Planning the Corporate Data Centre

BUTLER COX FOUNDATION

Management Summary
Research Report 55

BUTLER COX FOUNDATION

Planning the Corporate Data Centre

Management Summary
Research Report 55, April 1987

Butler Cox & Partners Limited

LONDON
AMSTERDAM MUNICH NEW YORK PARIS

This document is the Management Summary of Foundation Research Report 55, published in April 1987. The full report is available to members of the Butler Cox Foundation.

Published by Butler Cox & Partners Limited
Butler Cox House
12 Bloomsbury Square
London WC1A 2LL
England

Availability of reports
Members of the Butler Cox Foundation receive three copies of each report upon publication; additional copies and copies of earlier reports may be purchased by members from Butler Cox.

Printed in Great Britain by Flexiprint Ltd., Lancing, Sussex.

Planning the Corporate Data Centre

Data centres are the premises in which computers, data storage, and communications equipment are concentrated. Modern data centres have developed from the computer rooms of 15 years ago. The change in name, probably originally a buzz word, has turned out to be particularly appropriate because, today, the planning and management of these facilities is dominated by the space and environmental requirements of data-storage devices rather than by computers. In Figure 1 we show a typical data centre; there are no people and much of the space is occupied by disc drives.

Figure 1 A typical data centre

There are substantial financial risks in planning a new data centre

A new data centre represents a substantial financial investment - up to $50 million in some cases. However, many believe that the need for a corporate data centre could disappear because of the trend towards distributing computing power throughout organisations in the form of departmental and personal computers. Such people question whether an investment in a large new data centre could prove to be a waste of money.

Even if the data centre continues to exist, there is still the difficult problem of forecasting how much equipment space should be provided. Technology is leading to more compact equipment for any given processing power or storage capacity. On the other hand, computer users demand ever larger amounts of data to be stored. Over or under provision of space both impose substantial financial penalties.

When designing the data centre and deciding on its layout, there are further problems to be faced. Technological improvements are leading to computers that do not have stringent environmental requirements to keep them running. But there are still unsuspected problems that can arise. Finally, with the increasing dependence on computers for the day-to-day operation of most organisations, security of the data centre from natural or man-made disasters (accidental or deliberate sabotage) needs to be safeguarded.

So how real is the possibility of a new data centre not being needed? What will it be needed for? What will it house? How should space requirements be forecast and catered for? What points need to be evaluated in designing the centre with regard to the environment and security?

The need will continue

We believe the need for data centres will continue at least until the end of the century despite the fact

Figure 2 Computer power is less expensive in small units

Type of computer	Manufacturer and model	Processor power (MIPS)	Approx. cost ($000)	Cost/mips ($000)
Large mainframe	IBM 3090/200	29.0	4,500	155
Minicomputer	DEC Vax 8600	4.2	350	83
Microcomputer	IBM PC/AT	1.0	6	6

that smaller distributed computers offer considerable cost savings for computing power (see Figure 2). The main reasons are:

Size of applications

Many data processing applications, by their nature, require fast-response access to very large data files. Although, in theory, the processing and files could be distributed among several computers and databases, in practice the software and hardware architectures needed to achieve this are not yet mature.

Systems inertia

Even where applications could technically be implemented on distributed machines, many have already been implemented on large mainframe computers within existing data centres. They typically account for half the existing processing load. Hence it would be uneconomic, and impracticable, to replace them with distributed systems within a short space of time. Replacement will be phased over the remaining lifetime of such systems – typically five to ten years. Furthermore, given the existence of the data centre, it will often be easier and quicker to use it for new systems. Hence the momentum of existing systems will encourage continual growth.

Growth of personal computing

Contrary to expectations, personal computing is leading to extra demands for central computing and data-storage capacity to provide access to corporate databases.

Concentration of skills

Centralisation permits more effective use of management and technical skills that are still difficult to obtain and retain.

Security

Centralisation also facilitates more careful and stringent security precautions, although the risk is concentrated.

The data centre becomes a data utility and communications centre

However, the role of data centres is continuing to change. The main changes, shown in Figure 3, will be that the data centre will become:

More of an information utility

Becoming a facility for storing, distributing, and correlating growing volumes of data, but with application processing increasingly under the control of users either on processors in the user departments or under remote control at the centre.

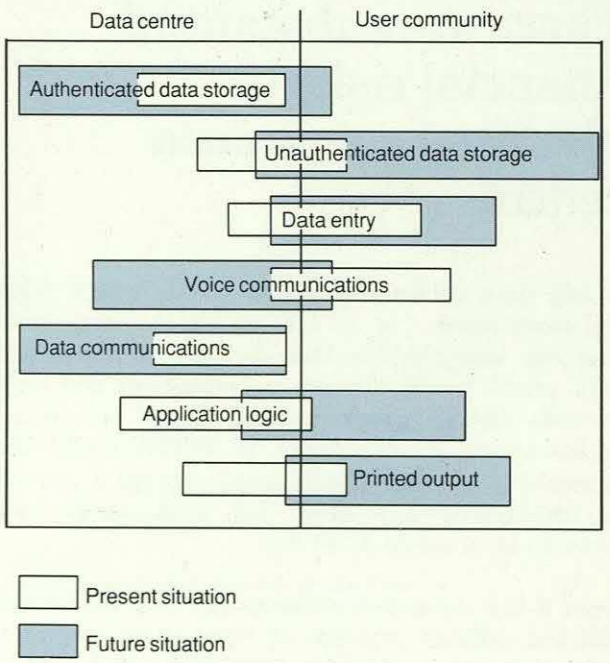
More of a communications centre

Becoming the central switching centre for information, increasingly sharing the same networks as for electronic mail and telephones.

