes over the past seven years?" A selection of the replies is given in my next slide. One or two of the responses surprised me, and I would disagree with a few of them. However, I feel that the responses illustrate the enormous breadth of change that has taken place. And the list is by no means exhaustive; I suspect a wider-

circulated questionnaire would have led to even more suggestions.

I particularly liked this reply:

> *"The big change is the change of status of the management services department. Three years ago we were irrelevant; now we are seen as being important; in three years' time we'll be recognised as crucial".*

Let me now give my own view. I believe that overall the most important developments have been the following:

—The micro.

—The expanded scope of 'systems'.

—Advances in telecommunications and the telecommunications environment.

—User pull replacing dp push.

—The extension of computing into everyday life and everyone's awareness.

—Recognition of the systems development problem: the demise of the hand-crafted system.

—Adjustment to a permanently tough economic environment.

—The changing goals: from efficiency to effectiveness to competitive edge.

I would have been quite happy if I could have shown that list seven years ago.

Some of the changes are, in retrospect, very clear and obviously significant (the micro, changes in telecommunications and the extension of computing into everyday life, for example). Others, although important, are perhaps less obvious (or more subtle), because they have crept up unannounced over the years.

During this period the scope of systems, and the application of advanced technology, has spread out from the traditional areas of data processing. The focus used to be entirely on information that consisted of codes and quantities and that could be tabulated either on paper or on a screen. Today, information systems are perceived in a wider context, encompassing voice, data, text, graphics and video. In other words technology now has the potential to handle all forms of information. What is lacking still is the wide recognition of this fact, and the skills to exploit it.

I have spoken already of user pull replacing dp push. It's a major and permanent shift. It cannot be reversed. It therefore needs to be recognised, harnessed and directed.

Figure 4 The most important changes in the past seven years

(All of the following are direct quotations from the responses received to the questionnaire)

"Viewdata."
"End-user computing."
"The changed balance of cost between people and equipment."
"Information centres."
"The end of data preparation as a specialised function."
"Direct application of IT to the sales force."
"Corporate reorganisation of the information systems function."
"Office technology, in particular computerised text handling."
"The ending of IBM's monopoly in network architecture and devices."
"LANs."
"The myth of LANs."
"Personal computing".
"The Japanese invasion."
"The impact of online information systems."
"The concept of information management."
"The digital PABX."
"Advances in data communications."
"The de-mystification of computing for the users."
"The growth in demand for systems."
"Systems development tools."
"The oil crisis and world economic depression."
"Computing moving into everyday life."
"Practical experience of integrating widespread IT systems."
"Networking."
"Databases."
"The increasing status of the computing department."
"The increasing dominance of IBM."
"Liberalisation of systems down to the end user."
"IT practitioners switching to becoming facilitators rather than providers."
"The irrevocable move away from 'force-fit' centralisation."
"Increased business complexity."
"The introduction of decision-support systems."
"The growth in involvement and commitment of senior management."
"The privatisation of British Telecom."
"The amazing ubiquitous chip."
"Delivering what had been promised for the previous 14 years."

Another change that has been slowly taking place over recent years is the demise of the hand-crafted system. The traditional way of developing information systems has been for a team of analysts to specify the users' requirements (assuming quite erroneously that it is always possible to specify requirements in advance); the analysts then document the requirements as a systems specification; this is then translated into a systems design; in turn, this is converted

into program specifications, and eventually a one-off system is written to fit the needs, tested, modified, implemented and modified again.

I believe that this hand-crafted approach is totally inappropriate for the future. It is too expensive, there are inappropriate resources and users will not tolerate the elapsed times required to develop systems in this way. In future, very, very few applications will be able to justify this traditional development approach.

