Office Information Systems

in the United States and Sweden

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Preface

Alan Purchase, Managing Director Alan Purchase Associates in Los Altos, California, was commissioned by TELDOK to report on the past, the present, and even the future of Office Information Systems in the United States and Sweden. We asked Alan Purchase to study the use of such systems in selected corporations in the US and in Sweden.

As you will see from the report, Alan Purchase has interviewed major US corporations in different lines of business. He also visited major Swedish companies – mostly in similar industries – in the fall of 1992. Alan describes his working methods in the Closing Comments (pp 103–104).

Alan was so impressed with the extent of and the plans for the computerization of the "Riksdag" (the Swedish Parliament) so we included that case study as well, even though there is no US equivalent in Alan's database.

It is quite a feat to perform a task such as this. The corporations are very large, and the US mergers and take-overs have not left the development of Office Information Systems unaffected. The trend of large corporate mergers continues, so the descriptions of the firms must be in constant change.

All case studies are presented and analyzed with the insight and training of a very experienced researcher/consultant. Alan Purchase had a long and successful career at the SRI before establishing his own company. Furthermore, Alan Purchase studied corporations that are presented here at several instances: in 1983, 1986 and 1989.

Thank you very much, *all US Corporations and Swedish organizations* who so willingly have participated in the study.

Thank you, *Alan Purchase*, for your well structured and balanced report giving very valuable insight into the large trend-setting organizations in US and Sweden.

Kudos also to *Ms. Kerstin Petterson* for your editing of Alan's text.

TELDOK will distribute this report not only to our core readers (some 3,000 professionals who regularly receive TELDOK publications), but also to the users of large Swedish Information Systems as well as to foreign organizations, so Alan Purchases findings and analysis can be profitably employed in strategy considerations regarding future system planning and system investments.

We wish you pleasant reading!

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Summary

This study program was initially conducted in 1980, when mainframe computer systems dominated corporate computing. Many corporations simply standardized on IBM systems for all of their computing requirements. Information Technology, (IT) departments were separate, often "unapproachable" organizations that were taking an increasing percentage of the corporate budget. Few staff outside of the IT organization understood information systems. System capabilities were increased whenever IBM (or other mainframe suppliers) introduced new products. End users had long frustrating delays in getting new applications developed and implemented.

By the early-mid 1980s minicomputer based departmental systems, largely from Digital Equipment Corp., (DEC) were rapidly being implemented. This moved the management of information systems from being entirely a Corporate IT responsibility to sharing with individual departments, (something the Corporate IT staff strongly resisted.) With departmental systems, applications were able to be developed faster, at lower cost and focused more on the enduser needs.

Departmental systems often replaced the stand alone and small group word processing systems used by the secretarial staff and the stand alone personal computers, (PCs) used by some of the professional staff. DEC's "All-In-1" integrated office software was a major factor in the success of departmental systems during this period. This often brought word processing under the responsibility of the IT Department for the first time, generally through merging the previously separate Word Processing Department into a new "Office Automation" function.
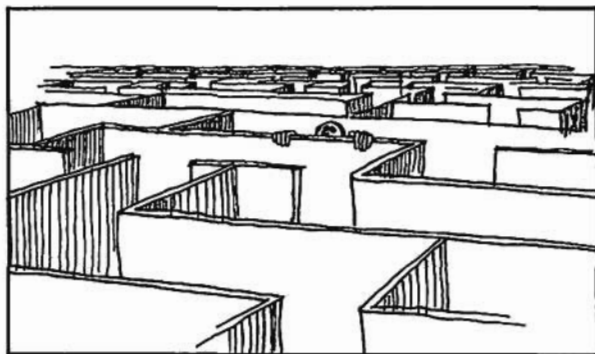
Figure 1   *Office of the Future — The view in 1975*

During the mid-late 1980s local area networks, (LANs) started to be implemented, in some cases replacing the departmental systems. PCs offered the advantage of lower costs, easier installation and a wide variety of inexpensive standardized software programs that were constantly being upgraded to incorporate new features. Many custom applications required only simple modifications of these standard packages. LANs tied the PCs together, providing E-mail communications, print sharing and other advantages of the departmental systems but with lower costs and more flexibility.

