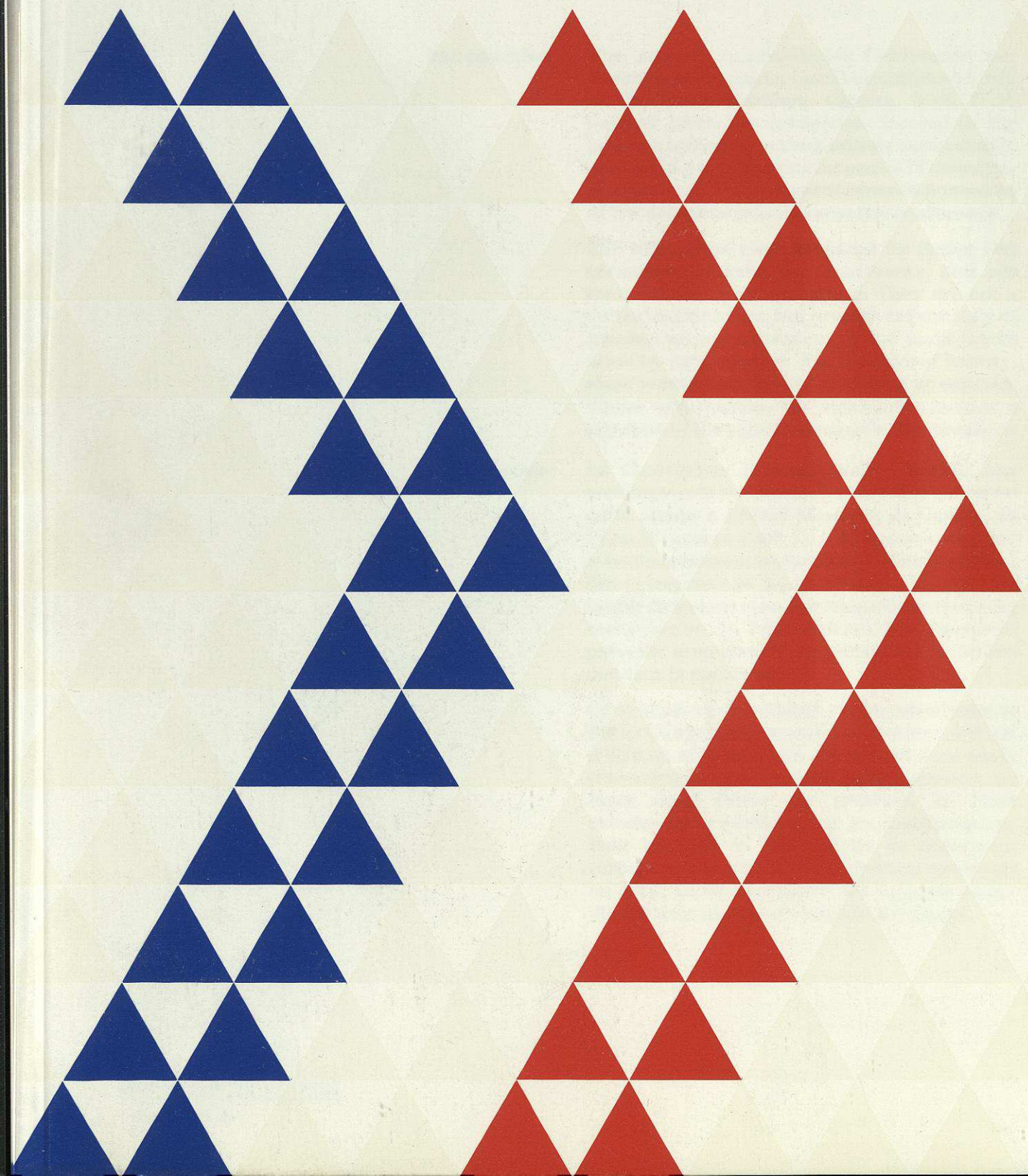
International Conference Session Summaries

BUTLER COX FOUNDATION

1990 — A New Decade for Information Management
Cannes, 16-18 October 1989



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Introduction

The annual International Conference for members of the Butler Cox Foundation was held at the Hotel Martinez, Cannes, from 16-18 October 1989. The conference focused on the growing upheaval in the business environment and the key implications for senior IT managers and directors. This document contains summaries of the presentations made at the conference.

The summaries were prepared by Butler Cox consultants during the conference and are intended as an aide-memoire. They are not a verbatim transcript, but present as faithfully as possible an interpretation of the main points made by each speaker. For the sake of brevity, some points have been condensed or omitted. Where appropriate, the summaries include a selection of the visual aids used by the speakers.

Introduction

La Conférence Internationale réservée aux membres de la Fondation Butler Cox s'est tenue cette année à l'Hôtel Martinez de Cannes du 16 au 18 octobre 1989. La conférence a souligné le bouleversement croissant de l'environnement des entreprises et les incidences clés pour les cadres dirigeants et les directeurs des services des technologies de l'information. Ce document présente le sommaire des présentations tenues pendant la conférence.

Ce sommaire a été préparé par les consultants de Butler Cox pendant la conférence et leur objet est d'être un aide-mémoire. Ils ne sont donc pas la transcription des sessions mais résument, de façon aussi fidèle que possible, les idées principales présentées par les conférenciers. Pour garantir la brièveté de ce document, certains points ont été volontairement condensés ou omis. Là où nécessaire, les supports audio-visuels sont incorporés dans le document.

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

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

A perspective on the information technology industry for the 1990s

Jacques Stern

Jacques Stern was, until recently, Chairman and Chief Executive Officer of Groupe Bull, one of the world's largest computer vendors. The views he expressed in this presentation were, however, his personal views, not those of Groupe Bull.

Jacques Stern gave an overview of the world in which we live and work, describing both the role that IT has played in bringing that world about, and the different view that we need to take of the contribution that IT will make in the future.

A changed world

We live in a world characterised by complexity and uncertainty. We have allowed organisations to grow so big that they have reached the limit of their manageability. Uncertainty is such that even the leading computer company, with all its sophistication and market knowledge, cannot forecast accurately its revenue and profit for the next three months.

IT bears a large part of the responsibility for bringing this world about, but although technology has changed the world, neither our behaviour nor our way of organising our world has changed at all. We still look upon IT largely as a way of automating our processes rather than looking at the fundamental processes themselves.

People still think that IT means simply automated data processing, and since most data processing has already been automated, they believe that the computer industry is a mature industry. In fact, it is in its infancy. We are now moving from data processing to information processing, and the difference is as large as the difference between mathematics and literature. Only by processing information intelligently will it be possible to manage well in today's world.

We also need to manage with strategic vision, if we want to proceed in a world of uncertainty. It is no good having rigid long-term planning. We need the means of gathering information together rapidly to make decisions within a strategic framework, reducing the areas of real uncertainty to a minimum. The problem today

Perspectives à l'horizon des années 1990 de l'industrie des technologies de l'information

Le fonctionnement des entreprises est aujourd'hui devenu totalement dépendant de leur système d'information. L'industrie informatique doit comprendre ses nouvelles responsabilités et cela passe par de nouvelles architectures de systèmes d'information ouverts, conçus autour de standards assurant l'inter-opérabilité des produits matériels et logiciels provenant de fournisseurs différents ainsi que la portabilité et la scalabilité des programmes. C'est le rôle que se sont donnés les constructeurs Européens en prenant l'initiative de créer SPAG pour imposer des standards de communication autour de l'architecture de réseau OSI, X-OPEN pour des interfaces programmatiques autour de UNIX et en participant avec les principaux constructeurs américains dès l'origine à la création d'OSF pour coopérer au développement d'un système d'exploitation portable indépendant des technologies et des architectures ainsi que de tout constructeur ou de société de logiciels.

A l'ère des systèmes propriétaires succède l'ère des efforts coopératifs permettant de favoriser la croissance du marché sans remettre en cause la capacité concurrentielle des entreprises à apporter leur propre valeur ajoutée autour des technologies de base.

is not simply how to react to change, but how to bring that change within our control and impose a direction upon it.

Changed organisational approach

Our organisational philosophy also needs to change. We have been brought up in a mechanical world with hierarchical organisation structures. With information becoming our key resource, we need to be moving to 'biological' structures: structures that do not simply transmit information up, and instructions down, but that put a premium on liberating intelligence, initiative, and creativity.

The more uncertainty we have to deal with in our environment, the more we need to look for the way ahead and identify the long-term goals. We then have to share this strategic vision and allocate responsibility for pursuing it. Our organisational structures need to be based on how we want to manage information. This needs courage to implement: it is not just a matter of small adjustment. We need to move to a network organisation, still with a hierarchy but with vastly increased information flows in all directions. Such a structure will facilitate dynamic changes of responsibility and place the emphasis on individual initiative.

The role of suppliers

The IT suppliers must bear some of the responsibility for where we stand today, but the basic problem is that the buyers have not been strong enough to force them in the required direction. Today, manufacturers are working towards open systems. This will, at last, give customers the ability to choose the technology appropriate for a particular need, to mix and match products from different suppliers. Systems can be made portable and scalable. These are essential requirements for organisations that are going to share and distribute data widely.

We need new, worldwide standards. We need to be able to define systems independently of the technology and independently of suppliers. No more will we see a dominant company, in any field, that can dictate standards; all new products coming to the market will be based on open standards. Cooperation between suppliers will become more common — not just alliances of weaknesses, but alliances to exploit strengths. This is not incompatible with competition. Common standards, in cases such as the motor car, for instance, lead to an expansion of the total market.

In a world moving towards globalisation of technologies, industries, and markets, Europe has the opportunity to be in the forefront. Technically, we are well placed to build the necessary networks — each European country has excellent telecommunications networks within its own boundaries. The only trouble is that we do not have a shared standard. Selfishness will preserve this situation; business pressure must help to change it.

The impact of globalisation on information systems management

Tony Brewer, Butler Cox

Tony Brewer is the director of the Butler Cox Foundation in the United Kingdom. He began his presentation by asking "what is a global company?" He defined such a company as one that treats the world as a single market. It buys, manufactures, distributes, and sells globally. It designs and develops its products and services wherever the skills are available, it buys raw materials and components wherever they are cheapest, it manufactures wherever it can achieve the lowest cost of labour and distribution, and it sells everywhere, especially in Europe, North America, and Japan. Global companies have to learn to balance global economies of scale and scope with local responsiveness.

Global companies differ from international or multinational companies. These two types of companies might be exporters from a home market, who design, develop, purchase, and manufacture in their home country, and merely distribute overseas. This gives them economies of scale. The best examples are the Japanese producers of cars, cameras, and home electronics. Alternatively, they might be international 'clone' companies, which divide the world into many smaller markets, and set up lookalike businesses in each overseas location, following the formula that has already proved successful. This gives them good access to local markets. Well-known examples include MacDonald's and American Express.

