

The Intranet.

Retail stores. The company collects data from its 1,200 retail stores around the country and fills hundreds of product reorders electronically. All stores are on the Cool Sportz intranet, a secure link that traverses the Internet. Cool Sportz also “pushes” information on promotions and discounts to its stores.

Employees. Instead of phoning the Human Resources department, Cool Sportz staff refer to an electronic version of the employee book on the company intranet. They use a Java-based application to change their investment and health-care options and calculate their retirement benefits. Expense reports filled via the intranet are paid within 48 hours.

COMPUTING LAYER

A computer environment supports information processing in EII through the following building blocks:

1. Computer sets, divided into the following classes:
 - Supercomputers (ex. Cray T90),
 - Mainframe (e.g.: IBM ES/9000),
 - Midrange (e.g.: IBM AS/400),
 - Server (e.g.: IBM RS/6000),
 - Desktop PC,
 - Mobile PC,
 - Network Computer, NC (IBM Network Station),
 - Internet browsers (e.g.: WebTV),
 - Hand-held computers,
 - Other.

2. Operating systems (a layer software that resides between hardware and application, which manages the execution of programs and the data flow among devices), such as:
 - Server/host operating systems (IBM MVS, VSE, VM, OS/400, DEC VMS),
 - Server operating systems (Novell NetWare, MS Window NT server, Unix),

- Desktop operating systems (DOS, Windows, MS Window NT Workstation, MacOS, Unix, Linux),
 - Mobil operating systems (MS Windows CE, GEOS, Magic Cap, Apple Newton).
3. Programming languages:
 - 3 GL - generation languages (e.g.: COBOL),
 - 4 GL - generation languages (e.g.: Information Builders FOCUS),
 - Object languages (ex. C++),
 - Visual languages (ex.: Visual Basic),
 - Other.
 4. Data Management:
 - Database Management Systems (Oracle, Access, SQL),
 - Data Warehouses (IBM Visual Warehouse, OmniWarehouse),
 - Data Mining (KnowledgeSeeker, IBM Intelligent Mining Tool).
 5. Developmental tools:
 - Computer Aides Software Engineering (CASE) for system design and analysis, source code generation, documentation creation, and so forth (Oracle Designer, 2000),
 - Object-oriented Development Environments (IBM Visual Age, DEC Visual Smalltalk),
 - Component Base Development (CBD) such as enterprise objects ("customer," "employee," "product,"),
 - GUI (Graphic User Interface) toolkits (HyperCard, CenterLine, HP C+++),
 - Web tools for the presentation of information, design of transaction systems and information retrieval (ex.: Front Page, Sapphire/Web, WebObject, NetCraft),
 - Other.

Computer platforms are organized into the following computer configurations:

- Independent computer configuration – one computer used by in-house users,

- Computer interconnection configuration – at least two or more computers are organized into clusters in order to increase the reliability of real-time applications, such as at banks, air-traffic control, or military command and control,
- Computer distributed configuration – where according to the 20/80 rule 20% of information processing takes place at the headquarters level and 80% of information is processed at the departmental level. A network of departmental computers is connected to the headquarters' computer,
- Computer multi-system configuration – where several computers are geographically dispersed among a company's units and interconnected through a network,
- Client-Server configuration – is organized around a Local Area Network (LAN) where servers store files and application software which are accessible by client computers with a limited scale of their own resources,
- Network computers (NC) configuration – inexpensive, "thin" computers are connected to Local Area Networks (LAN) or to Value Added Networks (VAN) which on the fly mode provide necessary software and files to client NC's.

COMMUNICATIONS LAYER

PBX

Private branch exchange (PBX) is one of the oldest communication services. It connects external telephone callers with internal extension numbers. PBX is also applied to data transmission at a speed from 19.2 KB/s to 196 KB/s within ISDN service. The latter is AT&T Integrated Services Digital Network (ISDN), which provides multimedia transmission through a twisted pair of telephone lines. Instead of building an autonomous LAN, PBX may be applied as a LAN.

Voice Mail

In voice mail the sender can record a verbal message (voicegram) and send it later either to one or to many receivers (broadcasting). The most frequent procedure is to store a voicegram on the receiver's answering machine. A voicegram can also be forwarded to more receivers by any one of the receivers. Voice mail is the most popular telephone-based system of communications. This system can avoid the following negative factors:

- wasted time on unsuccessful attempts ("telephone tag") to reach a party,
- many calls to individuals by broadcasting messages that are in nature one-way communication,
- costs associated with chatting by sending a voicegram during off peak time, when rates are lower.

E-mail

A typical electronic mail (e-mail) system provides the following functions:

- new mail message composition, including spelling checker,
- address book handling,
- message management which includes such functions as:
 - scanning the incoming messages,
 - filtering incoming messages for unwanted contents,
 - replying to received messages,
 - forwarding received messages,
 - redirecting received messages,
 - broadcasting new messages,
 - organizing folders; message filing and retrieval,
 - automating signature,
 - managing written attachments,
 - managing video and audio attachments,
 - managing attached Web pages,
 - notifying message, received and/or read by the receiver,
 - saving and/or printing messages,
 - other.

