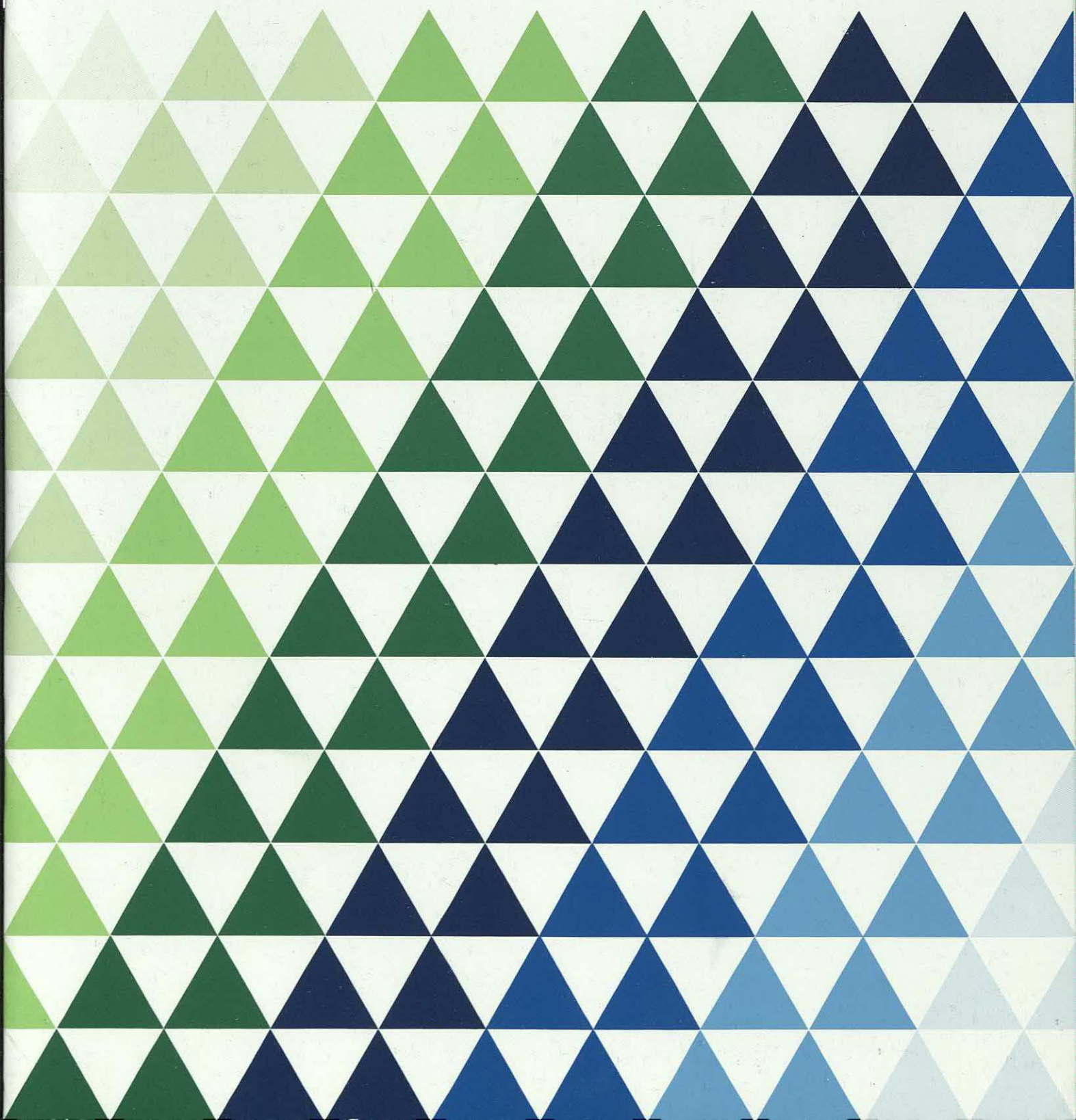
Management Summary

BUTLER COX FOUNDATION

Managing Technical Architecture



BUTLER COX
FOUNDATION

Managing Technical Architecture

Management Summary
Report 83, October 1991

Published by Butler Cox plc
Butler Cox House
12 Bloomsbury Square
London WC1A 2LL
England

Availability of reports

Members of the Butler Cox Foundation receive copies of each report and management summary upon publication; additional copies and copies of earlier publications may be obtained by members from Butler Cox.

