ABSTRACT

The emergence of the *smart design* and the *intelligent building* will direct building developments in the eighties. Intelligent buildings are structures that include teleconferencing, telecommunications, local area networks, energy management, and other new information technologies. In an increasing number of cases, these buildings are designed by CAD systems.

Today architects are challenged to design buildings that incorporate the new office automation technologies to make people more comfortable, better connected, and ultimately more productive. In designing intelligent buildings, it is necessary to understand new technologies and review the management styles and communications infrastructure of those organizations using the intelligent building.
INTELLIGENT BUILDINGS: INFORMATION TECHNOLOGY AND DESIGN

The emergence of the smart design and intelligent building will direct building developments in the eighties. Intelligent buildings are structures that include teleconferencing, telecommunications, local area networks, energy management, and other new information technologies. In an increasing number of cases, these buildings are designed by CAD (computer-aided design) systems.

Today architects are challenged to design buildings that incorporate the new office automation technologies so people will be more comfortable, better connected, and ultimately more productive. However, simply introducing smart office equipment into an organization often results in barely-controlled chaos. This phenomenon is clearly evident in many office and building complexes where, for example, a continual rearrangement of equipment, desks, partitions, and people occurs. Because each workplace tends to have a complicated combination of terminals, telephones, and cables, more than one person and one department is usually involved in making the decisions about what and who goes where. Organizations will come to value design features that simplify the automation of offices and buildings. These design changes will run the gamut from good cable management to floor layout.

Some of the many technological and social factors affecting the approach taken to the design of intelligent buildings include the following.

1. Most of the technology which will have the greatest impact on office design over the next 10 years already exists and is in use by leading-edge organizations. How these technologies will be integrated with existing office technology and how rapidly the office worker will assimilate these systems into daily work life will be major issues.
2. Information technology is not easy to incorporate into office building design, but the intelligent building can provide vast numbers of intelligent services without requiring space; power and backup power; heating, ventilation, and air-conditioning (HVAC); and other support systems and management personnel.
3. The specification for intelligent buildings is more stringent than is generally assumed. Office buildings are presently described in terms of the way they are constructed; they are rarely described in terms of the way they are used. Data on how buildings can be designed to incorporate information technology are critical to planning.
4. Currently, office automation manufacturers have addressed only micro-issues in the work environment. Innovators will provide a systems approach.

In designing intelligent buildings, it is necessary to understand new technologies and to review management styles and the communications infrastructure of organizations using the proposed building.

Though data processing decisions have been monopolized by specialists, this trend is rapidly fading as more and more user departments are making the decision to purchase and control their own systems. Moreover, now that the interface between telecommunications and data processing has been made technically feasible, and people understand that connection, the complexity of decision-making about information technology within the organization has increased. There is controversy about who will manage the new and converging systems, and whether management should be carried out in-house or by systems integrators.

Information technology, especially office automation, is likely to change the way organizations make decisions about the allocation and type of space needed. Studies such as The Orbit Study, carried out by Duffy, Eley, Giffone, and Worthington in England, show that a great deal of coordination is required between servicing departments having maintenance responsibilities and the operational departments that procure and use the equipment. The difficulties experienced in installing equipment and distributing terminals illustrate just how interdependent buildings and work operations have become. Consequently, building managers and computer systems personnel often become involved in decisions about future building requirements.

The Orbit Study indicates that a more discriminating client is emerging who will no longer judge buildings solely on traditional criteria (location, rents, finishes, etc.), but on the basis of how well information technology is taken into account throughout the entire building system. Presently, the needs of information technology do not appear to be adequately understood either by suppliers or consumers of office space. Good building performance criteria are sorely needed, and related studies should be a tested. Known rationales for integrating information technology into building designs are as follows.

1. Information technology represents an enormous increase in the levels of capital investment. The hope is that new technology will lead to increased productivity, staff morale, and profitability.
2. There is concern that the office environment be suitable for both in-house and telecommuting employees; specifically, competition for staff knowledgeable of the new

office technology is increasing (such staff is in short supply in many areas). The quality of the office building environment is likely to influence the choice of jobs and the length of time people stay with a particular employer.

Telecommuting is presently in its infancy, but with changing employee goals it is a high growth area. The office building environment will be altered as a result of employees working at home or on the road. Intelligent buildings should have the capability for connecting telecommuting employees.

3. Pressures from building owners who constantly stress the need to reduce costs and manage building facilities (air, space, energy) more effectively will force the issue of incorporating new technology into building apparatus.