The economic environment in which systems are developed has also changed. I believe that today's much tougher environment is more than just the trough of an economic cycle, certainly when seen from the viewpoint of most European countries. From now on, all enterprises will have to be managed more tightly, more adroitly. As a consequence, I think a better breed of manager is emerging: more aware, more numerate, more decisive. This makes a big difference to the way information systems are perceived by the organisation. It makes a difference to the relationship between users and the information systems department.

The final change listed above is also related to the business environment. Originally, most computer systems were aimed at improving efficiency because they helped to carry out the administration of the business faster and cheaper. More recently they have become concerned with improving effectiveness by providing better controls, new ways of doing things and better decision support. We are now beginning to see systems deployed for a yet more important advantage — that of providing a competitive edge for the business.

This last point is extremely significant. There is a growing list of examples of organisations exploiting their systems in this manner. They include banks, insurance companies, retail groups, airlines and others. There are striking examples of where systems have been used either to change the company's services or to lock-in customers.

The implication of all these developments is that systems need to be viewed in a different way. A new perspective is required. Throughout the early years of computer use, computers were perceived as: "a tool, like any other tool". This was reassuring — but in retrospect, rubbish. The computer is not like any other tool at all. Even so-called 'general-purpose' tools, like spanners, have quite specific and limited functions. The computer provides a different kind of capability altogether.

This is an important point to remember when considering the issue of using systems for competitive edge. All competitors have access to similar equipment. Competitive edge comes not from acquiring computer equipment, but from using it in an imaginative way, coupled with the ability to apply change quickly.

I wish more senior managers understood this.

Surprises

In my survey, I also asked what had been the most surprising development during the past seven years.

Top of the list by a long way was the micro. I would agree, but why should the micro have been a surprise when all the technological trends pointed unfailingly to its birth and capability? The fact is we are all blinkered by our past concepts and experiences. The micro did not represent 'computing' as we understood it. Everyone accepted that a considerable amount of power could be put into a very small box at very low cost, but everyone failed to recognise what this would mean.

Many organisations, or rather their information systems departments, regarded the early micros as irrelevant. They were perceived as a distraction from serious systems. The accepted wisdom was that they were all right for games or, perhaps, for a little extended local calculation, but they did not have a significant role to play in overall corporate systems.

This underlines the point I have already made. When looking to the future, it is not difficult to predict the technology. What is difficult is predicting the way in which the technology will be used and what this implies. And that means assessing the likely behaviour of people.

Even when directly confronted with the technology we often misunderstand its real significance. And by "we" I do not just mean user organisations — I also mean the whole of the computer industry, including consultants.

There are many amusing examples. My favourite is the following:

> "My department is in possession of full knowledge of details of the invention, and the possible use of the telephone is very limited".

That was said in 1877 by Mr Culley, Engineer-in-Chief of the British Post Office!

Disappointments

I also asked what had been the major disappointment. Not surprisingly, in a personal questionnaire many of the answers concerned particular corporate or individual circumstances. But there were three broad

categories of disappointment that were more widely applicable. Two did not surprise me, one did.

The first category was related to the technology itself. Examples included:

"First-generation word processors".

"The slow development of voice-driven devices".

"Lack of improvement in systems development productivity".

"The applicability of fourth-generation languages".

The second category concerned widespread disappointment with the lack of common standards. For example:

"The slow pace at which OSI standards are developing".

"The lack of international standards for transferring text".

"Machine-independent language portability".

The general feeling about this second category was well-expressed by one respondent:

"The major disappointment for me has been the lost opportunities arising from the lack of standards within the industry".

It is really very sad that a modern, 20th century industry concerned exclusively with collecting, handling and disseminating information should view standards as primarily a means of erecting protective barriers around products and around perceived national interests.

The third area of disappointment took me by surprise. It is not that I disagree with it, I was simply surprised that so many heads of corporate systems felt the same way. It concerns the failure of the information systems department to adapt quickly enough to the challenges of the past few years. Let me give you three examples, all direct quotes from my survey respondents:

"Central dp's failure to recognise the User Empire striking back".