The changes in information systems during the 1980s were dramatic. This resulted in equally dramatic changes in the responsibilities of IT organizations. Through the 1960s and 1970s IT had managed the "corporate computer system", typically a single vendor, mainframe based system with a proprietary operating system. Growth was orderly and predictable. In the space of a few years in the early-mid 1980s information systems changed to include departmental systems, PCs, word processing, and then in the later 1980s networks, in a multi-vendor, multi-operating system environment. End users gained more control over systems and budgets. The IT staff had to change from a protected, mainframe oriented "glass house" environment, to a constantly changing, application oriented, end user support environment.

The increasing importance of data communication brought together the IT and Telecommunications staffs as organizations struggled to cover everything from mainframes and desktop systems to LANs, and global networks.

Changes in information systems during the 1990s are expected to be as great as they were during the 1980s. Rapid improvement will be made in "personal systems", with a merging of the capabilities of notebook computers, cellular telephones/personal communicators, fax machines. Individuals will be able to communicate anywhere, anytime; accessing the corporate information systems or sending messages globally. Similarly, video conferencing, groupware, multimedia will all have significant impacts during this decade.

In 1980 information system knowledge was almost entirely within the IT Dept. One of the major impacts of personal computers was that by 1990, information system knowledge was wide spread through all levels of organizations. In addition, schools and colleges are now using computers as routine educational tools so graduates entering the workforce are comfortable using computers.

Computer knowledge is now a prerequisite for a growing number of positions within many organizations. Some employees are still "computer illiterate" and will probably remain so. This will limit their future effectiveness and thus potential advancement opportunities. Unfortunately, some senior managers are still computer illiterate. A lack of management vision on the effective use of information systems could effect their corporation's success.

Leading corporations, such as Levi Strauss in the U.S. and ICA in Sweden are currently using advanced information systems to increase their competitiveness and gain market share. Both of these corporations have senior managers very knowledgeable in the use of information systems. The continued expansion of global business activities will result in highly competitive environments in all market areas. Organizations using the most effective information systems will have an advantage.

This study covered eight U.S. organizations and six Swedish organizations. Since both U.S. and Swedish organizations were studied it is natural to try to draw comparisons. However, these organizations operate in several business areas, with different levels of resources and different management styles. It is much too small a sample to reach any definitive conclusions.

From a general perspective, it is clear that Swedish organizations Electrolux and LM Ericsson are truly international in their activities. Their use of IT is very comparable to leading international organizations in the U.S., such as PepsiCo, General Foods and Monsanto.

Management and organizational philosophy, and the operating environment are major influence on the development of new information systems at all of the organizations studied. They seemed to be a major influence on development of advanced systems at the Riksdagen, ICA and Levi Strauss, and to have restricted implementation of more advanced systems, at different times, at other organizations studied. Avon, Sears and UNOCAL have all undergone financial contractions which impacted the advancement of their information systems. Mergers and organizational changes at General Foods and Manufacturers Hanover Trust definitely affected their implementation of new systems.

Downsizing

Downsizing, the movement of information system applications from larger computers to smaller computers, or networks of smaller computers, continues to be a major driving force in the development of new information systems. Applications are continually being moved from large mainframe computer systems to minicomputer systems, (examples include Electrolux and Monsanto), and to networks of personal computers, (examples include ICA and Sears).

Virtually all new applications being developed are for system architectures based on PC networks. Mainframe computer systems will continue to be used for many years. Typically, a corporation's financial, tax and accounting data are maintained on their mainframe system.