Photoset and printed in Great Britain by Flexiprint Ltd., Lancing, Sussex.

Management Summary

Managing Technical Architecture

Foundation Report 83, Managing Technical Architecture, was published in October 1991. The report explains why organisations need to define a technical architecture, how to go about defining one, how to justify the investments required to upgrade the technical infrastructure so that it conforms with the architecture, and how to ensure that everyone continues to comply with the architecture. This document summarises the main messages arising from our research. The full report is available only to members of the Butler Cox Foundation.

A technical architecture is a plan for a set of computer facilities (the 'technical infrastructure'). The architecture defines the components of the infrastructure, how they will work together and where they are to be located. In many organisations, the existing technical infrastructures are now obstacles to business development. Departmental systems and personal computers from a variety of vendors are unable to communicate with each other or with corporate systems and it is not unusual for data produced by one system to be rekeyed into another, for analyses to be based on incomplete or outdated data, and for the use of electronic mail to be inhibited. These obstacles can be overcome by a well designed technical architecture.

A technical architecture provides integration, connectivity and flexibility

The main business benefits of a technical architecture derive from greater integration, easier connectivity and greater flexibility. As Figure 1, overleaf, illustrates, these benefits can be substantial. Greater integration and flexibility and easier connectivity are important because of the increasing need both for systems and for management information that cuts across the old functional divisions of the business. In particular, the increasing emphasis on business process redesign has heightened the need for connectivity and integration between computer systems.

The need for greater integration was also highlighted by our previous research into competitive-edge applications. We found that many such applications arose from using information that was already stored in a variety of existing databases. One of the greatest barriers to using information in new ways is overcoming the technical difficulties of assembling and integrating the information. These difficulties can be eased by a well designed technical architecture.

A technical architecture also facilitates the connection of an organisation's computer systems to those of its trading partners for the

Figure 1 A technical architecture provides significant business benefits

A charter airline took steps to make its technical architecture consistent with its business objectives. Business benefits have been achieved because the resulting technical infrastructure has facilitated:

- A reduction in the cost of cross-functional processes.
- Speeding up of information flow across functional boundaries.
- Access to a repository of company information.

After a false start, a public utility deferred the definition of its technical architecture until business objectives were known and agreed. The resulting benefits to the business were that:

- Data from a variety of functions could be accessed by one workstation.
- Access to this data was simple to operate.

A chemicals group's aim is to facilitate operating units' use of IT by supplying essential communications and standards. The technical architecture has enabled the units to achieve synergy by exchanging information.

The existence of a technical architecture in another chemicals company is enabling it to change its business processes. The chief benefits are that:

- Global systems can be introduced — for example, for issuing customer/product codes from one source.
- Customer service can be improved.
- Intersite communications can be improved.

The technical architecture in a drinks company has enabled it to install common systems around the world. The main benefits are:

- Economic provision of a full range of systems services to all sites.
- Quick, cheap and effective transmission of reports from remote sites.

An oil company aims to define the minimum mandatory standards necessary to handle critical common data, while promoting, rather than mandating, other aspects of systems policy. The chief business benefit will arise from the ability to prepare good-quality information based on common data.

purpose of electronic data interchange or for more general trading in electronic marketplaces. In some industries, electronic trading will become the dominant means of doing business by the end of the decade. The technical infrastructure is therefore of fundamental importance to many major organisations if the required connectivity is to be achieved. With this in mind, Peter Keen (director of the International Center for Information Technology), has derived a set of policy-level requirements (summarised in Figure 2) that, taken together, set out the agenda for defining a technical architecture.