"The survival of so many bad dp departments clinging to discredited beliefs".

"The innate and careless conservatism of middle ranking dp practitioners".

I think this concern corresponds with my earlier point concerning the forces opposing change.

It is significant that these are not disaffected user managers speaking, they are corporate systems directors controlling very large — and by most standards highly successful — departments.

Changes within the systems department

The fact that the information systems department has itself had to cope with considerable change was borne out by responses to other questions in the survey. More than 90 per cent of the departments had seen their role change, and the changes had taken three forms:

— Adding new areas of responsibility, such as telecommunications and office systems.

— Adapting to reflect changes in the organisation's structure and management philosophy.

— Changing to reflect the move from being the facilitator of systems rather than the provider.

Two-thirds of the respondents had changed the department's name in recent years. The remainder appeared to wish they had!

As you would expect, the changing role had often resulted in a change in the department's structure. More than 90 per cent had been reorganised. Surprisingly, but perhaps realistically, the same percentage felt that further organisational changes were necessary in the future. Such changes are probably inevitable as the systems department's role continues to evolve. What should be sought therefore is not stability, but planned, and hopefully smooth, change.

TODAY'S POSITION

Let me now move on to consider where the changes of the past few years have placed us today. Clearly the role of the systems function is still evolving. Clearly users are also becoming increasingly aware of what systems can do for them. Also, we are still in the midst of considerable technical advances. But has full advantage yet been taken of the technology that is already available? I asked in my survey if systems would be different if they could be started again from scratch. As you would imagine, given the inertia of the installed base, the answer was no (see Figure 5 overleaf).

I also asked if, starting today, the same suppliers would be selected, given today's knowledge and requirements. The answers (shown in Figure 6) varied according to the category of equipment.

Software

My questionnaire missed out by not embracing an important related issue — software. This was pointed out in response to my final catch-all question which

Figure 5 Would your systems be different if you started today from scratch?

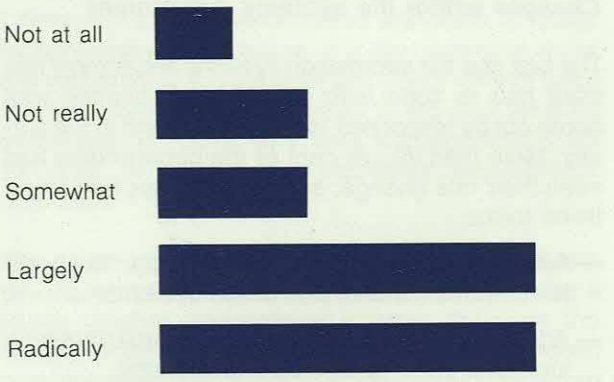
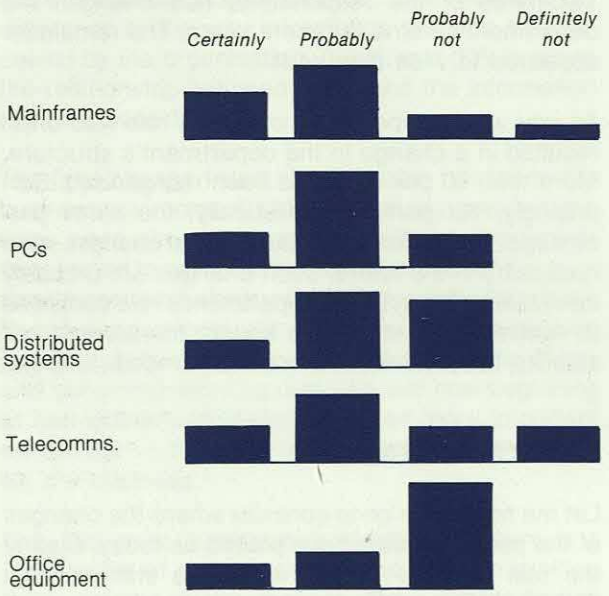