There is a strong need to take the long-range view of the office building and information technology. Certainly other trends will affect development of the various types of intelligent buildings required. Many of the driving forces behind intelligent buildings include the following.

1. The number of small, fast-moving, innovative entrepreneurial firms is likely to increase sharply. Such organizations will adapt to the new information technology more rapidly than older, established organizations and will demand intelligent services as part of the work environment.

2. Home and neighborhood work centers are becoming economically viable. These operations will need high-speed communications links to near or distant headquarters.

3. Large organizations are increasingly delegating decision-making to smaller and more autonomous business units. Improvements in all forms of communication are, in turn, increasing the available options for organizations to either centralize or decentralize their operations. For example, it is becoming possible to centralize administrative services while decentralizing production.

4. There is an accelerating trend among large organizations to cut down main office support and service functions by reducing the number of in-house personnel and contracting out work.

5. There is more pressure on building designers to include more service options such as health centers, video conferencing, and even housing.

6. Information technology affects not only the size of office staffs and building requirements, but the ratio of skilled to unskilled employees; it necessitates a different combination of professional, managerial, clerical, and secretarial staff.

7. Greater accessibility to information via computer networking and improved communications will change traditional functional and departmental (space-geographic) boundaries. In the past, office workers needed to be close together in large office buildings. Now they can be located thousands of miles apart and still "feel close" to one another.

Intelligent buildings can also play a major role in the integration of building services. Many organizations simply "bolt on" new technologies, telephones, local area networks, teleconferencing equipment, and satellite receiving dishes; but intelligent buildings require an integrated approach to be successful. The following is a list of major products and services suggested for intelligent buildings.

Intelligent Building Management
1. Online administration and financing
2. Computer-aided design space management
3. Online facilities management and planning

Intelligent Command and Control
1. Life support and comfort—personal comfort environments
2. Online power management
   uninterruptable power supply systems
   power generation
3. Wire management—building and local area networks
   (BAN/LAN)
   power
   computer
   telephone
4. Online building control
   remote administration
   simulations
5. Maintenance
   repair and diagnostics
6. Security
   access and reporting
   protection
7. Traffic
   flow
   accounting and control

Information Technologies
1. Shared-tenant—telecommunications
   video teleconferencing
   audio bridging services
   audio-graphics presentation equipment and computer-generated slides
   sale, rent, or lease of telephone station equipment
   sale, rent, or lease of data communications systems
   sale, rent, or lease of computer and office systems
   intercom-only calling service
   access to local calling service
   standard and advanced calling features
   automatic least-cost calling
   installation of systems

maintenance of systems
moves and changes
billing and management reports
special account codes
authorization codes
toll restrictions

2. Messaging
telephone answering
electronic text messaging and network interface
voice mail

3. Network interface—carrier and bypass
access to CATV network/programming
access to external online databases
remote access ports
modem pooling
packet network interface

4. Paging
speaker
pocket pager
cellular telephone

5. Tenant/text—building directory and information systems (online concierge)

6. Archival storage
online storage
vault storage and document shredding

7. Intelligent/movable/programmable office environments

8. Online word/data/info processing—OCR/Facsimile/Telex
9. Tenant support and training (CAI)
10. Encryption—systems security

Intelligent Resources

1. Conference and situation “war” rooms—online room scheduling
2. Temporary services—leased staff
3. Package, courier, and delivery services
4. Travel, conference, and meeting planning services
5. Day care and health/recreational gyms
6. Print/copier/office supplies/services
7. Interior design services (CAD)
8. Educational/training services

CONCLUSION

Intelligent building design stands today where data processing stood 25 years ago. Many knew then what data processing could do, but they did not understand how to do it and did nothing about it. Now is the time to do something about intelligent buildings.
Panel: Smart buildings for intelligent people

Chair:
THOMAS B. CROSS, Cross Information Company, Boulder, Colorado

Members:
FRANK DUFFY, DEGW, London, England
GORDON LORIG, AT&T Resource Management, Basking Ridge, New Jersey

This session discusses the interplay among design, technology, and networks in planning, designing, and implementing intelligent buildings. Issues with respect to local area networks, data communications, integrated micro-mainframe networking, and building management systems are presented.

Panel: Electronic mail—benefits and challenges for the user

Chair:
STEPHEN J. DURHAM, Cermetek Microelectronics, Inc., Sunnyvale, California

Members:
DOUG BRACKBILL, MCI Mail, Washington, D.C.
NINA BURNS, Transend Corporation, San Jose, California
OWEN GREESON, Microstuf, Inc., Rosewall, Georgia

Electronic mail represents an inexpensive communication system that almost any firm can use and that generally enhances office productivity.