The technical architecture must be flexible enough to cope with changing business requirements. It should therefore be designed to take account of short-term and long-term business objectives, leading to an infrastructure that supports current and foreseen applications, and that is economical, manageable and robust.

The architecture should also provide the flexibility to take account of changes in technology, particularly the general move to open systems. For many organisations, this means Unix. For others, it will mean standardising on 'universal' software products that are 'platform-independent'. (An IT platform is a combination of hardware, operating system and systems software.)

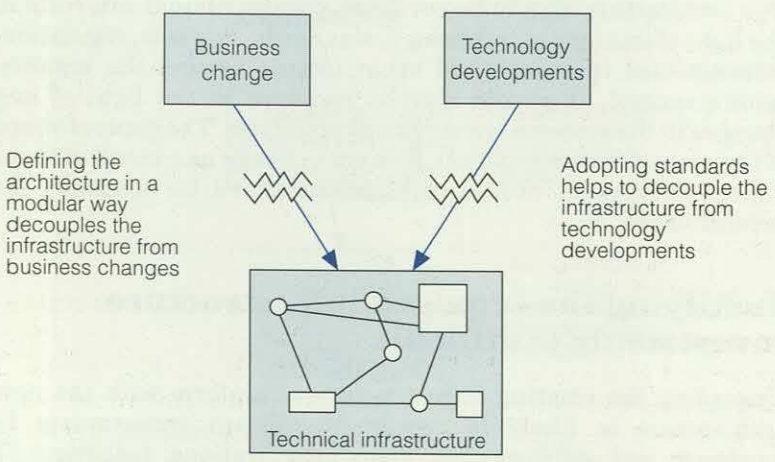
Figure 2 Policy-level requirements define the agenda for creating a technical architecture

1. *Practicality:* Our IT base will never block a practical and important business initiative.
2. *Competitive lockout:* If our competition uses IT as the base for an effective business initiative, we will not automatically be locked out of countering or imitating it.
3. *Electronic alliances:* We will match the competition in being able to make alliances, create value-added partnerships, or enter consortia in intercompany or intra- and inter-industry electronic operations such as point of sale, electronic data interchange and customer/supplier linkages.
4. *Re-organisation and acquisitions:* If we re-organise, make acquisitions or divestments, or relocate operations, our core operations, information systems, communications and processing will be able to adapt to the changes quickly and simply.
5. *Third-party intrusions:* No firm in our industry, or third parties outside it, will be able to intrude on our areas of strength or into the mainstream of our marketplace because their IT base gives them advantages that can be turned into a competitive differentiator that we cannot match.
6. *Vendor staying power:* We will not be dependent on IT 'brochureware' – capabilities vendors claim but do not have – nor on vendors with doubtful financial, technical, R&D or managerial resources and staying power. We will choose only vendors with the ability to move towards integration at the same pace as the rest of the IT industry and to adapt proven innovations to its core products, and *vice versa*.
7. *Comparable international capability:* The above requirements will be applicable in an international context.

(Source: Keen, P G W. *Shaping the future: business design through information technology*. Boston, MA: Harvard Business School Press, 1991.)

To achieve the required flexibility, the architecture needs to be defined so that the resulting technical infrastructure is decoupled both from business changes and from technology developments. Figure 3 shows that this can be achieved by defining the architecture in a modular way and by adopting standards for interconnecting the modules. Modularity provides the flexibility to respond to changing business requirements, because changes will

Figure 3 A flexible architecture should be defined in a modular way, with clearly defined standards



be restricted to one or a few modules. Standard interfaces reinforce the independence of the modules and provide the means for incorporating new technology and platforms into the architecture.

