TECHNOLOGICAL EXPLOSION

The Technological Explosion in the Workplace

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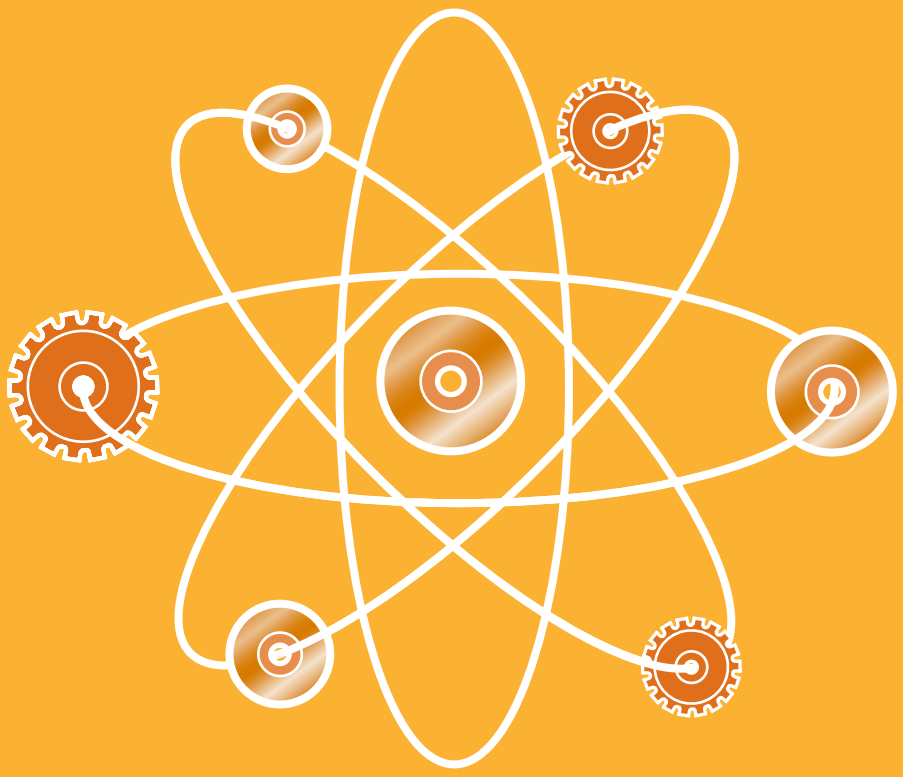