Figure 6 Would you retain your existing suppliers?



asked "In looking back at past developments, at today's position and at tomorrow's prospects, what is the most important question I have failed to ask and what would your answer have been?" This gave opportunity for considerable wit, but also to one or two omissions being corrected. For example:

> *"We .... have only recently come to the conclusion that our database choice (made in 1978) entails more than just that. It may have been appropriate then, but it is not now. It limits our choice of data dictionary and system development tools and also of communications software between mainframe and micro, and perhaps even the choice of micro. We feel we are more tied to the particular database supplier than to our main equipment supplier (IBM) — at least there are plug-compatible equipment suppliers!"*

The applications backlog

When considering the present situation, one particular area that I felt merited special attention was the applications backlog. We all read and hear a great deal about this nowadays. The logical argument suggests this area should be a major concern. Everyone has an ever-growing demand for new systems; there is also an ever-growing demand for systems maintenance as the installed base expands; the resources are limited and finite; therefore everyone should be facing an ever-increasing backlog.

So, was this therefore the major — indeed overwhelming — preoccupation for the heads of information systems departments? According to my survey, surprisingly it was not. Only 20 per cent felt it to be a major cause for concern. 56 per cent believed that the backlog had remained static over the past few years. A small number believed it had actually fallen. Nearly 70 per cent felt it was currently stable.

I have several suggestions as to why this should be so, though perhaps at this stage no grounds for a really firm answer.

Maybe information systems departments have learned to live with a permanent overload. It has become the norm. Perhaps it is due to what Bob Alloway calls the "hidden backlog". Users know that existing systems requirements will take two years or more to be met, so they do not ask for more, particularly where the new requirements relate to management support systems rather than essential operating systems. There is thus a concealed backlog of systems the business could use, but which never reach the 'to do' list.

Or perhaps it is a case of the problem changing. Let me quote a response:

> *"The backlog is increasing in real terms, but changing in emphasis and content. It is now being incurred to help data management and to facilitate user manipulation".*

Or perhaps there is now better control of the workload, as illustrated by this response:

> *"Significant reduction in maintenance has been obtained by giving users a 'maintenance quota' for the year, similar to a capital budget. They have to manage this budget and set priorities. Once used up, senior line management has to authorise any further expenditure. This has proved to be a deterrent against unreasonable requests and marginal improvements".*

Another respondent made a similar point:

> *"The backlog is not a cause for concern because we have a straight commercial relationship with*

the users. The key constraint is how much money companies in the group are prepared to invest in any one year in new applications. This has been the case for some time and the companies know that they have to cut back their aspirations to the amount of money they have available to invest. In this way information systems are no different from any other set of new facilities that companies may want to acquire. Every company can come up with 'wish lists' to revolutionise every type of facility. Until the same pressures are put on information systems in companies the mythical 'applications backlog' will continue to exist".

I think these responses explain partly why systems development departments are not totally swamped by the applications backlog.

There could be another dimension to this problem, however, which is largely unrecognised. I have already shown that if organisations could start again today from scratch, most of today's systems would not be retained. In practice, these systems are seldom replaced wholesale, but rather they are added to, modified, and extended. They become bigger, more extensive, evermore costly to maintain. But they work. And they represent a massive investment.

Maybe the real backlog is the need to replace these systems.

So, in summary, today there is a growing demand for systems. There is an increasing understanding of their potential impact on the business and its management. There is an unending flow of new technology and new products, much of which has yet to be fully assimilated and exploited. Today's systems work but, in the main, they do not exploit the current knowledge or available technology.

So, what happens now?