Competitive factors are forcing companies to change from international to global operations. These include, first, what Mr Brewer described as Californianisation — needs, fashions, advertising, and distribution are becoming universal, and everyone wants to live, work, and shop in California. Second, the costs and risks of doing business are large and rising. For example, in the 1970s, developing a new drug cost around $20 million and it took four to five years. Now, it costs nearer $250 million and takes over 10 years. Third, there is a need to maximise revenue and to share fixed costs. Domestic markets are too small, so there is a

Les incidences de la globalisation de l'économie sur la gestion des systèmes d'information

Une entreprise 'globale' par opposition aux entreprises multinationales traite le monde comme un marché unique. La nécessité de rester compétitif conduit les entreprises à franchir les étapes les amenant d'un état multinational à un état global.

Trois caractéristiques du management des entreprises globales doivent être soulignées:

— La configuration, déterminant géographiquement les unités qui effectueront des tâches à répartir.

— La coordination, établissant les flux entre les unités précédentes.

— L'interdépendance, définissant les relations de partenariats et d'approvisionnements entre les différentes unités et l'environnement de l'entreprise.

Dans les entreprises globales, le rôle des systèmes d'information doit permettre de supporter le réseau global d'information, de constituer en quelque sorte la colle qui maintient l'organisation matricielle des différentes unités et l'huile qui permet d'assurer une bonne fluidité de la circulation de l'information.

Ces systèmes doivent donc renforcer les caractéristiques fondamentales des entreprises globales (configuration, coordination, interdépendance).

need to enter worldwide markets rapidly, but to provide local differences in customer needs — real or perceived. For example, Europeans favour front-loading washing machines, whereas Americans prefer top-loading ones. This provides global companies with economies of scope. Examples of industries that are becoming global include automobiles, banking, domestic appliances, entertainment, pharmaceuticals, publishing, and travel.

There are also important differences in management style. In global companies, units are differentiated rather than uniform, they are interdependent rather than independent, and leadership and control are shared rather than imposed. The company becomes a 'spreadsheet' organisation — a global resources matrix, in which action in one cell triggers a response in all the others.

There are three management tasks that are particularly important in global firms. These are *configuring* — determining which units should do what tasks, and where, *coordinating* — establishing flows within functions, and *linking* — establishing flows between functions and between the company and its suppliers, customers, and trading partners (see Figures 1, 2, and 3). Carrying out these three tasks successfully creates economies both of scale and of scope.

Changing from national or international to global operations can cause great strain and difficulty. The main reason for this difficulty is the organisational environment — the combination of structure, roles, skills, styles, attitudes, aspirations, and history (particularly past success) — that is the unique characteristic of each organisation. It is an asset when markets are stable, but it can become a liability when they are unstable, since it resists change and inhibits learning. Researchers have even claimed that a company's organisational environment is the greatest constraint on its effective global management.

The impact of globalisation on the systems function

Systems management in international companies depends on the extent of decentralisation.

International exporter firm

In an exporting firm, the principal role of systems is to support the head office. There will be a single centralised technology architecture, centralised data management, centralised planning and control, standard methods, tools and techniques, and common applications in overseas units. The justification for investment

Figure 1 Management task 1: configuring units

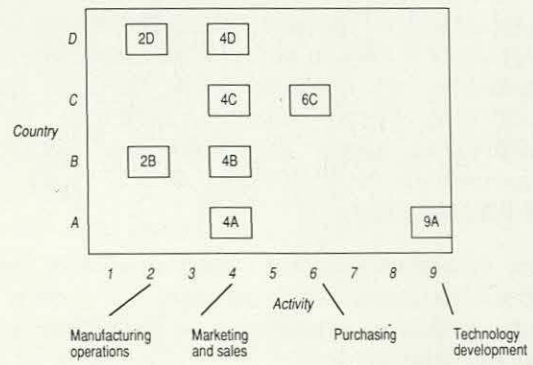


Figure 2 Management task 2: coordinating functions

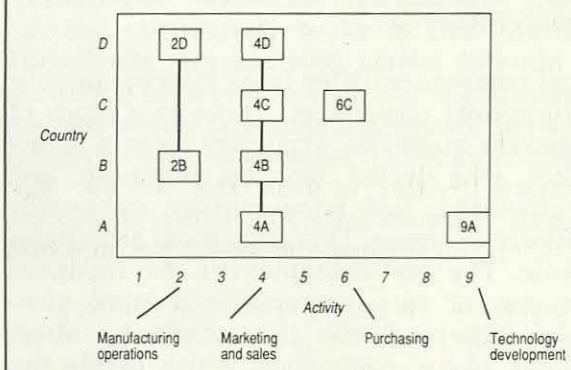
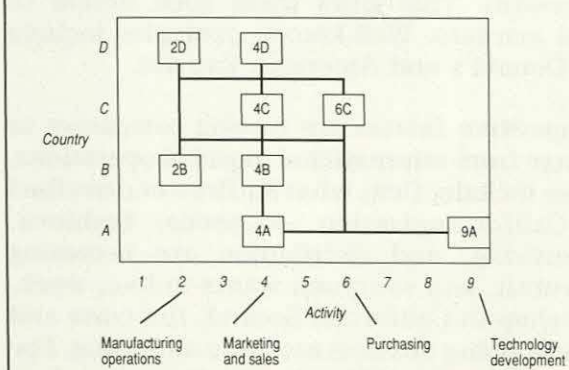


Figure 3 Management task 3: linking units



in systems is corporate consolidation and control, and the typical profile of the systems function is one of strong management but low functionality.

International clone company

In an international clone company, the principal role is to support the overseas branches. There will be many local technology architectures, little or no data management, local planning and control, a lack of standard methods, and incompatible applications and architectures. The justification for investment in systems is local efficiency, and the typical profile of the systems function is one of *laissez-faire* management and high functionality.

Global company

In global companies, the role of systems is to support the global resource network, providing the glue to hold the organisational matrix together and the oil to enable it to work smoothly. In particular, systems must support the three critical tasks of configuring, coordinating, and linking. For *configuring* — determining which units should do what, and where — the company needs systems to help decide on appropriate configurations, and to monitor and compare performance. They must be accurate and timely, and this implies data standards and good communications. For *coordinating* — establishing flows within functions — the firm needs systems that facilitate functional decentralisation and location independence, especially team technologies such as electronic mail, data storage and retrieval, business TV, and videoconferencing. Again, this implies data standards and good communications. For *linking* — establishing flows between functions and with business partners — the company needs systems for market analysis and forecasting, purchasing and production scheduling, logistics management, and interorganisational systems like EDI. Again, this implies data standards and good communications.

The generic requirements, therefore, are first, for applications that are independent of time and place, that can deliver service from anywhere, to anyone, at any time. Second comes quality data — data with the same meanings, definitions, and formats in different parts of the world. Third comes international communications. Satisfying these requirements implies a single network architecture, centralised data management, coordinated planning and control, standard methods, tools, and techniques, a common software infrastructure, and a common applications framework in overseas units. The justification for investment in systems is that it is an essential component of global management, and the profile of the systems function must be one of strong management and high functionality.

The action you should take

While it is easy to state the requirements, providing systems support for a global firm is not easy. The following actions are needed.

Carry out the three global management tasks within systems

In *configuring* the systems function on a global basis, you may find staff or skills shortages or surpluses in different places, and you may need to change recruitment and training patterns, and to redeploy staff to other countries. *Coordinating* means ensuring that the information needed flows freely within the systems function, such as standard procedures, training manuals, requirements specifications, application designs, software releases, and informal exchanges of information. *Linking* means establishing relations between the systems function and its users everywhere, including internal users, external users, and the systems departments of external users.

There is no standard model for the structure of a global systems function. Tony Brewer's advice is to concentrate on those activities that are dependent on skill or knowledge, such as application design and development, system support, and network support, and to locate them at the most appropriate place. By contrast, the user-support activities, such as requirements analysis and application support, should be distributed and located as close to the users as possible. There should be investment in communications systems to maximise sharing of information, skills, and experience, and international teams to coordinate activities within the function should be set up.

Develop global applications

In developing a portfolio of applications to support the global business, it may be necessary to replace many local applications with new

global applications with different requirements and different design criteria.

Figure 4 shows an applications map, with the three opposing forces of business, function, and geography at the three corners. These are the forces that influence applications design. Applications are located to balance these forces. Some are dominated by just one influence — for example, CAD by the engineering function, or local payroll by national regulations. Some applications, such as MRP, are dominated by two influences. A few applications — for example, customer accounting and distribution scheduling — are heavily influenced by all three forces. As the company becomes more global, applications need to move to the centre of the map, to balance all three forces.

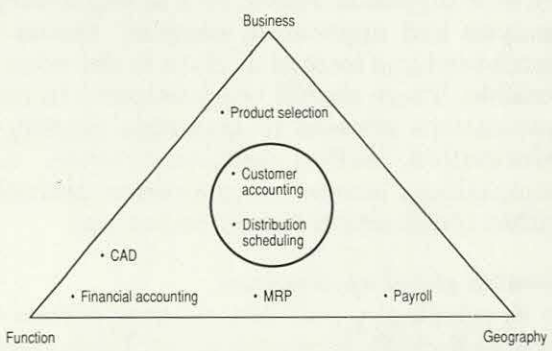
Developing such global applications can be particularly difficult. The existing portfolio reflects the original balance of forces, with applications that were never designed to balance all three forces equally. Effective data standards are required, with a compatible technical architecture. This implies the need for a high level of systems integration skills.

Implementing and supporting global applications is difficult because of national, cultural, and language differences. What is normal in the United States or Germany may be unworkable in Greece or Brazil. Justification assumptions will not always be valid. Managing new software releases in many countries is difficult, as is maintaining high standards of customer support.

Recognise the complexity of managing international applications

Complexity rises exponentially as requirements increase. Taking batch data exchange between countries, which requires only simple networking and data definitions, as a complexity rating of 1, information sharing between countries has a relative complexity of 10, because it also requires security, simple computing, database standards, and storage and retrieval tools. Integrated applications between countries have a relative complexity of 100. They require full computing, operating software, common applications, and standard working practices.

Figure 4 Applications map showing opposing forces



Create and support a global telecommunications network

Rationalise and reconcile different national communications standards, understand and negotiate with local service providers, and manage the network internationally.

Recognise that the organisational environment within the systems function is likely to be more a liability than an asset

Too often, the systems function is very conservative and inflexible, and so unsuited to a crucial support role. The company, and its systems function, must be flexible and responsive.

Think multiculturally

Encourage systems staff to travel, to meet their overseas colleagues face-to-face. Form international project teams and set up international coordination mechanisms. Provide support for these activities through technology.

Recognise the impact of globalisation on the IT director

The IT director's role in a global company is essentially the same as in a national or international company, but the scope and difficulty of discharging it is much greater. He or she must understand the special characteristics of global management, understand business issues in many countries, make and monitor configuring decisions, create and manage interdependence between the home and the overseas units, reconcile national and cultural differences, and manage much greater technical complexity. Most important, the IT director must recognise and grasp the wonderful opportunity that globalisation presents, with IT as the essential component of effective global management. European managers, in particular, can use their experience of the single European market to gain an advantage over their American and Japanese competitors.