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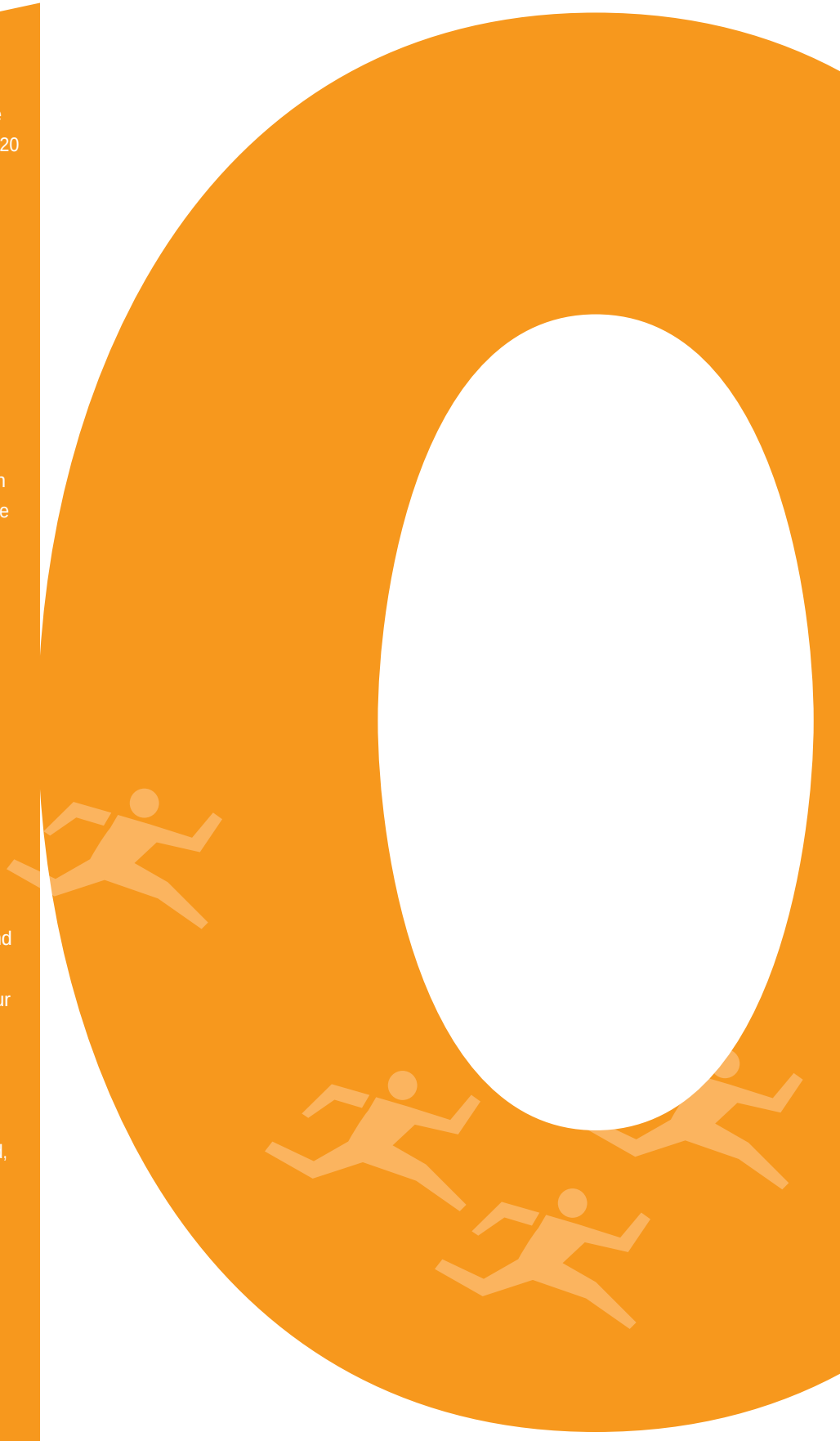
Let’s look at the next ten years...

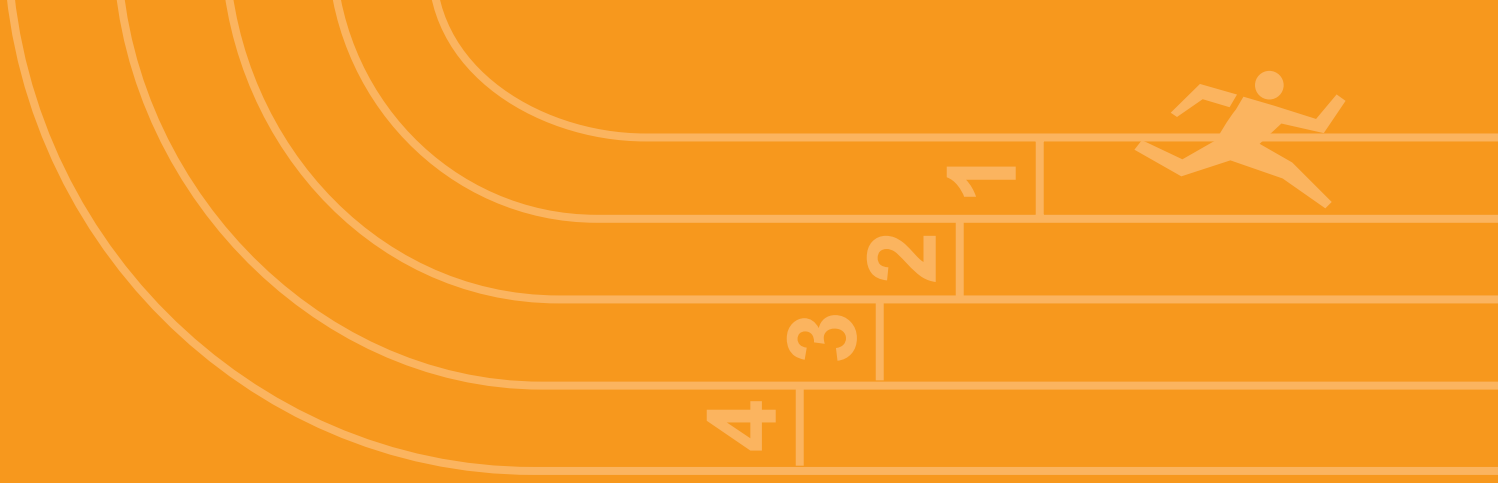
The alarm goes off at 6 a.m. At 6:10, the coffeemaker starts percolating, and at 6:20 the lawn sprinklers go on for exactly 30 minutes. All of these activities are coordinated by your computer, which was programmed the night before. A combination of expressway sensors, global-positioning systems, and in-car computers allows you to read the paper, use your laptop, or talk safely on your cellular during your commute to work.