WHAT THE FUTURE HOLDS IN STORE

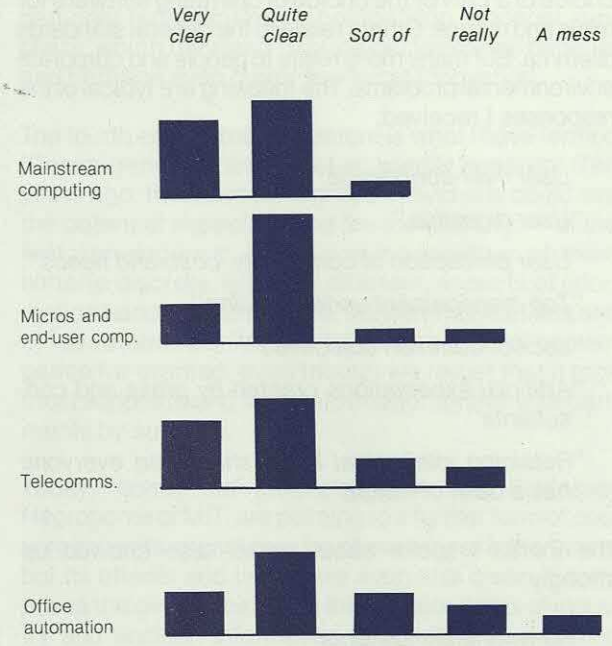
What are the policies and skills required to exploit the future opportunities? What are the problems that will have to be faced?

Policies

The question of policies is an important one. Given the changing technology, the changing nature of systems and the changing role of information systems departments, an organisation needs to set a clear framework within which systems can be developed, operated and exploited. I asked in my survey whether such policies existed for the different categories of system. The responses are summarised in my next slide.

I always allow for some distortion in answers to this type of question. I suspect the true situation is a little further to the right.

Figure 7 Policy?



Overall, the answers did not surprise me. I would be surprised if today anyone did not have a firm policy on mainframe computer systems, even if the policy needs to be adapted from time to time. The position with office systems is less clear, however. Generally, people feel they need a policy but find it difficult to determine what it should be and how it should be effected. Judging by experience in the United States, as surveyed recently in considerable depth by our American company, the Omni Group, there is a steady move by large organisations towards clear and firm corporate policies or strategies for office automation.

However, I was somewhat surprised by the response on telecommunications policy. I would really have expected by now that there would be more firm corporate policies in this area.

Skills

Far more organisations in my survey felt well-equipped to face the future than might have been expected. About half felt confident that they either had or could acquire the skills needed.

The others (who might either have been less well-equipped or more realistic about the potential demands) cited telecommunications as the main area of technical deficiency. Nevertheless, the overall problem was seen more as a case of quality and of upgrading skills, particularly managerial and commercial skills in the systems area. This concurs with my own view.

The immediate problems

My survey revealed a number of concerns about the

immediate problems. As might be expected, some relate to immediate technical decisions, such as the choice of a LAN or the choice of operating software for minis and micros. Others relate to the general standards dilemma. But many more relate to people and corporate environmental problems. The following are typical of the responses I received:

"User over-confidence".

"User digestion".

"User perception of complexity, cost, and needs".

"Top management understanding".

"Lack of common objectives".

"Artificial expectations created by press and consultants".

"Retaining intellectual leadership when everyone has a dash of insight".

The inertia I spoke about earlier also showed up strongly:

"Re-writing old systems".

"Obsolete applications on big mainframes".

"The need for increased investment: how it can be justified and raised".

"Delivering new systems quickly enough".

"The intellectual drag of the installed application base and the social responsibility of those involved in tending it".

It is unnecessary and perhaps inappropriate for me to comment further on the problems people find themselves facing today. So let me now focus on the further problems and changes we can expect to be facing over the next seven years.

Future problems and changes

Any forecast of the future is likely to be wrong, at least in terms of emphasis and timing. Certainly our past record of forecasting is not very good, as I have already pointed out. Nonetheless, I believe it is possible to take a balanced view that will alert you, and hopefully prepare you, for some of the problems, particularly if that view avoids a purely technical emphasis.