In the mid-1980s, memory capacities of mainframe systems were growing 20—30 percent per year. In many organizations the growth of mainframe systems has now essentially halted. The applications being downsized more than balance the increased memory requirements of the remaining mainframe applications.

With downsizing has come a fundamental change in responsibilities for information systems. Functional departments and work groups now have budget responsibility for information systems in their areas. They are the ones authorizing new hardware/software procurements, application development programs, with the IT staff acting as consultants.

Figure 2

Outsourcing

Outsourcing is not an important factor in the IS operations of the organizations studied. Commercial organizations often rely on outside organizations for payroll and tax services. Some outsource system development in "non-critical" applications, (an example is Ericsson), system integration services, training and PC repair services. Outside services are also used for limited periods when decentralized IT organizations "get into trouble", (Electrolux is an example).

Local Area Networks

LANs have been a major growth area during the last few years in virtually all of the organizations studied. Upgrades to client/server networks are now in progress. Inter-connection between the networks, with peer-to-peer communication is also being implemented in many organizations.

Future trends are well established, with complete interconnecting of all the organization's networks, common or compatible E-mail systems, permitting easy, rapid communication desktop-to-desktop, throughout the organization.

The growth in networks is directly related to downsizing applications. The interconnecting of networks is resulting in more authority for IT organizations as they specify the standards for hardware and software to insure interconnectivity.

Desktop Workstations

There has been a rapid increase in the power available in new designs of personal computers, and many businesses have continued to buy the latest, most powerful PCs available. Six years ago a typical desktop PC had a 12 inch display, "286" microprocessor, 640KB RAM, 10MB hard disk and a 4MHz cycle time. It cost about $2,000. Today businesses are buying PCs with 14 inch displays, "486" microprocessor, 8MB RAM, 210MB hard disk and a cycle time of 33MHz for about the same cost.

The power of desktop systems has increased more than ten times, even though they are used primarily for the same business operations. The difference is the graphical user interface, (GUI), Microsoft's "Windows" in most cases, and the increased functionality of newer application software programs. The GUIs and updated software programs require larger memory systems and faster operating speeds to function efficiently. PC memory capacities now standard in many organizations were "beyond the imagination" just six years ago.

With the increasing use of graphics and the expected growth in multimedia applications, the trend toward ever increasing PC power will continue. However, the rate of increase should definitely slow during the next decade as users need time to assimilate the more complex application programs.

Communication Systems

All of the organizations studied are increasing the development of their communication systems. Rapid growth in the use of networks, fax, cellular telephones and home PC systems has resulted in the need for improved communication capabilities. In another communications area, there is growing use of video conferencing to bring together groups of staff without the time and expense of travel. (An example is Monsanto.)

Multimedia

There is general agreement among IT professionals that multimedia will play a roll in future information systems, but few see any need for it at present. The general comment was: "I don't see any applications that require multimedia."

IBM, Apple, Microsoft and other suppliers are starting to promote multimedia applications using voice, CD-ROMs, video and other media. Initial applications include training and corporate presentations. However, multimedia will have to demonstrate it can provide definite productivity improvements before it will achieve widespread acceptance. In todays economic environment IT staffs are reluctant to invest in major new application areas just because the technology makes them possible.

Enterprise-wide global networks

All of the companies studied want to have networks linking their global operations. The goal in most cases is to make it possible for everyone in the corporation to communicate with everyone else, desktop-to-desktop.

Organizations have well established communication systems linking their operations in North America and Europe, and most have made suitable arrangements for communications to Asia, South America and other areas of operations. (Examples include General Foods and Electrolux.) Increasing cooperation between communication service suppliers will make it easier for organizations to obtain quality international communication services.

Electronic Document Interchange

Electronic Document Interchange, (EDI) is a key technology for the 1990s. Its usage has been increasing at a rapid rate and strong growth is expected through the next decade. EDI, combined with bar code technology, is making a number of new IS applications possible, supporting corporate distribution and marketing strategies. (Examples include ICA and Levi Strauss.)