Defining a technical architecture requires a staged approach

Our recommended approach to defining a technical architecture is summarised in Figure 4 and described in detail in the main report. Although the approach is presented as a series of stages, in practice, it is one of successive refinement. It will often be necessary to go back over stages or, indeed, over the whole process. Depending on individual circumstances, it may also be possible to omit some stages.

The approach starts with the 'systems management principles' – the corporate-level policies governing the use of IT. It then identifies the users' needs for IT support, expressed in general functional terms for a small number of distinct user categories. Figure 5, on page 6, shows how a security-alarm company categorised its users under three broad headings.

The functional needs are then grouped into classes of IT support (batch processing, online transaction processing and so on). Next, the characteristics of the IT platform required to provide each class of support are identified. The existing infrastructure is then reviewed both to determine if any of it can be used to meet the IT platform requirements and to identify any elements that cannot be replaced quickly and that therefore have to be carried forward to the new infrastructure. Systems scenarios (possible combinations of IT platforms that can provide all the classes of support) are then identified and are expressed in terms of hardware and software products, and locations. The three possible scenarios identified by one organisation are shown in Figure 6, on page 6.

The scenarios are reviewed and compared to identify which is the most appropriate to form the basis of the architecture. The main evaluation criteria will be relative costs, functionality provided beyond that required to meet the essential requirements, and the degree of risk. Finally, a migration plan is developed to upgrade the existing infrastructure so that it conforms with the new architecture.

The architecture should be reviewed at, say, annual intervals in the light of changes in technology, standards, markets, regulation, international relations, and other factors beyond the organisation's control. It should also be reviewed in the light of any changes in the systems management principles. The general shape of the architecture should not, however, change as a result of these annual reviews. A radical rethink should not be necessary for several years.

Justifying the required infrastructure investments is difficult

Upgrading the existing infrastructure to conform with the new architecture is likely to require significant investments in hardware and software. For many organisations, justifying IT