In summary, the critical success factors for global information management are shown in Figure 5. These are the activities that the systems manager must ensure are carried out particularly well, in order to achieve success in managing the systems function in a global firm.

Figure 5 CSFs for global information management

- Supporting the global business strategy
- Identifying and reconciling requirements
- Standardising data
- Establishing a coherent technical architecture
- Implementing and supporting multiculturally
- Staying flexible
- Learning and improving

Information technology and organisational advantage

Peter Keen, International Center for Information Technologies

Peter Keen is Executive Director of the International Center for Information Technologies (ICIT), an independent research organisation that provides advice and education to organisations in Europe, North America, and Latin America.

Competitive disadvantage

Over recent years, companies have striven to exploit information technology (IT) for so-called 'competitive advantage'. Peter Keen believes that this era is now over, and that it has been replaced by one of *'competitive disadvantage'*. This comes about by not recognising that a company's organisational environment is an asset as well as a liability and by not closely integrating IT and the organisation. In Peter Keen's view, more than half the companies in the United States will fail to meet these challenges. A true measure of a company's recognition of the value it places on IT is when it is prepared to invest an increasingly large proportion of its capital in IT rather than, say, in marketing.

Business design

Since IT is a major business enabler and business coordinator, companies must ensure that their base of management skills is sufficient to support fully the activities illustrated in Figure 1. Peter Keen calls this the business design.

Appropriate *geographic positioning* is vital. Many companies have aspirations to become global, yet their disorganised communications strategy will prevent this. Companies cannot continue with the style of organisation they have today. An *organisation redesign* is needed if they are not to fail in a global environment.

Education is fast becoming a major aspect of the IT function, typically representing 20 per cent of systems development costs. Unless at least 10 per cent of people's time is spent on education, those people will become a depreciating asset. These are just examples of the need to *redeploy human capital.*

Availability of key applications over the next five years will make the progress achieved over

Technologie de l'information et avantage organisationnel

L'ère des 'avantages concurrentiels' se termine. Le temps est maintenant aux 'désavantages concurrentiels'. Les limites de la complexité sont maintenant atteintes mais nous ne voyons pas encore de limite à la croissance.

La capacité des entreprises à gérer les 'discontinuités' organisationnelles dépendra de plus en plus de leur 'système nerveux informatique'.

Les technologies de l'information et les 'avantages organisationnels' reposent sur les temps incompressibles de réflexions préalables aux décisions. Il est impossible d'acheter du temps.

Nous devons prendre soin des hommes au moins aussi soigneusement que nous le faisons pour les machines. Nous devons consacrer suffisamment d'effort et de ressources financières pour la formation et l'apprentissage des hommes.

Peter Keen a conclu en rappelant que tout comme il s'avère impossible d'envisager une stratégie globale sans une stratégie des TI, il est impossible de constituer une stratégie des TI sans prendre en compte une 'stratégie organisationnelle'.

Figure 1 Business design via information technologies

the past 20 years look extremely poor. Peter Keen suggested that by 1993:

- Between 25 per cent and 80 per cent of any company's cash flow will be online.
- Electronic data interchange will be the norm.
- Image will be an operational necessity.
- Point-of-sale terminals will be one side of every payment system.
- Distributed work will create distributed data. Just as organisational structures will need to change, so will data.
- Technological risks will become the business risks (photonics and micro-electronics should be considered as enabling technologies, but software as a blocking technology).
- Network management will no longer be an 'add-on'. It will be *the* network.

Peter Keen reiterated that a company must be increasingly preprepared to invest in IT. He calls this *managing information capital*. He likened the business design to 'developing a platform', something which takes several years to achieve.

Organisational advantage

As IT units have attempted to deliver value within a company, they have caused the company's structure to become dominated by organisational complexity. This trend must be reversed, so that an information infrastructure is developed that can cope with rapid change. The time taken to effect this change will influence a company's competitive position.

IT strategy

He suggested the route illustrated in Figure 2 as a method of breaking out of today's environment, in which IT has created complex systems and procedures, and contributed to the environmental complexity and the resulting organisational complexity.

Environmental complexity

Organisations need to examine why the environment has become so complex. Factors include:

- Globalisation.
- 'Hyper-extension' of services.
- The breakdown of the concept of an 'industry'.
- Strategic alliances and interorganisation business.

Organisational complexity

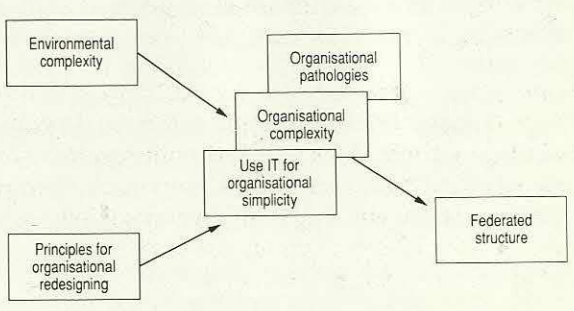
The response to this environmental complexity has been to reorganise, adding to the number of managerial layers. Companies have become dominated by the administrative overhead, with excessive procedures and controls.

Organisational pathologies

Too much information exists for staff to use, leading to a fragmented understanding of key issues. Leadership has been depersonalised, and middle management faces the dilemma of keeping the old IT systems running while handling the transition to the new systems.

IT has contributed to the tensions that exist between the headquarters staff and those 'out in the field'. Paper has become dominant, resulting in a subservience to documents.

Figure 2 IT strategy for breakthrough



IT for organisational simplicity

Peter Keen's recommendations to achieve organisational simplicity include:

- Giving business leaders the IT tools required to enable them to lead.
- Increasing the direct contact between people instead of via paper.
- Providing easy access to simply organised information, focusing on document-based needs.
- Offering 'fast-reaction' mechanisms (such as videoconferencing).
- Relocating functions to suit the business, not to comply with organisational 'neatness'.
- Restructuring via the information technology base in terms of 'range' and 'reach'.

Federated structure

Peter Keen recommended the adoption of a federated organisational structure, the key attributes of which are:

- Centralised-with-decentralisation.
- Distributed teams.
- Cooperative operations.
- Flattened pyramid structures.
- Location-independence.
- An ability to redesign and reposition the organisation quickly.

Principles for organisational redesign

The principles upon which the organisational redesign should take place are:

- To establish the business team as the basic unit of organisational design.
- To place core teams as close as possible to the customer interface.
- To establish equal-opportunity communication.
- To 're-personalise' leadership.
- To take work to the people, not vice versa.
- To put authority and information at the 'moments of truth'.
- To make communication direct and simple.
- To build collaboration and trust as skill, not value.
- To put the 'back-office' in the briefcase.
- To facilitate fast team rebuilding and relocation.
- To reward and promote star team-builders.

Summary

Peter Keen summarised his key messages as follows:

- The era of 'competitive-advantage' is over; the issue is now one of 'competitive-disadvantage'.
- We have reached the limits of organisational complexity, but not of growth.
- The ability of companies to manage this discontinuity will depend on their 'electronic nervous system'.
- IT and 'organisational advantage' depend on lead time — time cannot be bought off-the-shelf.
- Staff must be educated and re-educated just like machines — both need 'maintenance'.

He concluded by reminding delegates that just as it is not possible to consider a business strategy without an IT strategy, it is also not possible to consider an IT strategy without an organisational strategy.

Key human resource issues for the 1990s

Bob Zawacki, University of Colorado

Bob Zawacki is Professor of Management and Organisational Behaviour at the University of Colorado. In 1978, with a computer scientist from IBM, he founded Zawacki & Associates, a consulting and research firm working in the field of motivation and management of systems staff.

In 1988, he completed a research study, based on responses from systems directors, academics, and human-resources directors, which identified the main human resource issues in information systems. These are:

- Acquire a stronger business orientation.
- Transfer certain systems tasks to users.
- Define the skills required in the future systems environment.
- Keep key personnel (the 'eagles').
- Make managers business people (by selecting, training, and rewarding).
- Emphasise creativity and innovation.
- Motivate individual contributors.
- Train in communication and behavioural skills (especially in conflict resolution, change management, and negotiating).
- Develop better measures of performance.
- Provide for technical specialists.

Of these, motivating individual systems staff is particularly important. He said that 50 to 60 per cent of staff motivation was based on achieving a good match between a person and his or her job. He described motivation as the concept of searching for the satisfaction of a 'perceived need deficiency'. The search process is illustrated overleaf in Figure 1.

Professor Zawacki said that, for many years, management theory was based on the assumption that removal of dissatisfaction led to happiness, which in turn, led to productivity.

Problèmes essentiels des années 1990 concernant la gestion des ressources humaines

En 1988, le Professeur Bob Zawacki a terminé ses recherches qu'il a conduit auprès des directeurs informatiques, des universitaires et des directeurs des ressources humaines. Les points essentiels relatifs aux informaticiens qui ressortent de son étude sont les suivants — nécessité d'acquérir une connaissance plus approfondie des problèmes de l'entreprise, transférer certaines tâches informatiques vers les utilisateurs, définir les compétences nécessaires pour la gestion de l'environnement des futurs systèmes d'information, éviter le départ du personnel clé, former le personnel au management et à la communication, renforcer la créativité et la motivation, développer de meilleures mesures des performances.

Bob Zawacki souligne que la motivation des informaticiens est l'élément essentiel d'une bonne performance. Il a insisté sur le fait qu'une bonne productivité conduit à la satisfaction et au contentement et non l'inverse comme le veulent toutes les théories du management.

L'un des facteurs déterminants de la motivation est la capacité de se dépasser pour atteindre un certain nombre d'objectifs (GNS). Il a également décrit l'aptitude du personnel à communiquer (SNS). L'un des résultats essentiels des travaux montre que les informaticiens développent de grande capacité de surpassement (fort GNS) et de faibles aptitudes à communiquer (faible SNS).

Ces caractéristiques ont pu être acceptables dans le passé mais sont insuffisantes pour gérer les futurs systèmes d'informations.

This has been shown to be a set of invalid assumptions. His research work has been aimed at proving the alternative hypothesis — that being productive leads to satisfaction and happiness.

He briefly outlined Hertzberg's theory of hygiene and motivation. The 'hygiene' factors are needed to remove dissatisfaction. However, removal of dissatisfaction does not lead to satisfaction. The 'motivation' factors are needed to create satisfaction. The most usual hygiene and motivation factors are listed in Figure 2.

He then illustrated how five core job dimensions, which are the characteristics of work itself, create critical psychological states in the worker. These states in turn lead to desirable outcomes for the work and the worker. The relationships between job dimensions, psychological states, and outcomes are shown in Figure 3.

Also important in motivation are the worker's growth-need strengths (GNSs) and social-need strengths (SNSs). GNS describes the worker's need for achievement. Some GNS characteristics are listed in Figure 4. SNS describes the worker's need for social interaction. Some SNS characteristics are listed in Figure 5.