IT Applications that Boost Sales and Market Shares

IT applications that improve the service to and/or the profitability of the corporation's customers are the most important factors in boosting sales and market shares.

Examples are ICA's and Levi Strauss' distribution systems that provide their customers with the freshest produce and latest products, while minimizing their inventory investment. In both of these cases, the retail merchants receive better information regarding their sales and inventory management while their paperwork and "overhead" activities have been reduced. Also, in both of these cases, the customers become more dependent upon ICA and Levi, increasing their sales and market share.

Other examples are Handelsbanken and Manufacturers Hanover Trust, where information systems are being used to provide the Branch Managers and Account Managers with coordinated information about customer accounts. These managers are then in a better position to assist their customers in effectively using the bank's services and in advising the bank's senior management on the development of new services for their customers.

Potentially Profitable IS Application Areas for the 1990s

The profitable application areas for the 1990s will continue to be those that increase the service to and/or the profitability of the organization's customers. This includes applications that reduce the cost of goods and

services and/or increase productivity. Often this involves systems supporting the decentralization of authority and responsibility, while providing rapid, accurate operational data to senior management. (Examples are Handelsbanken and Electrolux's AB Elektroservice.)

Potentially profitable application areas include:

- Distribution management and inventory control
- Sales productivity
- EDI and other applications decreasing paper handling and storage
- Services promoting customer loyalty
- Communication systems/groupware/video conferencing systems facilitating close working relationships within the organization and with customers and suppliers
- Organizational and process "re-engineering" that eliminates unnecessary administrative controls and process steps.
- Systems decreasing the time required for the introduction of new products and services

Relationship between End Users and IT staff in the 1990s

Just as computer systems have undergone major changes during the last decade, relationships between end users and IT organizations have experienced fundamental changes.

Ten years ago, personal computers were just starting to be used in business operations. IT staffs managed and controlled the use of computing resources within the corporation. There were long lead times, typically 18 months, before new applications would even start development. In many organizations there was hostility between end users and the IT staff due to the long delays in application development, high cost, poor interpersonal communications and difficult system user interface problems. In some cases this resulted in the end user departments working around the IT organizations. (An example is General Foods' Finance Department.)

During the mid-1980s, as PC usage grew, end user departments became responsible for their own information systems budgets and IT acted as consultants, except IT was still responsible for the mainframe computer systems. IT became more "end user oriented", establishing help desks and training programs to assist end users in the operation of their PCs.

There was strong growth of LANs during the late 1980s as users realized they could not function effectively with stand alone PCs and networks were less expensive and more flexible than departmental systems. Initially LANs were used primarily for E-mail and shared printing. As LANs progressed to have distributed databases, end users recognized the need for more assistance from the IT staff.

With the development of client/server computing, interconnected networks to form wide area networks and with the trend toward "enterprise computing", IT has more direct responsibility for system de-

velopment and operation. Corporations are finding that systems are becoming too complex and network management too demanding to be left with end users.

Typically, the end user departments still have responsibility for PCs and specialized application software used within their departments, in close consultation with the IT staff. Network design, operation and database management increasingly is the responsibility of the IT organization.

This requires close working relationships between end user personnel and the IT staff. In many organizations specific IT staff are assigned to work with specific end user departments, often having offices at the end user department's location. There are also end user-IT working groups coordinating overall planning and budgets for information systems and discussing common issues.

Today there is a much more cooperative relationship between IT and end user departments then existed a decade ago. This is due in part to users and corporate management becoming familiar with information system capabilities and recognizing how systems can be used to increase productivity and gain competitive advantages.

IS Competence Required for End Users in the 1990s

In the mid-late 1980s, as the use of PCs and information systems spread beyond the "early adaptor-computer literate" user, attention was given to orientation and training, friendly user interfaces and other factors that would make it easier for the non-computer literate to work with computer systems.