At work, your office assistant’s workstation consists of an optical scanner built into the work surface, allowing paper documents to be fed into the computer’s magnetic or optical memory. Controlled by voice command, a 3' x 4' screen provides a link to the office’s computer network for face-to-face communication. Documents can also be displayed while talking.

Voice recognition features allow file creation and management commands that eliminate keyboarding, as well as control lighting and temperature in the workstation. All of the PC electronics fit inside the flat-panel monitor. Walk-around cordless phone/PDAs keep you in touch throughout the building; they become your cellular phone when you leave the office.

“Transpaque” panels are used to separate workstations. The panels become transparent at a voice command, and then at another command become opaque for visual privacy. Your chair automatically adjusts to your body size and height. The workday begins.





The Ever Increasing Pace of Technological Change

From the invention of the telephone, to the proliferation of the computer and beyond, technology has continually changed the way firms do business. The pace of technological change keeps getting faster. In 2000, there will be nearly one computer per person – that is five times what was the case in the 1980s.

According to International Data Corporation (IDC), in 1997, PCs accounted for 96% of Internet access devices shipped in the U.S. By 2002, PCs will account for only 50%. A new array of access devices may begin taking over, including TV set-top boxes, Web-enabled telephones, Web-enabled personal digital assistants (PDAs), and Web-enabled video game consoles. (1)

From the 1980s to the mid-1990s, new design challenges associated with office and information technologies emerged. To automate office correspondence, the personal computer was used to process both data and words, freeing users from the constraints imposed by mainframe computers. Technologies such as desktop publishing, facsimile, laser printers, videoconferencing, and voice mail became more pervasive.

Facility planners found themselves facing more problems than ever before as they wrestled with the integration of both people and technology in their workplaces.

Office design centered around accommodating the PC with the primary focus on cable delivery and management. Minimal attention was paid to the peripherals. Power and communication outlets moved above task surface height, wire trays were introduced, and the grommet for pulling cables through the task surface became commonplace. Panels of various heights and sizes, for providing visual and acoustical privacy, continued to dominate open space planning.

The definition of individual versus group space is under constant review because of emerging computer and telecommunications technologies. Individuals can rapidly exchange messages and data via computers and groupware/conferencing software over distances. These technologies provide the opportunity for organizations to ignore geography and conduct activities – even transglobal – as though they were local.

Emerging computer and communication technologies will continue to drive change in the offices of the future. Technology will impact how we connect, input, conference, and process information.

"I feel the trend is toward the co-existence of multiple planning concepts. Instead of one across-the-board set of space standards, there will be more flexible, variable standards. Space standards will be driven by technology. As new technology is introduced at an increasingly faster pace, office spaces will have to be able to change and adapt quickly to changes in how business is conducted."
Bill Krebs, WCE Facilities Strategist and Designer

"Throughout the 1980s, the goal of the developer of a smart building was to ensure its technological supremacy. Two key trends have changed this outlook in the 1990s. The first is attitudes toward workplace motivation. Productivity is enhanced through flexible use of space and technology that radically changes the process of undertaking work. Technology has evolved from a high-investment business-driver to a business enabler."
Eric Loe and Piero Patri, Lusk Review (2)

What Are the Design Challen

Today, it is essential that office facilities support people, information media, and electronic tools. New computer and communication technologies are redefining the meaning of the "office" and the appropriate use of various alternative design solutions. The issues that need to be addressed include:

ges of the New Millennium?

1. Support Changing Organizational Hierarchies
2. Integrate Technology to Enhance Human Productivity
3. Shift from Computational to Collaborative Technologies
4. The Electronic Meeting Place
5. Voice Recognition Systems and Acoustical Privacy
6. Growth in Laptops and Appliances
7. Growth in Communication Options, Wireless, and Internet
8. Shift Away from CRTs to Smaller and Thinner VDTs
9. Storage: Paper-based and Beyond
10. The Real Estate Industry

1 Support Changing Organizational Structure

Organizationally, people are beginning to become more comfortable working together and seeing each other as partners, rather than “boss and employee” or “manager and managed.” Organizational hierarchies are breaking down and semi-autonomous teams are forming. Planners of team spaces must provide for both individual privacy and team interaction. In team spaces, computer technology, visual display equipment, and telecommunications equipment must be supported, including access to data ports and power connection points.