Before I give you my personal assessment of the future let me first give you some of the responses to my questionnaire. I have made no attempt either to weight or categorise the following quotations, but I have filtered out the more personalised problems.

"Increased rate of organisational change".

"Growth of personal computers and their impact on the culture".

"Being strong enough to maintain discipline".

"Increased pressure from users to justify our existence".

"The decline of the personal computer in its current form".

"A half-educated top management team".

"Changes in staffing levels".

"Predicting the future".

"Introducing systems to users".

"Lack of communications standards".

"Managing the micro".

"Upgrading the present staff from conventional analysts/programmers to consultants/advisers".

"Retaining control of a burgeoning installed base".

"Steering a path through the technology".

"Dealing with management's high expectations (excited by the media beyond immediate realistic capabilities)".

"Increased software packaging".

"Inexorable spread of the chip — much further than we see today and commonplace in mass consumer products and services".

"Telecommunications/mainframe interfaces".

"OSI v SNA" (mentioned several times).

"Productivity".

"Cost reduction pressures".

"Skills ageing".

"User expectations fanned by popular misconceptions".

"Communications infrastructure".

"Recruitment".

"User fear of fast change".

"Even greater supplier competition: IBM, BT, GE, etc".

"Transition from obsolete mainframe applications".

"Huge advances in telecommunications".

"Getting the right people".

"Continuing to make profits and finance new development" (from a systems function run as a separate company).

"Continuing business complexity".

"Supporting new products and services for the company".

"Expert systems — and when to take them seriously".

"Data protection implications".

"Homeworking".

"Choice and discontinuity in the marketplace".

"Naive users".

"Continuing decentralisation".

"Developing senior systems managers".

"Growth".

The above list is not exhaustive, and it is hard to argue with any of the suggestions. It adds up to a future that is exciting, full of change, full of opportunities and problems.

Let me now try to provide a somewhat clearer perspective by giving you my view of the future. It can be divided into two elements: the environment, and the problems to be found in that environment.

The environment for the next seven years

I believe the main features of the future environment will be:

—Continued choice of standards.

—Continued technical advance.

—Changing supplier alliances and positions, with a growing, and eventually major, Japanese input.

—'Convergence II'.

Regrettably the standards dilemma will continue and, as I explained earlier, continued technical advance is guaranteed.

The development of the supplier market is harder to predict. Certainly, Japanese products will have an increased impact. The current programme to place Japan in the forefront of computing is, I believe, the eighth such national initiative. Judging by the success of the others, it would be wrong to dismiss or play down Japan's chances of success in this area. You only have to look at Japan's success, against all the odds, in fields such as cameras, automobiles, consumer electronics, and so on. All the evidence suggests that the Japanese are indeed very likely to succeed in the computer supply industry.

It is no good smiling at the apparently over-ambitious goals of the fifth-generation computer programme or retreating behind the belief that the Japanese language, which precludes the use of typewriters and is unsuitable for writing software, represents an insurmountable barrier. You only have to think back to the first Japanese sports cars that arrived in Europe. They were written off as a joke. They were small, underpowered, tinny, with a badge on the front that meant nothing compared with the race-bred pedigree of MG, Triumph, Austin Healey and so on. Nobody believed the Japanese could produce high-performance specialist cars. Today, Japanese suppliers like Datsun mass-produce sports cars for the world. The European marques are consigned to the history books.

In making these comments I am not concerned here with the desirability or international implications of the Japanese computing developments, only their inevitability. Indeed, for user organisations, the developments can only represent more competition amongst suppliers, which may lead to price-performance benefits and perhaps even faster technical innovation.