Figure 4 A nine-stage process can be used to define a technical architecture

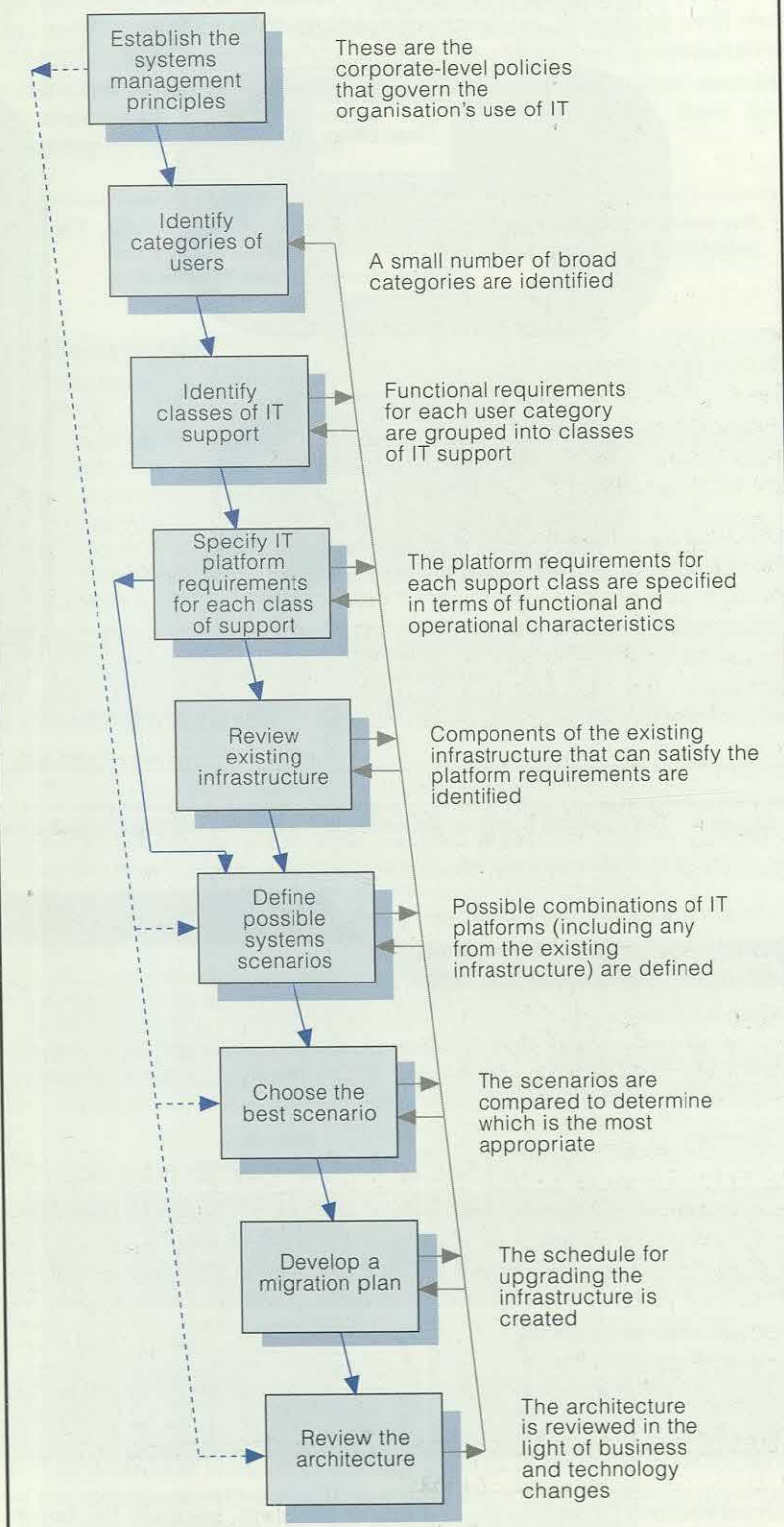


Figure 5 A security company identified three categories of users

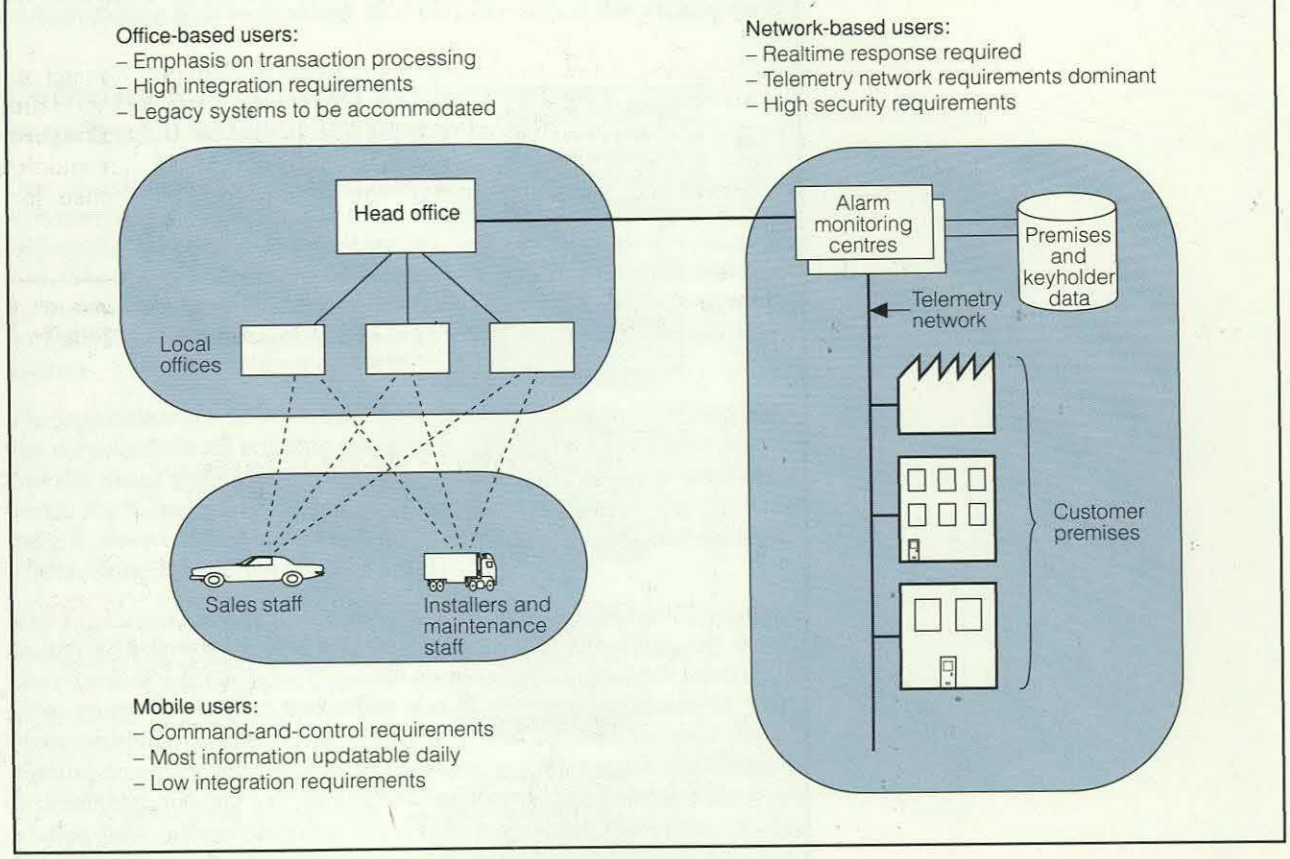


Figure 6 The possible systems scenarios represent the principal options for IT platforms

IT-support class	Scenarios 1 Vax scenario	2 Unix scenario	3 PC LAN scenario	
Batch database	Bull	Bull	Bull	'Stakes in the ground'
High-volume transaction processing	Bull	Bull	Bull	
Telemetry	MicroVax + private network	MicroVax + private network	MicroVax + private network	
Office systems – Computer – User environment – User interface	Digital ALL-IN-1 Windows 3.0	Unix X-Desktop Motif	PC NetWare Windows 3.0	
EDI and external messaging	ALL-IN-1	Uniplex	Novell MHS	
Personal computing – Workstation operating system – Applications	MS-DOS Word, Excel	X-Windows + MS-DOS Word, Excel	MS-DOS Word, Excel	

infrastructure investments is a major problem, because the benefits stem from the applications that will be built once the infrastructure is installed, not from the infrastructure itself. Furthermore, the benefits accrue to the whole organisation and are

not always apparent in short-term improvements in individual business units. Individual managers are therefore reluctant to sponsor the investment.

The best approach is to make a management judgement based on the known cost of developing the infrastructure, compared with the estimated likely benefits of the applications that the infrastructure is required to support. Figure 7 lists the main items that should be considered when preparing the formal business case for investing in IT infrastructure.

Figure 7 Considering these factors when preparing the business case will make IT infrastructure investment proposals compare favourably with other IT-related investments

Uncertainty and risk

- Compare the infrastructure proposals with the consequences of doing nothing.
- Compare the options not just on cost and practicability, but also on the level of risk involved.
- Consider the risks under the headings of financial (Can we afford it?), technical (Can it be done?), project (Can the organisation do it?), functionality (Will it work in our environment? Is the environment changing too quickly?), and pragmatism (Will the external environment — users, customers, owners, regulatory bodies — accept the result?).

Finance

- Review the responsibilities for budgets and the sources of finance.
- Consider start-up funding or central funding for enabling sub-projects.