The benefits of such a system are not without challenges. The user must understand how to integrate electronic mail into the office environment. Can existing office data communication equipment work, or must new equipment be installed? Should electronic mail be sent through a store-and-forward database, or should it be sent directly to the user? This session considers these issues and other problems associated with initiating an electronic mail system.
Panel: Managing information centers

Chair:
HENRY DELEVATI, Information Builders, Inc., San Jose, California

Members:
BART BENNE, Texas Instruments, Inc., Richardson, Texas
RANDY CASTO, United Telecom, Westwood, Kansas

This session covers areas of interest in today's information center environment. Panelists discuss the concept, yesterday and today, how centers have been run, and past mistakes. The issues addressed include staffing, what skills to look for in IC consultants, user education and training, hardware and software support, user support levels, management strategy, and management acceptance.

Panel: Managing development centers

Chair:
STEVEN GILMAN, Information Builders, Inc., El Segundo, California

Members:
JIM TAVS, Dean Witter Reynolds, Inc., New York, New York
ANNIE WANG, American Medical International, Beverly Hills, California

This session explores issues in the emerging fourth-generation-language application development world. It covers topics such as what types of systems should be developed, the size of the systems, the cost, and who pays for them. Key issues involve prototyping methods, implementing standards and procedures, staffing criteria, and differences from traditional development. Among the questions addressed are the benefits and production implementation of prototyped systems.
Panel: Choosing application software—the end user view

Chair: RICHARD L. LINTING, Arthur Andersen & Co., Chicago, Illinois
Members: RON ERNST, Puget Sound Power & Light, Bellevue, Washington
         JOHN HARRIGAN, State of California Controller’s Office, Sacramento, California
         MARCUS HARWOOD, Hayes Microcomputer Products, Inc., Norcross, Georgia

More and more companies are realizing the importance of packaged software, but they are also realizing that it is not a foolproof solution for meeting their information needs. This session helps users and data processing personnel focus on what is required to develop a strategy for the successful use of today’s application software packages. Specifically, this session will address two major subjects:

—Essential issues to be considered before selecting a software package. Consideration will be given to the newest technologies incorporated in today’s modern application software architectures.
—Key steps in a successful packaged software implementation and some of the frequently encountered pitfalls.

Panel: The micro-mainframe connection

Chair: CHRISTINE G. HUGHES, Gartner Group, Inc., Stamford, Connecticut
Members: ROBERT FORTELKA, Pansophic Systems, Oak Brook, Illinois
         H. F. JONES, Commonwealth of Virginia, Richmond, Virginia
         DENNIS VOHS, Management Science America, Atlanta, Georgia

The proliferation of workstations is real; and with the installed base of PCs at a new level, the market demand is for connectivity. The micro-mainframe link as a promising solution to this connectivity need is discussed from two perspectives, that of the end user and that of the vendor. Panelists discuss a broad range of topics, including a definition of the micro-mainframe market, the problems and benefits of such an implementation, the viability of generic versus vendor-specific solutions, market development issues and their impacts on other products and markets, and what IBM will eventually endorse.
Panel: Managing end user computing

Chair:
WALTER POPPER, Index Systems, Cambridge, Massachusetts

Member:
WILLIAM J. SYNWOLDT, Houston Lighting & Power Company, Houston, Texas

Most organizations spend enormous time and effort in planning for traditional information systems. Yet they spend very little in planning for end user computing, even though in most companies it is the fastest-growing component of the information systems spectrum. This session addresses management planning techniques for end user computing and office systems. Included are an outline of planning approaches from the perspective of a consultant and an analysis of these techniques from the perspective of a practitioner.

Panel: The ergonomic revolution

Chair:
HOWARD J. MacKENZIE, Stamco Office Products, Chicago, Illinois

Members:
STEVEN D. HERRON, National Safety Council, Chicago, Illinois

A comprehensive overview of the issue of ergonomics is presented. The panelists consider how productivity, health, and morale are affected by such diverse factors as the VDT, lighting, sound, visual distractions, and office furniture. The presentation includes results of studies concerning ergonomic problems and commentary on legislation that is beginning to spring up nationwide regarding these issues.
INFORMATION SYSTEMS MANAGEMENT

MARVIN EHLERS, Track Chair
Natural Gas Pipeline of America
Lombard, Illinois