Professor Zawacki said that typical systems staff have high GNS scores and low SNS scores. This means that they are very highly motivated by the work itself, by their personal sense of achievement, and by opportunities for advancement and personal growth in terms of more challenging work. Figure 6 shows the motivating factors ranked for samples of systems staff in the United Kingdom and Singapore.

He also showed the results of research carried out originally in 1956 and repeated in 1986. A sample of workers was asked to rank a set of motivating factors. Their managers were asked to rank the same set of factors into the sequence

Figure 1 Motivation

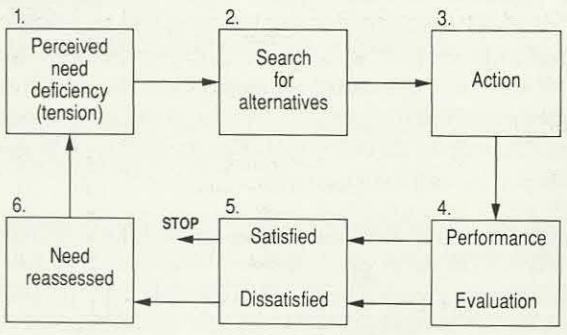


Figure 2 Examples of hygiene and motivation factors

Hygiene factors	Motivation factors
Company policies	The work itself
Working conditions	Achievement
Job security	Advancement
Supervision	Responsibility
Status	Recognition
Salary	

Figure 3 The relationships between job dimensions, psychological states, and work outcomes

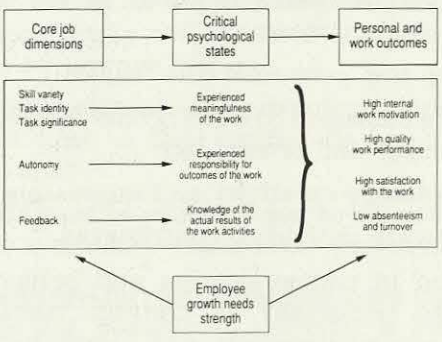


Figure 4 High GNS characteristics

- Goal oriented
- Ambitious
- Has perspective (separate important from less important)
- Interested in further education/training
- Self starter
- Internally motivated
- Confident
- Need for recognition
- Assertive
- Inquisitive
- Systematic

that they believed their staff would have wanted. The rankings are shown in Figure 7. This shows that the workers' stated needs were significantly different from what their managers believed them to be.

Professor Zawacki pointed out that the profile of typical systems staff, with high GNS and low SNS, while perhaps acceptable in the past, is certainly not suitable for the future, where they will have to work much more as change agents and negotiators than as technicians. Their motivation in terms of social skills and social needs will become much more important.

He concluded his presentation by saying that the three main determinants of job performance for systems staff are ability, motivation, and job content. Too often, systems managers concentrate solely on ability — aptitude, educational qualifications, and experience. They ignore the GNS factors that determine motivation, listed in Figure 2, and they also ignore the core job dimensions listed in Figure 3. By paying attention to these additional factors, motivation and productivity can be greatly increased.

Figure 5 Need for affiliation (SNS)

Does not join or attend activities	Joins activities and attends
Works alone	Teamworker
Does not help others	Is willing to help others
Unwilling to adapt	Willing to adapt
Few contacts	Many contacts
Weak feedback	Seeks and gives feedback
Seldom seen	Highly visible

Figure 6 Rank order of motivation factors

Comparison of IT systems people

Factor	UK	Singapore
Work itself	3	1
Achievement	2	3
Advancement/growth	1	2
Supervision	4	9
People relations	5	8
Recognition	6	5
Money (salary)	7	4
Responsibility	8	7
Job security	9	6
Company policies	10	10
Working conditions	11	11

Figure 7 Managers and workers have different views about the importance of motivation factors

What workers said they wanted		Motivation factors	What managers thought workers wanted	
1956	1986		1956	1986
2	1	Recognition	8	8
3	2	Feeling of getting information	9	10
9	3	Support with personal problems	10	9
4	4	Security	2	2
5	5	Good salary	1	1
1	6	Interesting work	5	5
6	7	Growth/personal development	3	3
8	8	Loyalty	6	7
7	9	Good working conditions	4	4
10	10	Discretion	7	6

IS strategy for the 1990s — a case study

Bill Hopkins, London International Stock Exchange

Bill Hopkins is Director of the Information Technology Services Division of The London International Stock Exchange. The division is charged with developing an IT strategy for The Stock Exchange. It is not yet completed (and in some ways, is still a vision), but the signs are that it will be a success and that the Exchange is on the way to making it a reality. Bill Hopkins began his talk with the background against which the finance industry will be operating in the year 2000, notably the single European market and the likely revolutionary changes within the industry, with the consequences for its overall approach to business. He also described some of the major changes that The Stock Exchange has had to face over the last few years.

The effect of 'big bang'

Key features of the London market were changed or swept away in October 1986 ('big bang'). In particular, The Stock Exchange had, for the first time, become dependent on information technology for the day-to-day functioning of the markets under its control. Three major changes occurred:

— The disappearance of the strict separation between jobbers and brokers heightened competition for many organisations, who used to know who their competitors were, but found that they now had a whole new range of unexpected competition.

— There were major changes to the rules concerning membership of The Stock Exchange. Specifically, member firms could now be totally owned by a single outside corporation. As a result, major overseas securities firms and banks became, for the first time, direct members of the Exchange, and the Exchange became truly international.

— The most significant change was the introduction of a terminal-based quotation system called SEAQ (The Stock Exchange Automated Quotations). This enabled market-makers to input prices and trading information directly into the system from their terminals for delivery and display on TOPIC, the Exchange's videotex network that makes realtime market price information available to more than 15,000 terminals in the United Kingdom, continental Europe, and the United States.

SEAQ ensured that the users' view of the market no longer depended on whether they had access to the market floor — there is now only one view of the market, the SEAQ screen. It is interesting to note that The London Stock Exchange was the first exchange to change from a trading floor to a screen-based trading system, and it did it over one weekend.

There was also a multimillion-pound project to modify the market floor to accommodate

Sécurité des systèmes informatiques et intégrité des données — un challenge managérial

La plupart des dispositifs de sécurité conçus ou existants aujourd'hui s'adaptent à des architectures informatiques du passé. Il n'est désormais plus possible de distinguer un seul individu responsable d'une tâche particulière, une personne unique établissant les spécifications ou les règles du jeu de la fonction informatique, et les limites du réseau de communication avec ses terminaux, ses points d'entrée et de sortie.

Aujourd'hui les contrôles d'accès au réseau ne peuvent plus prendre en compte les nombreux utilisateurs qui se connectent.

screen-based trading. The belief was that if floor trading were to disappear, it would take at least a year. Surprisingly, however, during the first week, only a quarter of all trading occurred on the floor, and within two weeks, floor trading had completely disappeared.

There have also been structural changes in the Exchange's business. Prior to big bang, the foreign equities market was primarily the preserve of the international houses in London, most of whom were not members of The Stock Exchange. These international dealers formed ISRO (The International Securities Regulatory Organisation) when it became clear that new rules would require them to seek recognition and would bring them into the new regulatory environment.

In November 1986, The Stock Exchange and the members of ISRO agreed to merge, and formed the Securities Association to police the conduct of the market participants. At the same time, The Stock Exchange was renamed The International Stock Exchange of the United Kingdom and the Republic of Ireland Limited. Today, the ISE in London has the most international membership of any of the world's exchanges.

The impact on computer systems

The IT facilities do, of course, have to be tightly coupled with the role and overall objectives of the Exchange, which Bill Hopkins summarised as running regulated markets in securities. He illustrated the running of a securities market by the analogy of a simple factory model. The 'raw materials' are the instruments of trading — enquiries, options, and gilts, as well as prices and orders. The 'production line' is the manual and automated services functions that support the entire life cycle of a trade. The 'product' is something referred to as the 'safely completed trade'.

The automated facilities that The Stock Exchange provides in support of the life cycle of a trade are of two kinds. First, there are the core services that are the constituent processes of the safely completed trade. These are shown in Figure 1. There are also 'peripheral' services that are largely communications-based, value-added services. Examples of these services are listed in Figure 2.

The Exchange's systems had been developed in a very reactive and fairly piecemeal way. Aside from increased capacity requirements, there were also increased demands for new system functions and services as a result of the changes in all markets since big bang.

The volume increases during the year after big bang were enormous, and it became clear that most of the Exchange's systems would need to be replaced over the short to medium term. Not only was an IT strategic plan required, but more importantly, there was a need for an agreed corporate business plan. However, the knowledge gained in the pre-big-bang industry was not very useful for establishing a corporate plan for the new commercial, competitive, and international business environment. As a consequence, at the beginning of 1987, The Stock Exchange set about defining a business strategy that would provide the direction and vision of the future. There was also a commitment to spend huge sums of money to build a new IT

Figure 1 Core automated services

SEAQ	The Stock Exchange's Automated Quotation System that covers the domestic equities, traded options, and gilts markets
SEAQI	The international version of SEAQ that covers the international equities market
SAEF	The SEAQ Automated Execution Facility that provides automatic order execution for small orders in domestic equities
SEQUAL	An online trade-confirmation service for the international equities market
CHECKING	Concerned with the matching of all domestic equity and gilt bargains
TALISMAN	The settlement system for the UK equity market, but also supports the settlement of Republic of Ireland, Australian, and South African securities
TAURUS	Transfer and Automated Registration of Uncertified Stock. This system is now being developed and, when implemented, will progressively do away with share certificates and will facilitate the settlement of bargains through a book-entry process

There are also surveillance systems that are designed to ensure the markets' quality, confidence, and continuity

Figure 2 Peripheral services

TOPIC	A videotex information system
STX	The Stock Exchange's private telephone network
CRS	A computer-readable service for other distribution systems
IDN	An integrated X.25 network

infrastructure that would allow the Exchange to operate in the global marketplace of the future.

The interdependence of world markets through improved communications was most graphically illustrated by the crash of 1987, which was accompanied by record volumes of trading. Stock Exchange computer systems were stretched to the limit and new insights were gained into the effects of information technology on the marketplace.

After the crash, trading volumes decreased significantly, which gave the Exchange time to consider the kind of products and services that needed to be developed as part of an overall information technology strategy. The existing systems were reaching their limits in terms of capacity and expandability, and there was a need for a new range of integrated services to support both the growth and changing nature of the Exchange's major markets. Also, some service providers, like Reuters, are assembling such a significant range of services that they are, in effect, challenging stock exchanges at the market level. If the Exchange does not provide products and services on a timely and cost-effective basis, it will lose customers to competitors or, perhaps more dangerously, members of the Exchange will develop their own services. Such a move would weaken and fragment the central market.