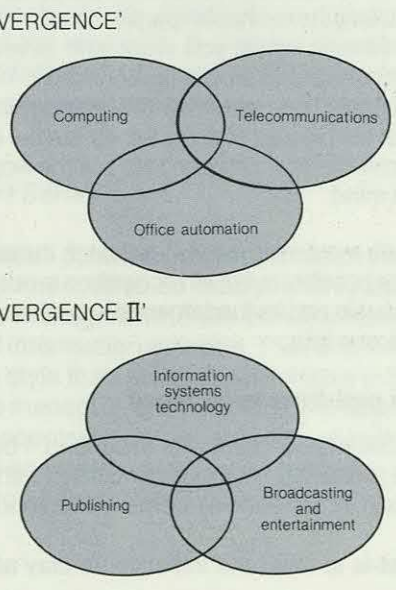
The fourth environmental feature is what I have termed 'Convergence II', and is not so readily apparent. Ten years ago, the more far-sighted individuals could see the potential impact — and the inevitability — of the first convergence — the coming together of three hitherto discrete, and very different, aspects of information handling: computers, telecommunications and office automation. We now take that aspect of convergence for granted, even though we forget that it took most suppliers and most information systems departments by surprise.

Today, some individuals, people like Professor Negroponte of MIT, are pointing to a further form of convergence. Its impact may be of even more importance, but its effects and timing are even less clear. It comprises the overlap between three major areas of industry and society: information technology (computers, telecommunications, office automation, et al), publishing (the collection, editing and dissemination of information) and broadcasting/entertainment.

Today, we are beginning to understand, if not yet fully exploit, the technology for collecting, manipulating and transporting information. The implication is that, from now on, far more attention will be given to the nature of the information itself and to how best to present it for human consumption.

To date, the attempts to produce clear, meaningful, readily assessed and digested information from sys-

Figure 8 Convergence II



tems have been limited by the tools available. The high-speed line printer pushed out volumes of 'printout' in fuzzy upper-case characters on striped sprocket-holed paper. This technology was hardly conducive to developing presentational skills! It was also a fundamental barrier to presenting genuine management reports, whatever title was put on the printouts.

When display terminals were introduced, the first move was simply to transfer printouts to screens. Thus the constraints of the old medium were transferred to the new one without recognising that the new technology removed many of the constraints. Slowly, it has been recognised that there is a need to apply the skills already learned in the graphic arts field. The possible uses of colour and graphics have been highlighted by consumer-oriented developments like the personal computer and videotex. But to be fully effective these techniques require not just an appreciation of the tools but also the development of genuine new skills.

I find it strange that an organisation that regards the design of a brochure or the layout of an advertisement as a skilled specialised task, is happy to leave the design of the presentation of high-level management information to almost any systems analyst, irrespective of background or training.

There is also increasing recognition that, if more and more information is to be stored in computerised form, then the ways of providing easy human access to that information have to be improved. The human brain cannot store masses of indices or coded references; it cannot hold more than a few telephone numbers. Instead, the brain accesses its mass of stored knowledge by association and by spatial awareness (position in a room, whereabouts on a page, how far through a book and so on).

This aspect of human behaviour partly explains the appeal of the latest generation of personal computers. These computers enable 'pages' to be pushed around on the screen whilst you work with several items at once, just like you would on your desk. It may seem strange that in one sense new technology is being used to mirror the old way of doing things, but the old methods had evolved over a long period to suit the workings of the human mind.

It is worth remembering that, although the computer will advance possibly out of all recognition in our lifetime, the human brain and its fundamental way of working will not change one iota.

Future problems to be faced

Within the environment just described, I believe there are five problems that those concerned with developing corporate information systems will have to face.

The first is to keep the initiative: to stay ahead of the forces pushing and pulling corporate systems forward. I believe this is the greatest challenge facing information systems departments and their managers today. I opened a recent address to a conference of senior information systems managers by saying that in five years time half of them would not be in their jobs. They would be removed or pushed sideways simply for failing to stay up with the demands of the job. My intention was to grab their attention, but I may not have been far from the truth.

The second problem is to identify and establish the right role for the systems function, recognising that most organisations do not even recognise what yesterday's role should have been. For the systems function to be effective its role has to be understood and accepted by the rest of the organisation, not just by the department itself.