A person can have an office anywhere – home, office park, or airport. This changes the need from a tethered, static office design, to a more active plan.

2 Integrate Technology to Enhance Human Productivity

Although an office can be up-to-the-minute technologically, if the hardware doesn't comfortably integrate with workers' human environmental needs, productivity will suffer. Employee resentment or confusion may actually undermine planned efficiencies and savings. Effective technology integration is becoming recognized as the greatest challenge facing designers and facility planners.

Health problems will become more of an issue in the future, as more office workers spend extended periods of time using computer technology in their offices, especially in fixed positions. In these cases workers tend to develop health problems such as eyestrain, backaches, and headaches. These problems can often be avoided through a proactive approach by eliminating many of the causes of cumulative trauma disorders in the office. This may include providing personal support tools, such as adjustable keyboard pads, sit-to-stand tables, and ergonomic chairs.

Increasing numbers and types of automated office hardware will challenge the adequacy of a buildings' HVAC (heating, ventilating, and air-conditioning) systems to meet the comfort demands of office workers. Facilities managers need to address sources of indoor air pollution, such as inadequate ventilation, chemical contamination from inside the building, microbial contamination and contagion from the building fabric, and people themselves.

The human factor will continue to present the most difficult challenges in the office of the future. Meeting the psychophysiological needs of office workers, by providing good ergonomic design solutions, is an appropriate strategy for keeping pace with the continuing office automation revolution.

Facility planners are incorporating holistic approaches to productivity planning into their designs and architectural plans, which take into account not only emerging computer and communication technologies, but also workers' health. Productivity can be achieved only through an approach that integrates people, their tools, training, and the environment.

The outcome of one's planning efforts should be a set of planning guidelines that support an organization's strategic plan.

3 Shift from Computational to Collaborative Technologies

In the next several years, personal computers and related applications will support more mobile computing, voice recognition, incorporate intelligent agents to customize routines and data to personal needs, and become more of a communications rather than a computational device. Expect flat panel displays, wireless data networks, and the elimination of the bulky PC.

Computers may become ubiquitous and could dissolve into the walls and background, as well as be embedded into walls, tables, and chairs by 2005. (3)

Computing will shift in the next few years from an emphasis on personal productivity to an emphasis on communications. Desktop virtual reality already lets teams of workers explore virtual prototypes together and conduct simulations interactively. In the next few years, this will include 3-D collaborative enterprises – teams throughout the company from various departments will work together on the same data using real-time 3-D visualization.

4 The Electronic Meeting Place

Electronic meetings using video and computer groupware software will soon become a standard, cost-effective forum. Multifunction meeting and training rooms, supported by distance learning multimedia technologies, will support just-in-time training requirements enabling workers, worldwide, to keep pace with rapid corporate change.

These electronic meetings will take place from the desktop, as well as from smart conference rooms and teaming areas. The conference room and teaming area should be redefined as a GROUP WORKSTATION equipped with a variety of technologies, such as desktop videoconferencing, portable video conferencing units that can be moved around a facility, LCD projection screens for PC presentations, VCR projectors with connectivity to personal computers, smart whiteboards, docking stations for laptops and fax machines.

The videoconferencing systems and services market is expected to grow from $78 million dollars in 1998 to $1 billion in 2001. (4)

Computer-based training, multimedia/CD-ROM, and experiential exercises are predicted to be the three most used technologies in 2006 in Education and Training. The Internet will create a web-based training market expected to exceed $1 billion in the year 2000. (5)

In addition, VideoWEB technology transforms spaces into virtual conference rooms. Full-wall, life-size images will make videoconferences feel like face-to-face meetings. This capability is already available in selected hotels with Telesuite.