Development of the IT strategy

The Exchange now has an agreed corporate business plan and a mechanism for keeping it up to date, and is well on the way to completing its IT strategic plan. For a while, however, progress on the IT strategy was delayed because of the lack of an agreed corporate business plan, and the belief that the former could not be started without the latter. The strategic planners at the Exchange then realised two things:

- First, operating in a volatile and ever-changing environment, there will never be a stable or fixed business plan. The true test of the IT strategy would be its ability to accommodate change without a major change in the overall technical architectures.
- Second, a significant part of the IT strategy should be related to achieving increased development productivity, better project cost and schedule performance, reduced operating costs, and systems flexibility and resilience. It should also remain valid regardless of the business direction.

There are six major components to the Exchange's IT strategy: seamless services, tolerant systems, networks, data management, technical standards, and systems development.

Seamless services

The first major component of the strategy is to provide an integrated, 'seamless' set of core services across the four market areas (domestic equities, international equities, gilts, and traded options). The aim is that, once a trade is initiated, there should be no further intervention required on the part of the participants, and they can be assured that the trade has been completed safely in all respects. There will be no loss of information between services, and no duplication of data entry; there will be a high level of integrity, and a record of the trade will be maintained automatically throughout the whole process. This should lead to lower costs and greater efficiency for both the Exchange and its clients, and should, in the longer term, provide a shorter trading and settlement cycle.

The plan is to provide customers with a single standard access into the central systems for both information and trading support services through a new, sophisticated workstation platform, and standard communication protocols.

Tolerant systems

To cope with the fast-changing environment, the second major component of the IT strategy is based on producing fault-, change-, and growth-tolerant systems. Fault-tolerant systems are required because there must be virtually no downtime. Even a few seconds of information loss, or the inability to react for a few seconds, could result in losses of large sums of money. Change-tolerant systems are necessary to cope with change in both a responsive and a cost-effective manner. This will be achieved through flexible and open-ended design approaches, appropriate technical standards, capacity and contingency strategies, and a continuing risk-management programme. Growth-tolerant systems will ensure that growth paths are always available at minimum cost and effort for hardware, systems software, and communications.

This will be achieved by selecting appropriate technical architectures and vendors.

Bill Hopkins stressed that the most difficult, but most important, part of the IT strategy will be the rationalisation and selection of architectures across the major processing environments — trading support, settlement, information dissemination, and internal corporate support services. Figure 3 shows the current inventory of applications, systems software, and hardware components. The size of the inventory illustrates the sheer difficulty and complexity of the task. Nevertheless, the Exchange does not expect to end up with one architecture or one supplier. It will, however, curtail and constrain the choices significantly wherever this is possible.

Networks

The network component of the Exchange's IT strategy relates, to a large extent, to the impact and consequent requirements of the single European market, and to cross-border and global trading. Bill Hopkins sees four main trends:

- Stock markets throughout the world are increasingly using IT systems, including communications networks, to support information dissemination and electronic trading. The result will be a worldwide move to screen-based trading and to extended hours of trading.
- European exchanges will increasingly be linked by the actions and resources of global financial conglomerates, global networks, and the 24-hour market.

Figure 3 Inventory of system components

Application systems/large subsystems or packages	120
Application interfaces	390
Operating systems	12
Data management	15
Hardware families (excl. PCs)	20
Securities files	15

- European exchanges will need to forge closer interrelationships in terms of information exchange and less restricted access to their markets. There are already initiatives underway to help achieve this.
- Natural geographical market boundaries are being eroded by information and communications systems.

Eventually, stock exchange services will have no natural working day and will be provided to a truly international community. There will always be someone, somewhere, requiring the services; the 24-hour dealing environment is not far away. Most exchanges are developing their new systems with much the same international and global objectives as The London Stock Exchange, and the concept of a worldwide global and electronic marketplace will soon become a reality. Increasingly, exchanges will find it difficult to operate on their own and, indeed, major exchanges that are not planning for such systems will be strategically disadvantaged.

These changes highlight the importance of networks in the Exchange's IT strategy. The Exchange needs to provide facilities for the wide distribution of its service. To achieve this, it will position itself as the hub of a network of networks, based around its own integrated data network. Market users will be encouraged to attach their networks to the Exchange's, provided the market functions are performed at the central market at the hub. The Exchange will be prepared to connect service and network operators with its networks to reinforce the value of the market to its users, and it would consider partnerships with other large commercial networks who would act as distributors for its services. In these ways, market users would be able to access the Exchange's market facilities from territories beyond the reach of its network.

The network strategy must therefore adopt emerging international standards. Hybrid networks combining the best features of private and public networks may also be used where appropriate — and this will be possible and permissible throughout the European community by 1992.

Data management

Data is The Stock Exchange's most important asset. It has therefore given high priority to

establishing and maintaining a corporate data model and an associated corporate data dictionary that will incorporate all data standards and definitions. The data models and definitions for each new product and service will need to fit within the corporate model and the dictionary. A referential database is being built. This will contain the values and descriptions of all 'static' data items that will be downloaded to the various operational databases on an as-required basis. Bill Hopkins felt, however, that the major suppliers still have a long way to go in providing the management, control, and security features for truly distributed databases.

Technical standards

Interface standards need to be specified if systems in different architectures are to be connected and integrated. Appropriate and convenient standards must also be adopted so that member firms can access and use the central services. The Exchange plans to take the lead in influencing the development and use of appropriate standards within both national and international organisations and committees.

Systems development

The Exchange has established an IT Productivity Department whose major role is the development of a computer-aided development and maintenance environment (CADME). This will provide a range of CASE tools supporting development methodologies, and will be tightly coupled with and controlled by a data-dictionary environment. A software architecture is also being defined to permit the development of pure applications that are relatively independent of changes in the hardware, systems software, and communications environments.

Organisation, people, and culture

Bill Hopkins concluded by stressing that there are organisational, people, and cultural issues that need to be addressed if any IT strategy is to be implemented successfully.

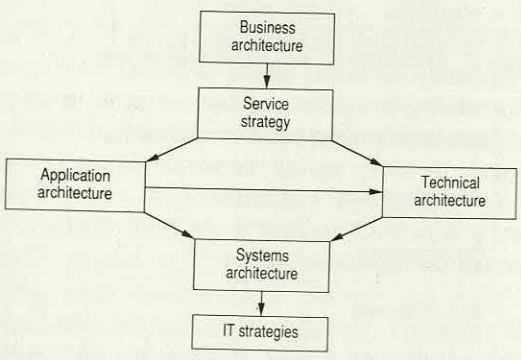
Considerable time has been spent in defining the business architecture in terms of industry and Stock Exchange business models. Service-strategy working and management groups define the required target services for both market-support and internal systems. These service strategies are now being translated into applications and technical architectures that, when completed, will provide the overall systems architectures or IT framework. The development of the detailed IT strategies will then be progressed within this well-defined technical framework (see Figure 4).

One of the Exchange's major goals is to think and act like a business, and achieving this will require a change in culture. To this end, the Exchange has established mechanisms that determine business priorities, facilitate effective cost-centre budgeting and accounting, and prevent any new development activity from proceeding without a well substantiated and approved business case. There are also well defined responsibilities and accountabilities.

The final cultural issue is related to management, specifically to decision-making and accountability. To some extent, a traditional committee-driven organisation like the Stock Exchange militates against these things. However, there are significant steps being taken to streamline and facilitate more effective decision making and accountability.

The final issue is that of people. This includes effective communication and good human-resources policies and management. A people strategy is an important part of an overall IT strategy, because if you cannot keep your people — or cannot keep them happy — you do not have an IT strategy that can be implemented.

Figure 4 Strategy architecture



The vendor stakes in the 1990s

Martin Healey, Emeritus Professor of the University of Wales

Martin Healey is Emeritus Professor of the University of Wales, and chairman of Technology Concepts Ltd. He is an IT industry expert and has been tracking technology and vendors for many years, now as a consultant and lecturer of international repute, and previously, as a professor.

Vendor environment

Today's products are founded on the underlying technology and practices of ten or more years ago. They are based on design assumptions, many of which are no longer valid in terms of either users' needs or technical constraints. Products need to be redeveloped, based on new design assumptions, to meet today's and tomorrow's needs.

Technical advances

Technology is continuing to advance at a phenomenal pace. The overall effect of the technical advances is a reduction in physical size of components and products, and in power consumption, and an increase in capacity and capability. This, in turn, improves availability and portability. These advances imply a shorter product life cycle, and also the risk that with faster development and market introduction, competitors can offer better replacements or alternatives, more quickly. Many products will not last as long as the vendors hoped, which means that many vendors have probably overstated research and development assets on their financial statements.

LSI

Today's large scale integration in silicon technology can deliver a three-mips, 32-bit processor at the cost of a single user's workstation. This kind of cost/performance places vendors in a difficult situation — for example, two years ago, IBM announced the 9370 at $60,000, and the PS/2 at $6,000. They had the same technical specification, but one cost 10 times as much as the other to buy. Such anomalies are untenable and IBM has since redressed the position — at a cost to itself.

The positive side of LSI advances is a continuing reduction in price, not only of the basic components, but also of overall costs because of the need for fewer interconnections between chips. Another positive feature is the advent of affordable, high-resolution, graphical workstations. The negative side is that vendors can

L'emprise des constructeurs à l'horizon des années 1990

Les progrès technologiques sont remarquables dans un certain nombre de domaines — microélectronique (LSI, CPU, mémoires vives), archivage (magnétique, vidéo), communications (intégration voix/données, réseaux locaux, et larges bandes).

Les standards deviennent des réalités et affectent les fichiers, la gestion des enregistrements, les applications et les interfaces utilisateurs. Les architectures tendent à déporter l'intelligence de plus en plus près de l'utilisateur.

Toutes ces tendances vont modifier l'emprise des constructeurs.

Actuellement, les constructeurs ont une offre globale qui cherche à répondre à l'ensemble des besoins des utilisateurs. A l'avenir pour répondre à leurs principaux besoins les utilisateurs pourront choisir parmi un ensemble d'offres spécialisés sur certains secteurs (composants, machines, systèmes d'exploitation, applications, services).

specify and deliver proprietary solutions because microcode is now designed into the chip. IBM's PC was readily cloned, but this has not happened with the PS/2 and Apple Macintosh. There will be PS/2 MCA bus-compatible products, but these will not be clones, as such. This restriction once again attempts to lock a user into a specific vendor.

Storage

Contrary to some predictions, magnetic storage will continue to be used for database applications for a long time to come, with optical discs largely used for documents. A 750M byte disc is now available at a price affordable by a single user, but a mini-refrigerator-sized tape deck is required to back it up. Vendors are now planning dual discs with automatic back up.

Displays

Few advances have been made in display technology, with most products still limited by the 80-character x 24-line screen. The line length of 80 characters is a hangover from the days of punched cards. The number of lines was determined by the size of memory chip (2k bytes) available when displays were first designed. Considering the capacity of memory chips today, this limitation is particularly archaic.