Less of a printing shop or data preparation centre

Increasingly, printing and data entry will be directly under control of the information user who will use a local machine to print or enter data as required.

Figure 3 The changing role of the corporate data centre



The size and position of the boxes represents the extent to which the data centre and the user community are responsible for each area.

More space will be required for equipment

The three main groups of components are computing, communications, and data-storage equipment. Of these, data-storage equipment will require the largest proportion of floor space. The crucial measure for all types of equipment is performance per square metre.

Computers

For large computers, the performance per square metre is expected to increase by up to 15 per cent a year. However, in most Foundation member organisations, the demand for processing power is increasing by 30 per cent a year or more.

Communications

Although there is considerable growth expected in most organisations' communications requirements, the equipment itself is shrinking dramatically in size. Communications modems that were once about the size of a briefcase are now available as semiconductor chips.

Data Storage

Data-storage devices, in particular disc drives, are not reducing in size as fast as the rate of increase in demand. Typically most large organisations expect to increase their disc capacity by between 30 per cent and 50 per cent per year.

At the same time, disc manufacturers only expect an improvement in storage density of between 25 per cent and 30 per cent per annum. Figure 4 illustrates how the combination of these trends could double the floor space needed for discs in only four year.

The rate of demand for storage may increase

It is tempting to suggest that the high rates of growth in storage capacity requirements experienced in recent years will not continue indefinitely and must soon level out. The issue is, however, not clear cut, and it is possible that the rate of growth in the future will increase rather than decrease.

The increased growth will not be driven by conventional data processing systems, whose storage requirements may indeed level out, but by systems involving the use of media such as voice, graphics, text, facsimile, or video.

All of these media require very much greater amounts of storage than conventional data processing (see Figure 5 overleaf for examples). Although systems using these media may well be distributed and not be located within corporate data centres, there will undoubtedly be many requirements that can only be met centrally.

Figure 4 Growth in floor space required for online storage

% increase pa in online gigabytes	%increase pa in disc density	Resultant % increase in floor space	Number of years before floor space required doubles
25	30	-3.8	Floor space reduces
25	25	0.0	Floor space stays constant
30	30	0.0	Floor space stays constant
30	25	4.0	More than 10 years
40	30	7.7	9
40	25	12.0	6
50	30	15.3	5
50	25	20.0	4

Plan to treat equipment as a commodity

Increasingly in the future, data centre equipment will become a commodity that the astute manager can buy and sell or lease depending on price/performance. Already within the IBM architecture this is so, but recent initiatives are leading to standard interfaces between peripherals and processors, and this will lead to increased competition between suppliers of all makes of equipment.

The implication is that equipment changes within the data centre will become more frequent. As a consequence, plenty of space needs to be set aside for installing and commissioning new equipment.

Less space will be needed for people

In the past, system development staff have often been located in, or adjacent to the data centre. With

Fgure 5 Storage required for different types of data

Type of data*	Relative amount of storage required
Structured data or text	1
Free text (500 words)	3
Line drawing	10
Facsimile (monochrome)	30
Spoken words (500 words)	100
Video images (4 images in colour)	300

* Each example refers to what could be represented on one A4 sheet of paper. Most data stored in computer systems today is in the form of structured data or text.

the advent of terminals giving online access to the computers for program development, and with the increasing use of off-line development aids based on microcomputers, there is no longer a need for analysts and programmers to be in, or adjacent to, the data centre. Indeed, many would argue that from the point of view of developing systems that really match the users' needs, the developers should be situated close to, or within, the user departments.

Also, fewer operators will be needed in the data centre to load and unload peripherals such as tape drives and printers, or to enter data from input forms. The remaining operators need not be in the computer room itself. They will be able to control the machines from terminals in a control centre. Hence, there will be less space required for staff in the data centre. Indeed, certain rooms may be devoted to equipment that only needs human intervention for maintenance or repair. Such equipment may be kept in a 'lights-out' room with the benefits of better control over the physical environment and less danger from fire extinguishing systems to the operators.

However, we do foresee the need for the technical specialists concerned with operating software, communications networks, or database administration continuing to increase in the next few years, but they will not require as much space as that released by the other staff no longer needed.

Everyone gets space planning wrong

The demand for space in data centres will be dominated by the requirement for data storage. However, our research indicates that almost every organisation fails to forecast its data centre space requirements accurately. The reasons are not technical – it is possible to produce reasonable forecasts of the storage capacity per square metre likely to be available in the future. In practice, the difficulty is in forecasting business requirements for systems. Most systems plans are in detail for two or three years but in outline thereafter. Ideally, data centres need to last for 10 or more years. The problems are compounded by company mergers and acquisitions and other changes in policy that cannot be foreseen. Faced with this situation, we believe the key is to plan for a range of needs rather than to rely too much on a single forecast of the future extrapolated from the past.