Multimedia technology will need to be supported and will require appropriate infrastructures in meeting rooms, teaming areas, distance learning, and training rooms. Furniture implications include the need to incorporate flexibility via modular tables containing built-in power cable management with desktop height plug-ins.

welcome

5

Voice Recognition Systems Will Require More Acoustical Privacy

Increasingly, voice recognition systems are being used as a form of input to personal computers. Today's commercial voice recognition applications provide "command and control" capabilities under which users can issue spoken commands to select menu items, launch macros, and click buttons. In the near future, speech will become a major component of user interfaces.

Future interfaces will incorporate a combination of *articulated* input types called multimodal input: mouse, voice recognition, speech to text, handwriting recognition, face or gesture recognition, and computer vision (the ability to observe the surroundings).

An application of computer vision could be intelligent videoconferencing; i.e., observing and reacting to the body language of those involved in a meeting. In addition, a 3-D Visual User Interface will replace the 2-D Graphic User Interface in the next decade. (6)

Acoustical privacy will become a more important issue than in the past, as workers speak more while "alone" at their desk, whether instructing their computer or videoconferencing with it. In both situations, issues of concentration and confidentiality are paramount. Facility planning solutions include higher panels, closed offices, line-of-sight space planning, and masking sound. Panels can surround flexible, user-adaptable furniture with multiple applications, and perimeters can be designed for groups to contain their noise. Sound-masking systems may be the best solution for dealing with voice recognition computers, while retaining the benefits of open office plans.

6
Growth in Laptops and Appliances

Laptops will increasingly represent a significant share of the personal computer market. Laptop and desktop technology may converge into a portable computer concept. Voice input, active matrix screens, multimedia, and wireless connectivity will become standard. Docking stations or power/telecom ports will be increasingly important for offices, conference rooms, lounge areas, and homes.

Several types of appliances will emerge as network computers (NCs) in the next few years, including a JavaStation to support Java OS. In 2000, 80% of all PCs will be networked. (7) Demand for computer network servers will continue to explode because of the need to host Internet websites and fairly extensive corporate networks that link employees and suppliers. According to Mike Kwatinetz, Director of Technology Research at Credit Suisse First Boston, global software spending should grow from $130 billion in 1998, to $230 billion in 2002, and the PC server market should double to $30 billion. (8)

In the next decade, equipment will be linked through both cable and wireless networks, challenging planners in creating effective systems of cable delivery and management. Facility problems of upgrading cable and office reconfiguration will be inevitable.

The advance of information technology provision systems includes the possibility of fiber optic cabling and wireless interconnectivity which would allow the design of interior spaces to be more free and less conscious of connectivity points. These developments will dramatically reduce the size of a building's cableplant by greatly reducing the required number of wire-runs.

Furniture implications include the need for increased flexibility, for LAN, and for power access points throughout a space. In addition, these more portable and personal technology devices will create a new secured storage need. It will also change space planning from corner-based computer worksurfaces, therefore reclaiming desk space.

7
Growth in Communication Options, Wireless, and Internet

Wireless communications will continue to be introduced on a larger scale. The goal of AT&T Wireless, Hughes Network Systems, and other companies is to provide one telephone-like device for use in the office, around the campus, and on the road. Wireless technology will increase mobile computing with PDAs that integrate computing, text, fax, and Internet access. Satellite feed will become the most widespread transmission mode worldwide by 2010. (9) New hybrid phones will also emerge over the next 5 years offering E-mail and Internet capabilities, as well as the capability for fax over the Internet.

Many mobile phone users will replace their cellular phones with new digital mobile phones over the next 5 years, supporting the growth in Personal Communications Services (PCS) which are projected to grow to 27 million subscribers by the end of the year 2000. Expect in the next several years, graphical cell phones that will display color images and even video.

ISDN and other communication technologies, such as cable modems, will be among the means for offering simultaneous extended-quality, on-demand video services, interpersonal communications, and high-speed data and image communication among fax machines, workstations, and computers.

Although ISDN is currently the more widely used telecommunications pipeline, this will change as new software coming into the market provides for 12 to 15 frames per second and higher over telephone (POTS) lines, impacting video usage over the Internet. (10)

The subcategory of computer telephony integration indicates the emergence of new computing platform standards for interfacing with an organization's telephony infrastructure in the next 5-year time frame. All of these communication innovations have to be managed from workstation cabling issues to the infrastructure of the building.