The flat screen displays generally available today are difficult to read. They are designed for economy (you have to turn the lights down to see the LCD display) and for security (you have to move close to the screen on the desk and any onlookers will thus be obstructed from seeing the screen). However, dramatic improvements are on the way.

Printers

Laser printers are an advance, but because of software and formatting restrictions, they often emulate line printers — printing a line at a time. However, there will soon be further advances in page-printing technology.

Communications

LAN technology has stabilised. Buying a LAN is almost as simple as buying a certain size of tyre for a car; a highly technical evaluation and selection process is no longer required. It is clear, in retrospect, that the PABX vendors providing a 64k bit/s capability could not possibly compete with LANs providing 10M bit/s at similar levels of cost. The next major developments in communications will be in the area of ISDN.

Software

At best, advances in software are 10 years behind advances in hardware. The PS/2 software is based on C/PM, which was developed in 1974 for use on an 8-bit microprocessor with a maximum of 16k bytes. But the PS/2 is based on a 32-bit microprocessor running at 2 mips (the speed of superminis and mainframes in the recent past) with a maximum of 2M bytes of memory. Partly because of this lag in software advances, supporting a PC is estimated to cost $2,000 per annum per user.

There have been some advances, however. Word processors have largely replaced typewriters, and spreadsheets have largely replaced calculators and pen and paper. These advances are not merely automation of existing practices, but have introduced new ways of working, and of exploiting technology.

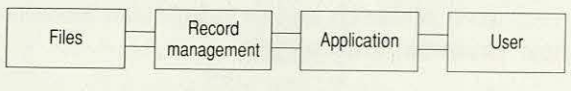
Model of architecture systems

A simplistic but useful model of architecture systems is shown in Figure 1.

Files

Data processing is obsessed with files and file-management systems; what users actually want is to store and access records. The file-processing techniques developed for data processing cannot be applied easily in the context of text processing, and this has led to a need for an intermediate level of record-management

Figure 1 Model of architecture systems



systems. Unfortunately, there are 25 million PCs being linked to share files — further institutionalising the data processing concept of files. Fortunately, relational databases and SQL are helping to restore the concept of records. Free-form objects management could be the next stage in matching stored data to users' views of the data.

Communications

Traditionally, communications networks have been structured hierarchically, with the flow of communications and transactions being controlled by central processors. The communications processing should be moved out, as a subsystem, to the workstation, and should provide high bandwidth capabilities. Databases should not be moved out to the workstation, but should be shared and managed separately, perhaps through the database servers attached to the network. The packet-based methods used by LANs are well suited to record-oriented (rather than file-oriented) data transfers.

Workstations

Workstations need to be capable of multi-tasking, but not necessarily of providing fully integrated software facilities. Multi-tasking is required because people do several things concurrently. When someone is using a word processor and the telephone rings, he does not close the word processing application, file the half-finished report, and so on before answering the telephone. Instead, people do several tasks concurrently, putting one task on hold while tackling another. Only occasionally is it necessary to integrate the tasks — obtaining data or other information on the telephone to incorporate into a report is one example.

The need for multi-tasking, multi-sessions, and database sharing requires a peer-to-peer communications protocol supporting multiple conversations, such as IBM's LU6.2. The dumb terminal is not necessarily dead, but there is no future for IBM 3270 or ASCII protocols.

Intelligent terminals and workstations with database servers (using SQL as standard) will increasingly be available. One drawback at present is the price difference between text-oriented and high-resolution graphics workstations. The latter still cost £7,000 to £8,000 each. The performance of networks shared by these devices and ordinary workstations is also a problem today, but further technical developments are on the way.

Windows, Presentation Manager, and so forth will form the basis of a common user interface and the platform as the application server. The Macintosh window style of interface is more natural than the standard display format of 80 columns and 24 rows.

Role of standards

With the advances in technology, and the slower improvements in software, there is a need to integrate the best combinations of products, using different software on the most appropriate hardware. With SNA and OSI for communications, SQL for database, and eventually, SAA for applications, we are moving towards workable standards. In turn, they will make it possible to create an integrated platform in place of today's poor compromises.

In very few other industries does one vendor produce all the parts. In no other industry does the manufacturer of components (for example, Intel) tell the user what to buy (for example, 386-based workstations). Tomorrow's users will buy from packagers of components, rather than from manufacturers.

There is a danger that vendors will subscribe to standards (such as Unix), but add their own extensions so that full compatibility is not possible. Several vendors have already invested hundreds of millions of dollars in Unix without any useful return. It may be that Unix itself is too basic. However, X/Open is promoting Posix, which will include the whole software environment, and a useful and usable standard may result from this work — but it will probably take five years to develop.

Vendor structure

Today, practically all the main vendors try to serve all levels of the industry, as illustrated in Figure 2, overleaf. This situation is increasingly untenable for most vendors. Tomorrow's structure will see vendors concentrating on just one level, as shown in Figure 3, overleaf.

Each level will attract its own excellent vendors — for example, Intel, Motorola, and Texas Instruments for processors, several major Japanese vendors for memory and other

Figure 2 The IT industry today

Support	✓	✓	✓	✓
Applications	✓	✓	✓	✓
System S/W and tools	✓	✓	✓	✓
Machines	✓	✓	✓	✓
Components	✓	✓	✓	✓
	IBM	DEC	Wang	etc

Figure 3 The IT industry tomorrow

Support	Facilities management, systems integration
Applications	Manufacturing, office, realtime, commercial
System S/W and tools	MVS/Unix; SNA/OSI; DBMS; CASE
Machines	PC, supermicro, workstation, PCM
Components	RAM, microprocessors, discs

commodity chips at the components level, and Hitachi, Fujitsu, and IBM at the machines level.

The weak link is, again, system software and tools. The main contenders at this level are IBM (MVS), AT&T (Unix), and perhaps Oracle. DB2 will increasingly be integrated into the operating system and possibly be built into the hardware. The gap between database software and applications software will be bridged through the implementation of the data repository. CASE will be extended upwards and outwards into meta languages.

The applications layer will increasingly be dominated by a few major software suppliers, but at present, a lot of so-called applications software includes a substantial amount of system software as well.

One major threat is that the new layered structure will provide opportunities for the Japanese vendors, developing upwards from the components level. The traditional 'vertical' vendors of today may find it extremely difficult to reposition themselves. The systems integrators and facilities managers of today — EDS, Arthur Andersen, AT&T (and ISTEL) — and their equivalents of the future, are likely to be the winners in the restructuring of the industry. It is not an accident that Kodak recently contracted for a systems integrator/facilities manager to take over its systems function in the United States. What is surprising is that the contract was won by IBM.

Conclusion

The vendor stakes in the 1990s are extremely high. The traditional vendors of today are pressured, on the one hand, by advances in technology, and on the other hand, by users demanding genuine portability through open standards. Unless vendors are willing and able to transform themselves from 'vertical' suppliers into 'horizontal' ones, they are unlikely to be successful, or indeed, to survive.

Communications between companies and their clients: the role of new information technologies

Xavier Dalloz, Butler Cox

Xavier Dalloz is a consultant with Butler Cox in Paris. He is a widely respected writer in France on the application of leading-edge technologies and their financial implications. He began by emphasising that the use of IT for communications between suppliers and their clients is already very much in evidence (ATMs, airline reservation systems, travel agent systems, and so on). This trend is accelerating and there are considerable opportunities arising from new advances in the technology.

Improved communications with clients

There are good business reasons for improving the way companies communicate with their suppliers. The first advantage is that the amount of paperwork can be drastically reduced. This can reduce delays and can save a lot of money. For example, SONAM, the freight-handling subsidiary of the French ferry company, has automated the exchange of information with its clients and, as a result, about 4,000 of the current 5,000 paper-handling jobs in SONAM are expected to disappear over the next five years.

Another advantage is the ability to improve the product information that is distributed to clients. A French construction company used IT to complete a building in record time by ensuring that all the different contractors had access, at the same time, to plans and design information as they were updated. IT can also remove the need for intermediaries between a supplier and its customer. There are many examples of where this has been achieved, particularly in the banking and travel industry.

Good communications between clients and suppliers can also reduce the amount of stock that needs to be held. A French car manufacturer, for example, saved 7 billion francs simply because its dealer system made it possible to hold smaller inventories of stock. Such client systems can also create customer loyalty. For example, the CD-ROMs provided by Renault to its dealers contain not only information about spare parts, but also information relating to the internal management of the dealership.

Most of these advantages apply to all industrial sectors: services companies, distribution companies, industrial companies, and even to the public sector. Xavier Dalloz then looked at three particular technologies that can be used to gain these advantages: telecommunications, optical media, and search technologies.

New telecommunications services

There are many telecommunications services in different stages of maturity that have (and will

La gestion efficace de l'information: le rôle des nouvelles technologies

Le rôle des nouvelles technologies de l'information apparaîtra clairement très rapidement à l'interface entre l'entreprise et ses clients. Les avantages de l'utilisation des technologies de l'information à l'interface client sont multiples — diminution des coûts de la paperasserie commerciale, suppression des délais inutiles, amélioration de l'information sur les produits, suppression des intermédiaires, possibilité d'utiliser les avantages de la flexibilité de la fabrication, accès plus facile à de nouveaux clients, fidélisation des clients.

Toutefois ces avantages n'apparaîtront que si les technologies adéquates sont utilisées de façon conviviale. Ces technologies mettront en oeuvre de nouveaux médias optiques (CD-ROM, DVI, CD-V, CDI), et de nouvelles démarches de recherche d'information (Hypertexte) et seront combinées avec de nouvelles interfaces utilisateurs (images, écrans tactiles, langage naturel).

have) an impact on the communications between customer and client (see Figure 1). Xavier Dalloz selected three technologies — facsimile, electronic mail, and ISDN — to focus the discussion and illustrate his points.

He predicted that facsimile and electronic mail will increasingly converge. Electronic mail will include graphics, and facsimile systems will be able to recognise the incoming text automatically, to pick out key words in the text, and based on these key words, to distribute the document to the appropriate recipient. This type of facility could, for example, be used to route sales enquiries more quickly and efficiently.

He also expected ISDN to become very important. The main benefits will arise from the ability to use data, images, and voice information simultaneously. One example of the potential is illustrated by the planned use of ISDN by FNAIM, a group of French estate agents. This group aims to distribute particulars of properties to its various offices with ISDN systems, providing both text and images.

New optical media

Optical media are based on different technologies, and on different production processes (see Figure 2). Applications for analogue videodiscs are mostly restricted to highly specific commercial or academic applications. CD-ROM, however, is making a major impact. Two examples of the use of CD-ROM are:

— The production of reference works. An estimated 1,500 reference works are now available on CD-ROM. By 1990, this is expected to grow to 3,000. The number of CD-ROM readers worldwide will increase from 250,000 in 1989 to 450,000 in 1990. They are typically used by doctors, lawyers, pharmacists, or others who require access to a large volume of reference information.