- security management,
- other.

With the advent of the Internet, an e-mail client had a simple mission: to transfer e-mail across the Internet or across a proprietary, in-house system. But as the number of e-mail users has increased dramatically and their addresses have become a target of marketers, e-mail systems have become more complex now. Their mission is to manage all messages that land in the user mailbox. These messages include news digests, notices about software updates, and messages from mailing lists, including junk mail that has become an occupational hazard for eager e-mail users. Many users have more than one account and new systems take care of managing all the user's accounts.

From simple communication programs, e-mail clients are evolving into true productivity applications that help the user work smarter and faster. Among such e-mail software are Eudora, Lotus Mail, Netscape Communicator, Microsoft Outlook, Pegasus, and others.

E-meeting

A typical electronic meeting (e-meeting) takes place in a room with interconnected client computers. Each participant of a meeting has one client computer and takes part in the live meeting through interactive written messages. A moderator organizes discussion by sorting and ranking participants' messages and concentrating discussion on those issues that interest all or the majority of participants.

An e-meeting has an advantage over a traditional meeting when brainstorming and consensus are required. Such meetings are suitable for developmental issues such as a conceptualization of a new business, new product, new strategy, and other solutions of this type.

The e-meeting is supported by a Local Area Network and application software which manages the meeting and supports the moderator's task.

Computer Conferencing

Computer conferencing is created by forming a network of participants who communicate through their remote, client computers. This is a system that supports communications in a mode of many-to-many. Participants send typed

messages and comments to a central host computer, where a moderator organizes these messages by subject and stores them for eventual further retrieval by other conferees.

In such a manner, conference members may participate at any time and from anywhere; home or office or from a laptop in a car or on an airplane. In computer conferencing, participants contribute their ideas, positions, with one idea/position building on another until after a few hours or days or weeks or months, there may be a dozen or hundreds of comments, all stored and read in that conference waiting to reach either conclusion or further reference. Such a conference is sometimes called a Group Decision Support System (GDSS).

For example, Harvard University has organized a computer conference among 215,000 living alumni worldwide and senior professors. This conference enables the faculty to be current with business practice issues and the alumni also to be in touch with this famous campus.

Most computer conferencing systems organize messages into conferences according to subject matter. Other terms for these organized topics are Special Interest Groups (SIG), mailing lists, or news group (USENET). Very often such a computer conference creates a social group or an existing social group organizes itself as a computer conference - a virtual community such as the WELL in San Francisco.

Many systems keep lists of conferences that can be used to discover what conferences exist. For example, for the Internet one can look for USENET newsgroups.

Bulletin Board Systems (BBS)⁴

A BBS is an electronic bulletin board for posting information and comments. A list of categories and topics is displayed by the moderator (administrator). A user may post messages per category and per topic. A BBS is a rudimentary single machine, a non-interactive conferencing system with a small number of topics available, without a sophisticated user interface. A user posts a message without any idea who will read it or reply to it.

A BBS is organized in:

- Conferences (non-interactive),
- Message exchanges,
- Item posting,

- Notes recording,
- Files handling,
- Administration services.

In business, among other applications, BBS's are applied within customer service to post customers' comments about products/services. In such a manner the vendor's staff can trace customers' opinions and improve their own products/services.

Groupware

Groupware is software that allows selected groups to share (collaborate) documents electronically and perform tasks such as writing, editing, and electronic note-taking. It encourages collaboration among teams in the formation of original documents (written, graphic, spreadsheet). It also helps to establish online and off-line discussion subjects that act as ad hoc collaborative teams and it documents a meeting's results and helps in organizing a project's history.

Groupware permits common access to the same:

- word processing documents,
- spreadsheet documents,
- database documents,
- file-distribution subsystem,
- automated calendaring-scheduling application,
- threaded-computer conferencing,
- whiteboards,
- e-discussion administration, and
- development and migration tools.

Implementing a groupware package in a large company is expensive and requires more administrative and technical support than a comparable e-mail system. Among the most popular systems are Lotus Notes and Microsoft Exchange. Groupware systems will play a critical role in implementing virtual offices and enterprises in the future.

Work Flow Systems (WFS)

A Work Flow System (WFS)⁵ is the automation of business/organization information movement as it flows through the steps from start to finish that make up the work procedure by maintaining a record of changes in status and the state of the document or transaction. Key to WFS is the tracking of process-related (e.g., a car loan's path in a bank's procedures) information and the status of each process' operation as it moves through a firm/organization.

The WFS fell into two categories:

- Collaborative WFS – a project team located in different locations uses a WFS to facilitate communication and development of documents (can apply a groupware software),
- Production WFS – is applied in mission-critical processes or transaction processes, usually within one department. It includes document image storage and retrieval capabilities, intelligent forms, database access, and ad hoc capabilities. This system is usually applied in claims processing by insurance companies or in loans processing by banks.