CPUs with gigabytes of RAM and terabytes of storage

Portable electronic slates or notebooks

Virtual reality software will move from games to becoming a useful business tool, e.g., virtual reality catalogs

Electronic paper

Thin, fabric-like LCD screens, possibly foldable

Digital desktops

What Technologies Will Emerge

Electronic post-it notes

Holographic CAD will become an important design and planning tool

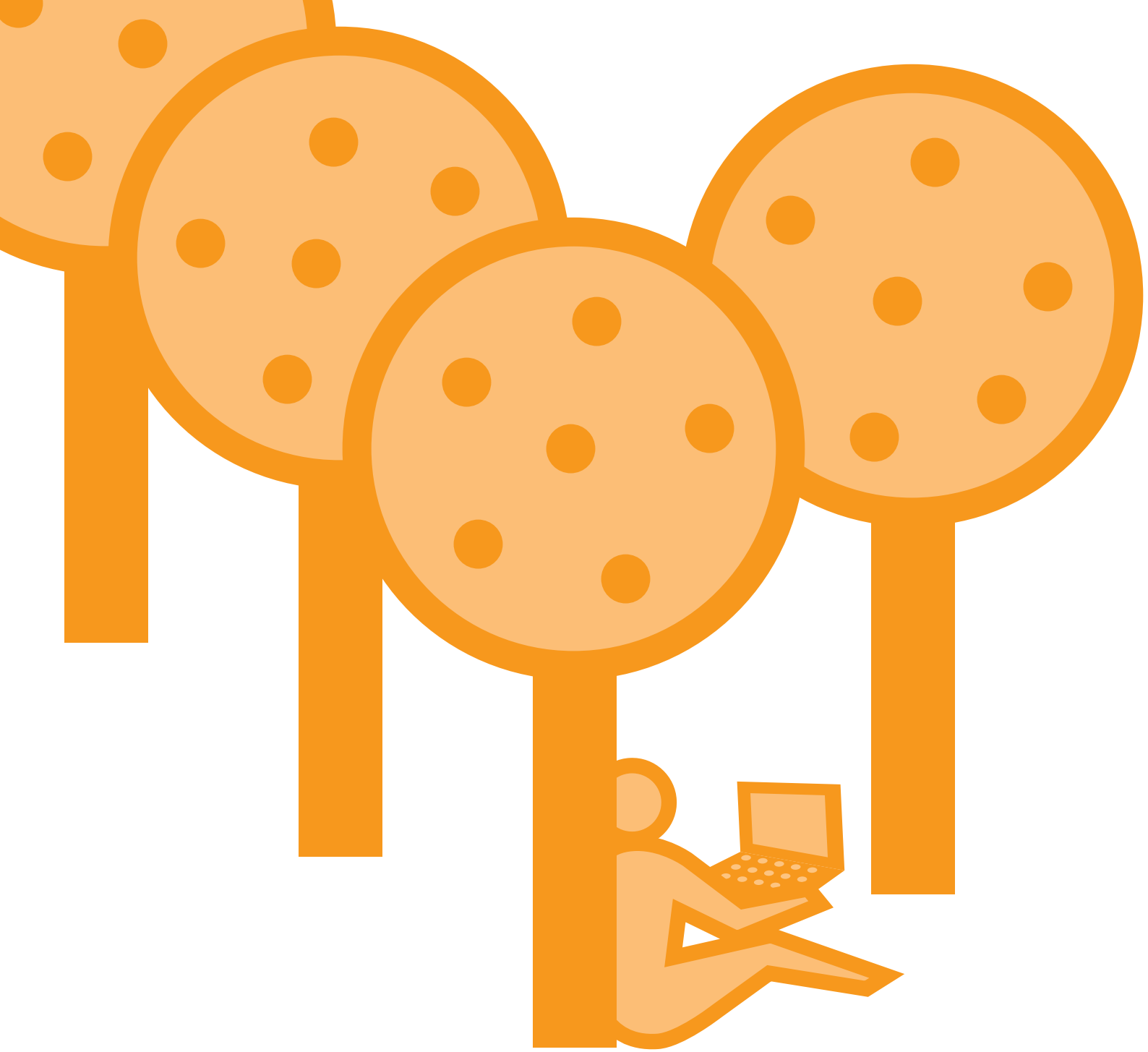
Three-dimensional holographic scanners to scan the object itself (11)

in the Next 5 to 10 Years?