— The production of catalogues and handbooks. Renault, the French car manufacturer, for example, has a spare-parts catalogue on CD-ROM. Dealers and garages can use these manuals as an aid to servicing and repairing cars, and can also use them to get the parts numbers for ordering spares.

The cost of CD-ROM is competitive. For 200 to 300 units, the cost of an individual disc will typically be between $25 and $50. For 10,000 discs or more, the price falls to around $5 a disc.

New search technologies

The availability of large volumes of information means that more attention must be paid to ways in which the information can be searched — particularly if the information is unstructured. Hypertext is an important development in this area. It makes it possible to browse through the information base, with the same ease as browsing through paper-based information. It is possible to skim through documents and jump from one document to another, and to jump forwards or backwards to different parts of a text. This mode of moving through the information is much more akin to the way humans think. Hypertext systems are particularly useful for people searching information in technical and legal documents, or for

Figure 1 The impact of new telecommunications services

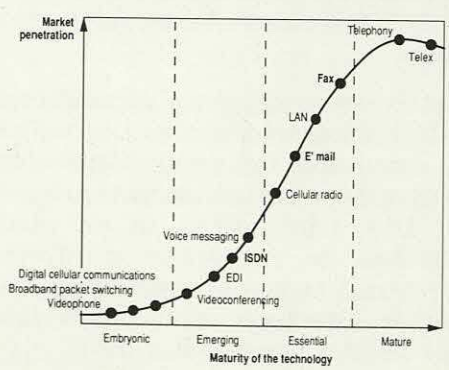


Figure 2 The new optical storage technologies

- Two different technologies:
  - Analogue (eg. videodisc)
  - Digital (ex: CD-ROM, DVI, CD-V, CDI)
- Two different production methods:
  - Pressing (eg. videodisc, CD-ROM...)
  - Directly by user (eg. WORM...)

browsing through press reviews or bibliographies.

Xavier Dalloz also stressed the importance of other technologies (such as images, touchscreens, word recognition, and natural interfaces) for making the user interface more friendly and more versatile.

He concluded with a cautionary note, however. Although the opportunities are immense for improving communications between customers and suppliers, it is important to avoid making mistakes. The use of IT in this way affects the fundamental commercial relationships of a company. Getting it wrong would be catastrophic.

Computer security and data integrity — a management challenge

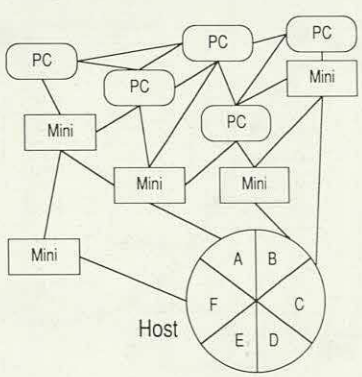
David Wilson, Ernst & Young

David Wilson is a principal of Ernst & Young, and is an authority on information security. Working with the National Security Agency, the National Bureau of Standards, and the Canadian Government, he is one of the leaders in developing standards for systems integrity to be used by hardware and software manufacturers. The aim of his presentation was to provide senior IT managers with a 'to do' list on systems security.

He began by highlighting the technology trends (distributed applications, networks without end points, complex processing architectures, and mixed systems 'ownership') that have changed the basic assumptions about systems security. Most security procedures (and products such as RACF and ACF/2) currently in use were designed for old-style systems environments. In the new environments, typified by the type of architecture shown in Figure 1, it is no longer possible to determine who is in charge, who sets the standards, and where the network starts and finishes. There are also multiple and incompatible access-control procedures to contend with, and it is more difficult to control who accesses the network and to detect when unauthorised users have logged-in.

There is a heightened awareness of the need for security because systems and information are now recognised as important corporate assets. Security is all about protecting assets. While IT managers do not need to know about detailed security techniques, they do need to know what questions to ask about security.

Figure 1 **Complex computer environments change the requirements for systems security**



Sécurité des systèmes informatiques et intégrité des données: un défi managérial

La plupart des procédures de sécurité utilisées aujourd'hui sont basées sur les environnements informatiques du passé. Les procédures de contrôle sont de plus en plus nombreuses et incompatibles. De plus il devient de plus en plus difficile de contrôler les accès aux réseaux et de détecter les utilisateurs non autorisés qui cherchent à se connecter.

La sécurité des systèmes informatiques est de plus en plus perçue comme la protection d'une ressource essentielle de l'entreprise, son capital d'information. L'authentification des utilisateurs repose essentiellement sur des mots de passe dont les lacunes sont connues depuis longtemps. Un certain nombre de solutions alternatives sont aujourd'hui disponibles — protection de ports, mots de passe aléatoires calculés à chaque accès, et identifications biométriques. L'intégrité des systèmes devient l'un des éléments essentiels de la protection du capital d'information d'une entreprise. Comment prévenir la destruction des programmes par les virus? Les points clés pourraient bien être les procédures de sauvegarde et de restauration.

User authentication

The most fundamental and central issue in security is to know who has access to your assets. In the past, passwords have been the usual means of achieving this, but password systems are deficient in several ways. Passwords are stored within computer systems, so users do not have the chore of remembering them. However, this means that anyone can get at them, and they are no longer unique to an individual. Users who need to access several systems often use the same password for each one, because they cannot remember different passwords. Passwords are more difficult to control and validate when someone can dial in to a system from anywhere in the world. Finally, determined hackers never find much difficulty in obtaining a required password. A request for information posted on an electronic bulletin board often produces the required password.

These problems have sometimes been tackled by 'port protection devices'. The earliest were dial-back devices. These provide no protection at all if such a device sits between a mainframe and minicomputer, and the unauthorised entry comes from someone dialling into the minicomputer.

The latest type of user-authentication is based on 'see-through' authentication techniques, which involve one-time password generation. Each user has a calculator-like device that is used to generate a one-time password each time he logs-on to a system. When the user first accesses the host system, he gives his user identification, and the host generates a random 'challenge' number. The user enters this challenge number into the calculator-like device (having first entered his PIN number). The device then calculates and displays a response number, which the user transmits to the host. The host performs the same calculation and will allow the user to log-on only if the two numbers match. Each calculator-like device is unique, using an encryption algorithm specific to the user.

Thus, there is a unique challenge and response for each sign-on, which means that hackers would have to be extremely lucky to bypass the system. They have only one chance to input the correct number — and they have billions of numbers to choose from. There could be a problem, however, if the calculator-like device is stolen, and if the thief also knows the user's PIN number. Reporting the loss will invalidate access using that device. In the meantime, it may be possible to use 'biometrics' to validate that the user is who he claims to be (see below). Figure 2 shows that see-through authentication is always at least as good as passwords, and nearly always better.

Biometrics is the term used to identify users from physical characteristics (hand geometry, eye-retina pattern, finger prints, signature verification, voice print, and so on). All of these techniques work, but each has its problems. Biometrics is aimed at providing people with a 'lifetime password', and storing and securing this information is a very sensitive issue. At present, biometrics should not be seen as a panacea to security problems, but can be very useful for specific applications, such as controlling access to highly controlled areas.

Systems integrity

Another major area of concern is that of systems integrity. How can you ensure that applications or data downloaded to a PC are not tampered with or used for unauthorised purposes? How do you prevent programs being infected with viruses? Viruses attack those systems with the weakest access control, usually PC applications. In reality, viruses are a high-threat, but low-risk problem. The key to protection against viruses is to provide good recovery and back-up procedures. The traditional cyclic back-up may not be sufficient, because time-triggered viruses can get into the back-up cycle.

Figure 2 See-through authentication is usually better than passwords

Threats	Ability to resist	
	See-through	Password
Password openly displayed	High	Low
Password guessed	High	Low
Password stored	High	Low
Password stolen	Medium	Low
Password observed	Medium	Medium
Duress	Low	Low
Wiretap	High	Low
Spoofing	High	Low
Collusion	Low	Low
Secret duplication	High	Low

Encryption

End-to-end (or point-to-point) encryption, based on DES (Data Encryption Standard), has been used for several years. DES-based routines encrypt the message and produce an 'authenticator' that is attached to the message. Where accuracy, rather then secrecy, is important, the message can be transmitted in clear text. The authenticator ensures that nothing gets changed during transmission.

More modern encryption systems use Public Key Systems based on Rivest, Shamir, and Adelman's procedures (see Figure 3). Each user has two keys — one public and one private. To send a secret message from A to B, B encrypts under his public code, and decrypts under his private code. To send a signature from A to B, A encrypts under his private code and decrypts under his public code.

The main problem with encryption systems is key management.

Contingency planning

Contingency planning is another important aspect of systems security. Many existing contingency plans ignore *communications* issues, focusing instead on computer rooms and equipment. Contingency plans must become generic and take account of all the critical resources. The aim is to ensure that the business can survive in the event of a catastrophe.

Responsibility for security

In the past, the data security officer was responsible for administering the security rules within the data processing organisation. Today, there is a need for an information security officer with a wider remit. This is an organisation-wide role and includes responsibility for:

- Corporate information security policies.
- Information classification and control systems.
- Risk-acceptance program.
- End-user control policies and procedures.

A model for security

David Wilson concluded by presenting a simple model for security, which can act as a security checklist for IT directors (see Figure 4). The first stage is to identify the assets, in terms of an inventory of systems, hardware, and data. The risks to those assets should be assessed and accepted by the organisation. Next, organisational responsibility should be established, which means identifying the system owner, the system user, and the system custodian. The third stage is to identify the people who are accountable for the information over which they have custody, and to ensure that they understand and follow the control guidelines for computer systems.

It is only then that the supporting controls, in terms of technologies and access-control systems, are established. Finally, an enforceable control system is established. To close the loop, the IT director must check that doing all of this will, in fact, protect the assets that were originally identified.

Security can no longer be reactive. It must be an integral part of the systems planning process.

Figure 3 Public key systems

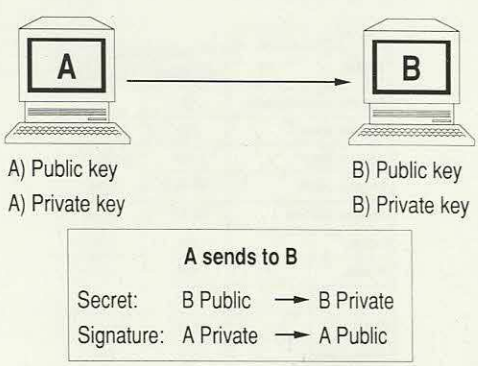
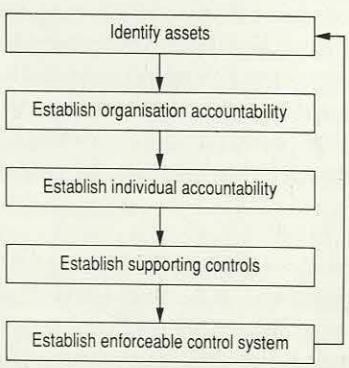


Figure 4 Model for security



This means that security considerations may even prevent an organisation from buying a particular type or model of computer.