Teleconferencing

Any live, point-to-point, electronically aided conversation is a teleconference. Technically, two people talking over an intercom are engaged in a teleconference. Such a conference is called an audiographic conference. Finally, if you beam a live, full-motion television picture from location A to location B or to many locations and add two-way telephone communications, you have a videoconference.

Meeting tables at Pharmacia-Upjohn can now stretch across oceans. A room with video conferencing equipment went into service in 1990 in Kalamazoo-Portage, Michigan. Similarly equipped rooms have been put into operation at Upjohn sites in Brussels, Belgium and Crawley, United Kingdom.

Videoconferencing involves the use of television equipment to conduct meetings between people at different locations. Television signals are transmitted from location to location using fiber-optic cable and/or satellite transmission systems. Applications include: reviews of advertising pieces, discussions of marketing plans, and exchanges of competitive information.

Primary objectives of Pharmacia-Upjohn's Global Videoconferencing System are:

- To improve home office - field communication,
- To deliver worldwide live information,
- To reduce travel time and expense,
- To speed up decision-making,
- To enhance training and education efforts,
- To allow reception of other programming,
- Other.

Almost every Fortune 500 company applies a video-conferencing system, and those companies that do not have such a system can rent facilities from about 10,000 public videoconferencing rooms.



Telecommuting

Telecommuting is a work-at-home or telework center through office automation that interconnects a workplace with an organization place. Telecommuting means teleworking from the house or teleworkplace (a shared, informed office in a residential area).

If telecommuting catches on, it will not be the first time telecommunications has reshaped the urban landscape. The telephone helped to separate office from factory, allowing knowledge workers to be concentrated in urban skyscrapers, and creating our modern pattern of moving suburban workers to the urban center.

We are now attempting the reverse: moving jobs to workers. Corporate headquarters are being relocated to suburban office parks. This merrily brings

urban gridlock closer to home, forcing even the urban escapees to consider telecommuting options like suburban satellite offices linked to their headquarters. Telecommuting from home will also increase. In the 1990's about 10% of the labor force was telecommuting.

Fax

A facsimile (fax) system is, after a telephone, the simplest business telecommunication technology. Its function is to send a paper-based document over a telephone line. Its commercial use took place in the 1980's and today almost every organization and many homes are equipped with a fax station.

Fax machines work by the telecommunication transmission of scanned image data. At the sending machine, a document is illuminated to recognize white or dark places that are subsequently converted into a sound and sent over the telephone lines. At the receiving station a printing process takes place.

A fax machine is an info-communication system which contains several useful functions such as: broadcasting, delayed dialing, storing, and storing-and-forwarding. In the former case, the sender transmits the facsimile message to an intermediary distributor who sends the message when the circuitry to the receiver is open, usually during morning hours. The fact that a fax connection can handle a paper message through several functions determines that the faxing process belongs to a system nature.

A PC is more frequently applied as a fax machine too.

EDI

Electronic Data Interexchange (EDI) is a system of transmitting standard, business, digital documents among two or more computers. By its nature EDI is of an inter-organizational nature. For example, an assembly plant may apply EDI to transmit an assembling schedule to component subcontractors' computers in order to modify their manufacturing schedules. Instead of faxing paper-based schedules, involved companies exchange electronically computer-to-computer digital documents that are incorporated into their own enterprise information systems, in this case in a production planning subsystem.

EDI is application software which uses telecommunications lines and it integrates applications of different organizational units, either of its own company or with another company or companies.

EDI speeds up the process by which companies conduct their business. A purchase decision is made and communicated to the supplier at once, instead

of waiting for a purchase order to make its way through the typing pool and then the postal system.

EDI takes on strategic importance by enhancing relationships between companies and their suppliers on one side and their customers on the other side. EDI helps companies to reduce their inventories and associated carrying costs. In a number of industries, such as the grocery industry, where margins are slim, the cost/benefit that EDI yields can significantly increase productivity.

EDI has a great future as a time-driven, integrative component of the organizational electronic infrastructure. New applications are continually being designed for such industries as aerospace and the ready-to-wear apparel industry, where electronic graphics are important in the purchasing process because blueprints or drawings are required to support the purchase decision.

EFTS

In order to take full advantage of the banking and stock exchange systems, the Electronic Fund Transfer System (EFTS) was invented. It replaces paper money with electronic money processed by computers and their networks. EFTS is a tool to communicate, transport, integrate, and share information among financial institutions and their customers.

On October 28, 1974, the Congress of the United States provided for the creation of a National Commission on Electronic Fund Transfers. It is a new information infrastructure for the facilitation of payment mechanisms. But not only is it an electronic tool for payments, it is also a tool for the generation of new financial and information services.

Once EFTS is in operation, online exchanges can take place. Not only users from financial institutions, but also consumers and private investors can fix deals electronically via Automated Teller Machines (ATM), Point-of-Sales (POS) machines, credit and debit cards, smart cards (with a chip), and information kiosks located in such public places as malls, libraries, hospitals, airports, bus and railroad stations, and other.

FURTHER TRENDS

Future trends in the EII development are:

- Broadband capacity should radically increase the speed and carrying capacity of telecommunications and computer networks,