Ease of use by the non-computer literate was one of the primary reasons for the success of Apple's Macintosh computers. More recently, Microsoft's Windows has been an outstanding success because its graphical user interface is much easier for new and occasional users to work with.

Now it is quite common for end users to participate in the software interface design. In specific application areas the system command terms might be those familiar to the end users. As an example, Manufacturers Hanover designed a major application using bank terminology so the system interface would be "more friendly" to their Account Managers, many of whom were "new users".

User friendly interfaces are now an accepted part of information system designs. Most organizations feel the transition phase to computer familiarization is over with. Their professional and support staffs should be sufficiently familiar with PCs and other end user systems so that basic computer orientation training is no longer required. As an example, Manufacturers Hanover will not hire a new Account Manager who is not computer literate.

Computer training has largely shifted to the schools and colleges. While some long term employees, including senior managers, might still be resisting using computers, new employees for professional posi-

tions will have to be computer literate in order to be considered quali-
fied. In many professions, those individuals most adept in computer
usage will have a major advantage in progressing within the organiza-
tion. (As an example, PepsiCo hired IT graduates rather than Finance
majors for their Financial Analysis Department.) The need for "com-
puter competence" will certainly be an increasing requirement for pro-
fessional employees during the 1990s and beyond.

Figure 3   Professional Workstation, circa 1900

Case Studies

The following case studies are based on personal interviews with managers and senior level staff of eight major U.S. and six major Swedish corporations. The interviewees included information systems specialists as well as end users of information systems.

The results of these interviews are presented in narrative form with emphasis on qualitative information rather than quantitative data. This approach was selected to more effectively communicate the status of office information systems within these organizations.

A review of these case studies will show different approaches and different levels of information systems development in the various organizations and within different divisions or departments within the same organization. Moreover, what has worked well for one organization has not been acceptable for another.

It is apparent from these results is that there is no one "right" information system architecture or organizational structure, even though similar organizations are addressing similar problems. The "culture" of the department or the division, or the organization strongly influences the approach to IS and will determine the system's success. Similarly, how effectively an organization uses its information system will strongly influence the organization's success. This will be increasingly important during the 1990s, as leading organizations implement information systems providing competitive advantages.

Kraft General Foods Corporation

Introduction

General Foods Corporation was a large, multinational food processing company. 1986 revenues exceeded 8 billion dollars. Corporate headquarters were in a very modern facility in White Plains, New York.

In 1987 General Foods was acquired by Philip Morris Corporation in one of the largest Corporate "take-overs" to that date. Philip Morris, one of the worlds leading tobacco producers, was interested in diversification so it would not be dependent on tobacco revenues. General Foods operated as an independent subsidiary.

Philip Morris continued its diversification program and in 1989 acquired Kraft Foods, Inc., a leading producer of processed cheese and other food products. Kraft's headquarters are in the Chicago, Illinois area.

With these mergers, Philip Morris' total 1991 revenues exceeded 48 billion dollars. Philip Morris became the eighth largest U.S. corporation, based on revenues and the second largest based on market value of its stock, (according to "The Business Week 1000", published by McGraw-Hill, Inc. April 3, 1992).

General Foods U.S. activities, except coffee, were merged with Kraft Foods, with Kraft the dominate partner. This organization is now known as "Kraft General Foods", (KGF). Management headquarters is at Kraft's Chicago area facilities. The remaining activities became "General Foods International", (GFI) responsible for all international activities and coffee worldwide.
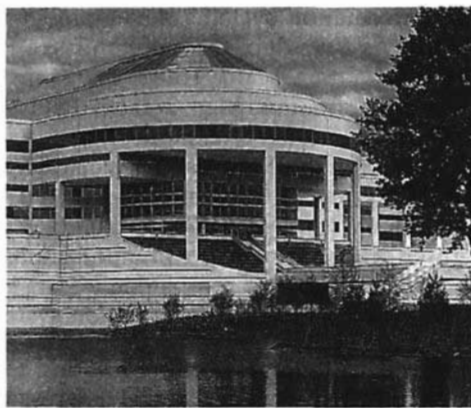
Figure 4   General Foods Headquarters, Rye, New York