Tangible benefits

- Set out a series of business-related questions based on the expected benefits of building a technical infrastructure that conforms with the architecture (for example, improved flexibility, globalisation, open systems conformance). Include questions relating to the types of rewards that the business will receive from the expected benefits of the infrastructure. For example, will the marketplace reward greater flexibility with increased market share?
- Identify the technical benefits arising from a technical architecture. These include reduced technical complexity, increased technical flexibility, improved communications between sites, the ability to operate common, or even global, systems, easier interoperability, and the ability to incorporate new technologies.

There are many ways of ensuring conformance with the architecture

The benefits of the architecture will be diluted if the infrastructure is allowed to evolve in ways that are outside the architectural rules. Our research revealed a variety of ways of ensuring that the infrastructure is constructed and maintained so that it conforms with the architecture:

Involving users. Users will be more committed to the architecture if they and their managers are involved in defining it, particularly at the requirements-definition stage. They should also be involved in selecting workstations and presentation software.

Establishing a high-level review body. A high-level review body that monitors strategic IT plans and capital expenditure can spot

potential developments that threaten the integrity of the architecture. Such a body is particularly important in a devolved systems organisation.

Providing IT education for senior management. Some Foundation members have set up senior management education programmes to promote the need both to conform with the architecture and to make business changes to comply with it.

Demonstrating support for business objectives. Efforts should be made to explain how the architecture has been designed to support business objectives that have been agreed at a high level in the organisation. For example, the architecture may be a prerequisite for a major change to a business process.

Providing support for cooperative working. It is important to explain how the infrastructure will help different working groups both within and beyond the organisation to exchange information.

Anticipating users' needs. The systems department should anticipate users' attempts to install non-standard hardware or software, and have architecture-compliant alternatives ready to offer.

Demonstrating the applications-delivery advantages. Business managers will more readily accept the need to conform with the architecture if they can see that it will enable critical applications to be delivered efficiently and at low risk.

Limiting the support provided. Some organisations have a policy of limiting the support provided for non-standard equipment or software, particularly as a means of persuading business units to migrate from the 'old' standard to the new one.

Approving purchases. An effective way of ensuring compliance with the architecture is to set up procedures for approving all IT purchases.

Promoting the availability of corporate data. Some organisations have achieved compliance with their technical architecture by promoting its ability to provide access to corporate data via standard software.

Identifying non-compliance. An internal systems-audit function is an obvious way of ensuring compliance with the architecture. The function must, however, have the authority to instruct line managers to take action.

The process of defining an architecture and of ensuring that the technical infrastructure continues to conform with it requires considerable effort. The effort is worthwhile, however, because of the significant business benefits that can result from a well defined architecture.

The key to gaining the benefits is to build an understanding in the business that conformance with the architecture will be of long-term benefit to the whole organisation. From our consulting work in this area, we know that most business managers are prepared to make the necessary compromises, provided they have a full understanding of the potential benefits.

BUTLER COX FOUNDATION

The Butler Cox Foundation

The Butler Cox Foundation is a service for senior managers responsible for information management in major enterprises. It provides insight and guidance to help them to manage information systems and technology more effectively for the benefit of their organisations.

The Foundation carries out a programme of syndicated research that focuses on the business implications of information systems, and on the management of the information systems function, rather than on the technology itself. It distributes a range of publications to its members that includes research reports, management summaries, directors' briefings and position papers. It also arranges events at which members can meet and exchange views, such as conferences, management briefings, research reviews, study tours and specialist forums.

The Butler Cox Foundation is one of the services provided by CSC Index. CSC Index is an international consulting group specialising in information technology, organisational development and business reengineering. Its services include management consulting, applied research and education.

Membership of the Foundation

The Foundation is the world's leading programme of its type. The majority of subscribers are large organisations seeking to exploit to the full the most recent developments in information technology. The membership is international, with more than 450 organisations from over 20 countries, drawn from all sectors of commerce, industry and government. This gives the Foundation a unique capability to identify and communicate 'best practice' between industry sectors, between countries, and between information technology suppliers and users.