Rather than base the design of the centre on one simple forecast it is better to consider a range of space forecasts, assessing the risks and costs of having too much or too little space. The best option from the business point of view may then be chosen. The design of the centre should allow for the actual requirements being over or under those expected.

Design the centre for flexibility

The ideal way to provide flexibility is to build a new data centre on a new site with plenty of space around it to allow expansion by modular construction. The technical trends described above mean that there is less need for data centres of the future to be physically colocated with the rest of the organisation. There may also be direct economic benefits, and better security, from building the new centre in a more rural area. Unfortunately, for most organisations this is not a practical proposition. However, there is scope for more flexibility in existing premises. The equipment currently located in the data centre need not continue to be concentrated in one small area.

In the past, technical constraints have meant that equipment must be located close to each other. The basic problem was that to achieve high-speed transfer of information between computer processors and storage, the cables had to be short. Many of these constraints still remain today. However some manufacturers are beginning to offer optical fibre connections between equipment. Optical fibres offer high speeds over greater distances and will remove some of the constraints. The implication is that it will be possible to distribute a single data centre quite widely in different rooms within a site (technically it would be possible to have some parts off-site but this would not be economic in the immediate future). Thus, one approach to flexible planning will be to identify and earmark suitable space for expansion within the site which can be used for other purposes until required.

Physical and environmental factors

Most large organisations understand how to provide the physical environment required by a data centre, and they have access to handbooks produced by suppliers or experts in the field. However, several novel factors came to light during our research which are worth mentioning.

Taller disc drives

One of the techniques now being used by disc manufacturers to increase storage density per square metre is to build taller units. The implications of this for data centre planning are not only much greater floor loading and higher ceilings but also access routes to the data centre themselves need to be higher. Speaking at a Foundation meeting recently one manufacturer said of a prototype unit, "when we found that our unit was too big to fit in the hold of a 747 we knew we had to modify it".

Ensure a clean air supply

Air conditioning and filtering systems do not normally remove gases. Some hydrocarbon and other gases can cause serious problems with modern disc drives. Hence, for example, a truck loading bay is not the ideal spot from which to draw clean air.

Security

As systems become of increasing importance to organisations, security both from disaster and attack is of increasing, sometimes vital, importance. Many organisations have recognised this and have built new data centres that have similar security to military installations.

Data centre planning guidelines

Thus, there are three critical factors for planning the data centre:

1. space planning
2. environment planning
3. security planning,

and the key guidelines are:

1. Recognise that the forecast of space requirements will be inaccurate and plan accordingly.
2. Wherever possible, move to a greenfield site.
3. Design the premises on a modular basis that can provide flexible accommodation.

Planning the Corporate Data Centre

Butler Cox is an independent management consultancy and research company specialising in the application of information technology within commerce, government, and industry. The company offers a wide range of services both to users and suppliers of this technology.

The Butler Cox Foundation is one of the services provided by Butler Cox. It provides the executives responsible for information systems in large organisations with a continuous analysis of major developments in the technology and its application.

The Foundation publishes six Research Reports each year together with a series of special Position Papers. The programme of activities includes a wide range of meetings that provide Foundation members with a regular opportunity to exchange experiences and views with their counterparts in other large organisations.

Butler Cox & Partners Limited
Butler Cox House, 12 Bloomsbury Square,
London WC1A 2LL, England
☎ (01) 831 0101, Telex 8813717 BUTCOX G
Fax (01) 831 6250

Benelux
Butler Cox BV
Burg Hogguerstraat 791
1064 EB Amsterdam
☎ (020) 139955, Telex 12289 BUCOX NL
Fax (020) 131157

France
Butler Cox SARL
Tour Akzo, 164 Rue Ambroise Croizat,
93204 St Denis-Cedex 1, France
☎ (161) 48.20.61.64, Fax (161) 48.20.72.58

Germany (FR)
Butler Cox Deutschland Ltd.
Richard-Wagner-Str. 13
8000 München 2
☎ (089) 5 23 40 01, Fax (089) 5 23 35 15

United States of America
Butler Cox Inc.
150 East 58th Street, New York, NY 10155, USA
☎ (212) 486 1760 Fax (212) 319 6368

Australia
Mr J Cooper
Consultants (Computer and Financial) plc Australia
Level 5, 303 Pitt Street, Sydney 2000, Australia
☎ (02) 2870400, Fax (02) 2870450

Italy
SISDO
20123 Milano – Via Caradosso 7 – Italy
☎ (02) 498 4651, Telex 350309 SISBDA I

The Nordic Region
Statskonsult AB
Stortorget 9, S-21122 Malmo, Sweden
☎ (040) 1030 40, Telex 12754 SINTABS

Spain
Mr Sidney M Perera
Rosalía de Castro, 84-2°D, 20835 Madrid, Spain
☎ (91) 723 0995