Wearable computers will become important for specialized applications

Natural language processing, human-interface systems that detect body movements and will recognize gestures, eye contact, voice, and bioelectric signals, giving rise to gesture-based input and thought-controlled computing (12)

Personal communications networks



8 Shift Away from CRTs to Thinner VDTs

Demand is growing for 16'' and 17'' screens. 20'' and 27'' screens are becoming increasingly popular at CAD and CAE workstations. A 20'' CRT screen will not fit under many overhead storage cabinets. Until bulky PCs and monitors are eventually replaced by flat screens, dimensions of equipment, as well as power/cooling requirements, continue to drive task surface requirements.

Meanwhile, the flat panel market is anticipated to grow at the rate of over 20% annually, providing for larger screen viewing.

Flat screens will allow offices with shallower worksurfaces. Deep computer corners will no longer be necessary. The positive side of this change is that the amount of square feet previously occupied by bulky monitors can be reallocated to the end user.

Lightweight, head-mounted displays, called PDs (personal displays), will emerge in the next five years. These will be used with virtual reality software and employ gyroscope-based motion trackers that keep user movements and the virtual world in sync at 30 frames per second. (13)

9 Storage: Paper-based and Beyond

Facsimile will continue to proliferate in offices and be supported by fax servers connected to an LAN with transmission over the Internet, as well as over telephone lines. Large fax machines able to accommodate blueprint drawings and color fax machines will also enter the marketplace. Multifunction processors will incorporate fax, copy, scan, and print technologies and be networked to desktop PCs.

CD-ROM and optical storage technologies will become indispensable for the storage of massive amounts of information to be communicated in the l990s. Electronic libraries will also make information available in a variety of media: text, images, sound, and full-motion video. (14)

Nanotechnology (ultra tiny machines), biomolecular computing, and neural networks will transform organizations. These technologies will store and manipulate virtually endless amounts of information, as well as approximate human capabilities for thought.

The centralized records management storage area will experience the use of optical disc technology. Although electronic record systems will challenge the need for centralized file rooms, lateral and vertical filing cabinets will still be required in individual offices and departmental work areas for the foreseeable future. This is made evident as computer usage increases and PC users print out E-mails, make copies of faxes, and carry files with them to read on the evening train.

10 The Real Estate Industry

The real estate management industry should seize the opportunity to provide new service for its tenants. Infrastructure, the skeleton of a smart building, is vital to support a tenant's technologies.

The Real estate management should focus on enabling both large and small clients to "futureproof" their technologically related business practices.

What are the implications of information technology for the real estate industry?

- Location of the physical workplace will become less important as virtual collaboration increases
- The space needed per person will continue to shrink as technology becomes more miniaturized
- Better technology will allow more companies to turn to telework, reducing the demand for real estate
- As overall demand for space diminishes, demand for technologically integrated and healthy spaces are increasing, resulting in reduced real estate revenue and increased square foot costs
- Lower real estate demand will increase pressures to renegotiate leases
- Leases may not be sacred as companies may chose to file bankruptcy to break a lease
- Buildings will not become empty overnight, the impact will be cumulative over the next decade

Summary

The next decade will witness many breakthroughs and changes in how office workers use technologies, set priorities, make decisions, and collaborate with each other.

The greatest challenge will be providing adaptable and flexible facilities which anticipate future changes – to meet the greatest challenge of all – the human productivity challenge!

Follow These Futurevisioneering Principles During Your Technology Planning Process

Examine current and projected technology requirements relating to facility implications and corporate goals.

Maintain a state-of-the-art awareness regarding technologies, facility design, and changing officing paradigms.

Plan for reconfiguration, flexibility recognizing the implications of technology, power, telecommunications, and HVAC infrastructures.

Build the required infrastructure to support both today's and tomorrow's technologies.

Consider the psychophysiological requirements and implications of technology on end-users' individual and group spaces.

When programming an office facility, concentrate on what people do rather than on spaces, per se, recognizing new work tasks.

Select furniture that is best suited for new work patterns.

Design for wire management and provide technology connectivity in both private and shared spaces.

Focus workplace design on integrating technology with flexible connectivity.

Establish an ongoing training and intelligence gathering procedure that will help your planners and facility managers absorb and plan for the oncoming technological impact on space and work environments.

Establish corporate criteria for acoustical privacy.

Develop new space planning strategies to support collaboration, as well as for supporting people in new non-hierarchical corporate cultures.

Design rooms to appropriately support high-end video teleconferencing.

Eliminate or modify outmoded standards and consider alternative officing paradigms.

Vision

ENDNOTES

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