The threats and opportunities for systems management

George Cox, Butler Cox

George Cox is the managing director of Butler Cox. He concluded the conference by bringing the various strands together, and focusing on what it all means to the individual: what the implications are for the systems director. He prefaced his talk by saying that such a level of self interest was neither selfish nor unreasonable. Faced with change, self interest is the natural reaction of every individual.

Today's systems manager

George Cox started by reviewing where we stand today, explaining how the systems manager's role has grown and developed, but pointing out how this has led to uncertainty about future direction. In the past, the corporate systems manager's role was to deliver and run computer systems. In view of the current trends in both technology and organisational philosophy, this role is being dispersed out to the various business units. The corporate systems manager has climbed to the top of the systems tree — only to find that this tree is often no longer part of the corporate forest.

George Cox also raised another point — to his mind, a worrying aspect of today's systems manager: that within the organisation, he is regarded as primarily a senior specialist rather than as a senior member of the general management team. To illustrate this point, he asked (without requesting a show of hands) how many members of the audience harboured the ambition eventually to become the CEO of their organisation. He suspected that it was very few. The same would not be true of a conference attended by, say, financial executives.

While it can be argued that the systems manager's role has become more strategic — looking at the fit of IT strategy and corporate strategy, seeking competitive-edge opportunities, and so on — it must also be questioned

Menaces et opportunités pour les responsables des systèmes d'information

Quel constat? Qu'est-ce qui va évoluer et permettre ainsi la naissance des conditions d'un changement du rôle des responsables des systèmes d'information? Constat.

Les responsables des TI sont considérés comme des spécialistes dans leur domaine mais n'ont pas vocation à devenir directeurs généraux de l'entreprise. Ces domaines paraissent pourtant très importants et se modifient peu dans le temps. En effet, la culture de l'entreprise et les procédures administratives sont liées à la manière dont l'entreprise traite les affaires.

Dans le passé on a su automatiser les procédures existantes mais ce n'est qu'aujourd'hui que l'entreprise est prête à modifier ses habitudes pour avoir une stratégie adaptée au nouveau contexte qui comprend:

— Un nouvel environnement de l'entreprise (accroissement de la concurrence, internationalisation, dérégulation, etc).

— Une technologie qui se transforme très rapidement (nouveaux standards, nouveaux moyens de stockage).

— De nouveaux fournisseurs.

— Un état d'esprit différent (modification de la demande des utilisateurs, évolution de la philosophie de l'organisation qui devient internationale).

Ce nouveau contexte nécessite un architecte qui soit capable d'avoir une réflexion du niveau direction générale ainsi qu'une pensée stratégique.

Le 'challenge' du nouveau responsable des TI est en même temps une opportunité d'accéder à des postes de plus grande responsabilité.

whether it is genuinely possible to carry out this role without the powerbase of direct responsibility for corporate systems. George Cox felt that only one thing made the current systems manager's role attractive — the increasing importance of the role of systems within the business.

The changing role of systems

He then explained how this role is changing, away from identifying isolated opportunities for competitive advantage, and towards a situation where the culture and the fundamental procedures and processes of the corporation can, with the help of IT, be continually re-appraised. While these features have always been critical to a company's competitive position, they were, in the past, largely unchanging and unchangeable. Today, the use of IT opens up the possibility of the designable business. Most corporations have not yet recognised that systems have the power to achieve this. Future competitive advantage — sustainable advantage — will come not so much from a corporation's systems, but from the speed with which those systems can be changed.

The future: a changing environment and new pressures

George Cox then looked at the future environment in which the systems manager needs to secure his new role and exercise this important power. A number of pressures will make this environment difficult and uncertain:

- The changing business environment.
- The changing climate for systems within the business.
- Changing technology.
- The changing external sources of supply of both technology and facilities.

He went through these in turn, progressively building up the picture shown in Figure 1. In particular, he stressed the need to re-educate the systems user about the implications. It has taken 20 years for users to come to terms with what computers *used* to be all about. They now understand transaction processing, but not strategic systems. They know how to use databases to produce accounts, but not how to use them as a powerful marketing tool. They understand applications, but not infrastructure. They understand controls, but not business-performance measures. They understand how to define requirements, but not how to structure a problem.

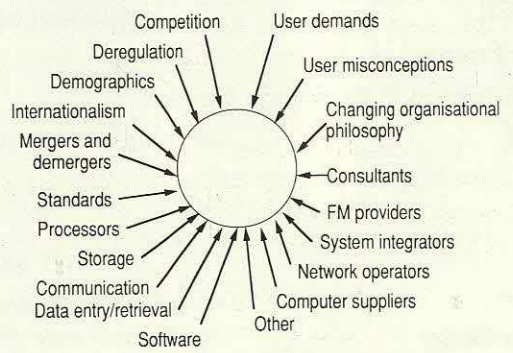
Conclusion

The future of the systems manager as a species hangs in the balance. There are opportunities and threats. The three main opportunities are the greater demand for systems, the greater importance of systems, and the greater facilities with which to deliver them. The two obvious threats are:

- A failure by the organisation to recognise the role and potential of systems — and hence, to recognise the future role required of the systems manager.
- Being 'reorganised' out of an effective role — because the view of the organisation is either that IT is now sufficiently well understood to enable it to be put back into the hands of the users, or that large businesses operate more effectively as smaller, more autonomous units.

There is a third, less obvious threat — the failure by the IT director to see and grasp the new role. Instead of looking inwards at the systems department, the IT director should seek to play a significant role in *shaping* the business. This can be achieved only if the IT director is immersed in corporate thinking and is an integral part of the senior management power group.

Figure 1 The pressure for changing the role of systems



List of delegates

Australia	
Australian Mutual Provident Society	John Kaunitz
Cadbury Schweppes	Richard Casey
Government Insurance Office of NSW	Christopher Nitsos
QBE Insurance	Peter Smith
Shell Australia	Ian Freer
Western Australian Department of Computing	Warren Harding
Austria	
Osterreichische Landerbank	Michel Ghanes
Belgium	
Belgische Boerenbond/CEM	Hubert Appelen
De Vaderlandsche	Yvan Vandersmissen
Digital	Josef Dermaut Ivo Stevens Eric Van Doorslaer
Monsanto Services International	Eric Marlow Richard Perera Henri Seynaeve
France	
AGRR	Daniel Lefebvre
Air France	Jean Cremet
Association Prévoyance Bayard	Jean-Claude Angoulvant
Bull	Michel Carbonnier Didier Chaussonnière Andre Chuffart Hervé Nora Jean-Paul Peyronnet Claude Salessy
Ciba-Geigy	Yves Pelliet
Crédit National	Gilles Claude
Digital Equipment	Carl Hemingway

France (continued)	
EDF/GDF	Robert Pic Claude Toulet
IBM France	Guy Collas
Jeumont-Schneider	Maurice Renaudie
Laboratoires Delagrange	Daniel Carré Michel Kleinprintz Thierry Rémond
Michelin	Phillipe Tassin
RATP	Arnaud des Rochettes Jean-Paul Ulrich
Rhône-Poulenc Informatique	Jean-Michel Le Nevé
SNCF	André Bouzy
SNPE	Gilles Roccia
Télémécanique Electrique	Jacques Joly
Télésystèmes Réseaux	Daniel Gilbert
Total-CFP	Michel Canolle
Germany	
Ciba-Geigy	Dietrich Henniger
Thyssen Edelstahlwerke	Helmut Grohmann
Ireland	
Aer Lingus	Pat Noone
Italy	
Banca d'Italia	Mauro Michelangeli Roberto Mori
Fininvest Servizi	Roberto Innocenti
Istituto Centrale di Statistica	Gerardo Giacommo
Italsiel	Massimo Manucci
La Rinascente	Ezio Bassanino
Japan	
Citibank	Nobuhiko Kakizawa
The Netherlands	
Bankgirocentrale	Hans Bakker
Dagbladunie	Henk Ter Meer Bert van den Berg
GCEI	Djoen Tan
IBM Nederland	Dick Nieuwkerk

The Netherlands (continued)	
Ministerie van WVC	Frans Huynen
Neddata	Frans Fransen
Nederlandse Philips Bedrijven	Jan Arisse
NMB Bank	Ruud Pruijm
Philips International	Bob Breimer Piet Trines
Rabobank Nederland	Evert Broekmans Fred van den Brink
Volmac Nederland	Piet Gielisse
Wavin	Gerhard Dikkers
Sweden	
Ericsson Telecom	Robert Alder
SKF Dataservice	Håkan Landahl
Vattenfall	Kare Bladin Anders Ottosson
Switzerland	
Dow Europe	Jean Bernardet
United Kingdom	
BOC	Gwyn Owen
BP International	David Eggleton
BP Oil	Marie-Anne Hosley
British Gas	Robin Laidlaw
British Gas Northern	Bob Spokes
Bull HN Information Systems	Dennis Chalk
BUPA	Frederick Rowe
Burton	David Jorgensen
Cardiff City Council	Mike Poulton
Citibank	Harding Bancroft
Department of Health	Peter Hills
Department of the Environment	Roger Bendall Mavis McDonald Bryan Rosser
Dixons	Olive Colville
ECGD	Geoff Codd
Girobank	Vladas Gedmintas
Glaxo	Malcolm Mitchell
Glaxo Export	Paul Morris
Glaxo Group Research	Vic Jacobson
Glaxo Pharmaceuticals	Iain Lee

United Kingdom (continued)

ICI	Ian Lang Maxwell Liversidge
ISTEL	Daman Raj Singh
National Power	Gerry Dunbar
Procter & Gamble	Robert Blofeld
Prudential	Christopher Clement
Rank Xerox	David O'Brien
Reckitt & Colman	Roy Ferris
Reuters	Heinrich Wenzel
Rolls-Royce	Alison Bateson
Surrey County Council	Bob Giddings
Swiss Bank Corporation	Felix Aeschlimann
Training Agency	George Dodsworth Mike Pender
TSB Group	Stephen Bligh
Unilever	Edward Ball
Union International	Michael Portlock
Unisys Europe Africa	Franco Di Cicco
S G Warburg	Jonathan Warner
Western United Investment	Gwyn Stone

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Richard Bowler
David Butler
Chloe Buttle
Charles Chang
George Cox
Carolyn Deuchar
Ian Dewis
John Kinnear
Graham Otter
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Frans Molhoek
Onno Schroder
Miriam van de Donk

Butler Cox France
Xavier Dalloz
Sabrina du Bourg
Michel Lederman

Butler Cox Germany
Klaus Heinrich

Butler Cox Scandinavia
Hakan Henriksson

John Cooper Associates
John Cooper

RSO Futura
Loredana Carpinella

SD Consulting
Dick Cahill
Julian Drury-Byrne
Tom McGovern

BUTLER COX
FOUNDATION

Butler Cox

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 Australia, Belgium, France, Germany, Italy, the Netherlands, Sweden, Switzerland, the United Kingdom, and elsewhere.

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 members' preferences are determined.

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 research 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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