The third problem — reorganising to take advantage of systems — is an important, and somewhat unpalatable point for most organisations to accept. In the past systems have been eased into organisations with as little disruption as possible. However, it is becoming increasingly clear that to take full, often strategic, advantage of new systems the organisation has to be redesigned to suit the systems. This is not an example of the tail wagging the dog. The fact is that organisation structures are built, inevitably, around the old way of doing things. Whilst earlier computer systems simply did the old things quicker or at less cost, they could be exploited properly within the existing structures. Today, technology provides the capability to do things differently, or even to do new things altogether. The business can be controlled differently; its administration can be grouped more effectively; communication can be faster and more complete; information can be shared more widely; and markets and customers can often be reached in entirely new ways. But to take advantage of this capability the structure of the organisation has to be viewed as part of the overall system design.

The fourth problem, or perhaps challenge, is to redirect the skills within the systems function. The information systems department is not there just to program and operate computers; its role is to help the organisation recognise and exploit the ways of handling information in its many different forms. Often, this information is the lifeblood of the business.

The fifth challenge effectively sums up the basic problem: we have to break free from yesterday's systems and that means yesterday's thinking, skills and concepts. I am not advocating a sudden or dramatic 'escape' — many of today's systems will still be around for some time. Today's skills will still be needed whilst developing the new environment. But if today's and tomorrow's technology is to be fully exploited then we really do have to break free from yesterday's systems.

THE BUTLER COX FOUNDATION

Butler Cox & Partners Limited

Butler Cox is an independent management consultancy and research organisation, specialising in the application of information technology within commerce, government and industry. The company offers a wide range of services both to suppliers and users of this technology. The Butler Cox Foundation is a service operated by Butler Cox on behalf of subscribing members.

Objectives of the Foundation

The Butler Cox Foundation sets out to study on behalf of subscribing members the opportunities and possible threats arising from developments in the field of information systems.

New developments in technology offer exciting opportunities — and also pose certain threats — for all organisations, whether in industry, commerce or government. New types of systems, combining computers, telecommunications and automated office equipment, are becoming not only possible, but also economically feasible.

As a result, any manager who is responsible for introducing new systems is confronted with the crucial question of how best to fit these elements together in ways that are effective, practical and economic.

While the equipment is becoming cheaper, the reverse is true of people — and this applies both to the people who design systems and those who make use of them. At the same time, human considerations become even more important as people's attitudes towards their working environment change.

These developments raise new questions for the manager of the information systems function as he seeks to determine and achieve the best economic mix from this technology.

Membership of the Foundation

The majority of organisations participating in the Butler Cox Foundation are large organisations seeking to exploit to the full the most recent developments in information systems technology. An important minority of the membership is formed by suppliers of the technology. The membership is international with participants from the United Kingdom, France, Sweden, Switzerland, Denmark, the Netherlands, Belgium, Italy, South Africa and the United States.

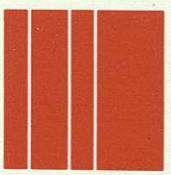
The Foundation Research Programme

The research programme is planned jointly by Butler Cox and by the member organisations. Each year Butler Cox draws up a short-list of topics that reflects the Foundation's view of the important issues in information systems technology and its application. Member organisations rank the topics according to their own requirements and as a result of this process a mix of topics is determined that the members as a whole wish the research to address.

Before each research project starts there is a further opportunity for members to influence the direction of the research. A detailed description of the project defining its scope and the issues to be addressed is sent to all members for comment.

The Report Series

The Foundation publishes six reports each year. The reports are intended to be read primarily by senior and middle managers who are concerned with the planning of information systems. They are, however, written in a style that makes them suitable to be read both by line managers and functional managers. The reports concentrate on defining key management issues and on offering advice and guidance on how and when to address those issues.



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