Benefits of membership

The list of members establishes the Foundation as the largest and most prestigious 'club' for systems managers anywhere in the world. Members have commented on the following benefits:

— The publications are terse, thought-provoking, informative and easy to read. They deliver a lot of messages in a minimum of precious reading time.

— The events combine access to the world's leading thinkers and practitioners with the opportunity to meet and exchange views with professional counterparts from different industries and countries.

— The Foundation represents a network of systems practitioners, with the power to connect individuals with common concerns.

Combined with the manager's own creativity and business knowledge, membership of the Foundation contributes to managerial success.

Recent research reports

61 Competitive-Edge Applications: Myths and Reality
62 Communications Infrastructure for Buildings
63 The Future of the Personal Workstation
64 Managing the Evolution of Corporate Databases
65 Network Management
66 Marketing the Systems Department
67 Computer-Aided Software Engineering (CASE)
68 Mobile Communications
69 Software Strategy
70 Electronic Document Management
71 Staffing the Systems Function
72 Managing Multivendor Environments
73 Emerging Technologies: Annual Review for Managers
74 The Future of System Development Tools
75 Getting Value from Information Technology
76 Systems Security
77 Electronic Marketplaces
78 New Telecommunications Services
79 The Role of Information Technology in Transforming the Business
80 Workstation Networks: A Technology Review for Managers
81 Managing the Devolution of Systems Responsibilities
82 The Future of Electronic Mail
83 Managing Technical Architecture

Recent position papers and directors' briefings

The Changing Information Industry: An Investment Banker's View
A Progress Report on New Technologies
Hypertext
1992: An Avoidable Crisis
Managing Information Systems in a Decentralised Business
Pan-European Communications: Threats and Opportunities
Information Centres in the 1990s
Open Systems
Computer Support for Cooperative Work
Outsourcing Information Systems Services
IT in a Cold Climate
Object Orientation

Forthcoming research reports

Downsizing — An Escape from Yesterday's Systems
Visual Information Technology
Strategic Alignment

Butler Cox plc
Butler Cox House, 12 Bloomsbury Square,
London WC1A 2LL, England
☎ (071) 831 0101, Telex 8813717 BUTCOX G
Fax (071) 831 6250

Belgium and the Netherlands
Butler Cox Benelux bv
Prins Hendriklaan 52
1075 BE Amsterdam, The Netherlands
☎ (020) 6 75 51 11, Fax (020) 6 75 53 31

France
Butler Cox SARL
Tour Akzo, 164 Rue Ambroise Croizat,
93204 St Denis-Cédex 1, France
☎ (1) 48.20.61.64, Télécopieur (1) 48.20.72.58

Germany, Austria and Switzerland
Butler Cox GmbH
Richard-Wagner-Str. 13, 8000 München 2, Germany
☎ (089) 5 23 40 01, Fax (089) 5 23 35 15

Australia, New Zealand and South-east Asia
Mr J Cooper
Butler Cox Foundation
Level 10, 70 Pitt Street, Sydney, NSW 2000, Australia
☎ (02) 223 6922, Fax (02) 223 6997

Finland
TT-Innovation Oy
Sinikalliontie 5, 02630 Espoo, Finland
☎ (90) 358 0502 731, Fax (90) 358 05022 682

Ireland
SD Consulting
8 Clanwilliam Square, Dublin 2, Ireland
☎ (01) 764701, Fax (01) 767945

Italy
RSO SpA
Via Leopardi 1, 20123 Milano, Italy
☎ (02) 720 00 583, Fax (02) 86 45 07 20

Scandinavia
Butler Cox Foundation Scandinavia AB
Jungfrudansen 21, Box 4040, 171 04 Solna, Sweden
☎ (08) 705 83 60, Fax (08) 730 15 67

Spain and Portugal
T Network SA
Núñez Morgado 3-6°b, 28036 Madrid, Spain
☎ (91) 733 9910, Fax (91) 314 3198