The combined organizations of General Foods and Kraft produce a wide variety of packaged food items. With revenues over 15 billion dollars KGF is a major force in grocery stores. Their brands, varying by geographic market, include Kraft cheeses and salad dressings, Philadelphia cream cheese, Miracle Whip, JELL-O, Post cereals, Ronzoni pasta. Coffee is an important part of their activities. Brands include Maxwell House, Yuban, Sanka, Gevalia, Klassische Auslese, kaffee hag.

Figure 5

General Foods, (GF), had been recognized as one of the leading corporate organizations in the use and implementation of information technology. Their information systems development was well in advance of Kraft Foods. As a result of the merger of Kraft and GF a senior manager of GF's Information Management Division became head of Kraft General Foods Information Management Division, (IMD), commuting between Chicago and his N.Y. home.

General Foods was strongly IBM oriented when GF was an independent organization. They had IBM mainframes for all corporate financial, personnel and operations data, IBM model S/36, S/38 and 9370 computers were used as departmental communications processors and they tried to standardize on IBM or compatible PCs.

GF describes the evolution of their information systems as;

1983: Centralized, with terminals communicating to a mainframe
1986: Three tier, with mainframe central processing systems, departmental systems and desktop PC/workstations
1989: Interconnected-networking

With the merger of GF and Kraft considerable effort was required to bring the two corporate information systems together in an environment of reduced budgets and smaller staffs.

In the early-mid 1980s GF was slow to move forward with departmental computing, primarily because IBM did not have suitable systems. As a result, several departments installed DEC VAX computers, with All-In-1 office system software, while other departments installed Prime Computers. They also had a number of older Wang "OIS" word processors that had been upgraded to Wang "VS" workgroup systems.

The incompatibility and lack of communication between the different systems was a critical problem. Most major U.S. corporations had this same problem.

A concern in the mid-1980s was to encourage more of the professional staff, including Corporate managers, to use PCs. They installed IBM's office system software, "PROFS" as an Electronic-mail system. After several years they found that over 80 percent of the staff using PROFS were information technology professionals. The interface was too "structured" for the casual user.

To solve the ease-of-use problem GF developed a "front-end menu system" for PROFS that is very similar to the user interface for DEC's All-In-1. A user can log-on by pushing one button. This also made it easier for users to shift between IBM and DEC systems. In 1989 they thought their next step would be to IBM's SAA, (System Application Architecture), with Presentation Manager, of which "OfficeVision" was the initial application system.

Their goal was for everyone to have a workstation and be able to easily communicate with everyone else in the company, worldwide, desktop to desktop. They want to eliminate as much paper as possible, particularly the need to move paper from one location to another.

In the late 1980s Information System Networks (ISNs) were installed within the different divisions to facilitate communications between the various departmental systems; such as the IBM S/36, S/38, DEC VAX, Prime and Wang. ISN is data equivalent to a PBX. It operates at 9.6KB. (It could operate at 19.2KB, but most ASCII boards operate at 9.6KB). ISN does not require modems for communication. The connections cost $300—500 each. (Refer to Figure 6).

The ISN communication is used within buildings; modems are used for external communications. DECnet (Ethernet), Primenet and Wangnets are used to tie together the departmental systems, while AT&T Starlans are used to tie together the PC/workstations. These networks connect through a standard 802.3 interface to the ISN data PBX, an AT&T System 85.

The ISN network is connected through a Protocol Converter (PC1) to a SNA network. The SNA network is a leased and dial-up line used for data communications throughout the U.S. It links the remote sales offices, which have IBM 9370s, and several other remote facilities.

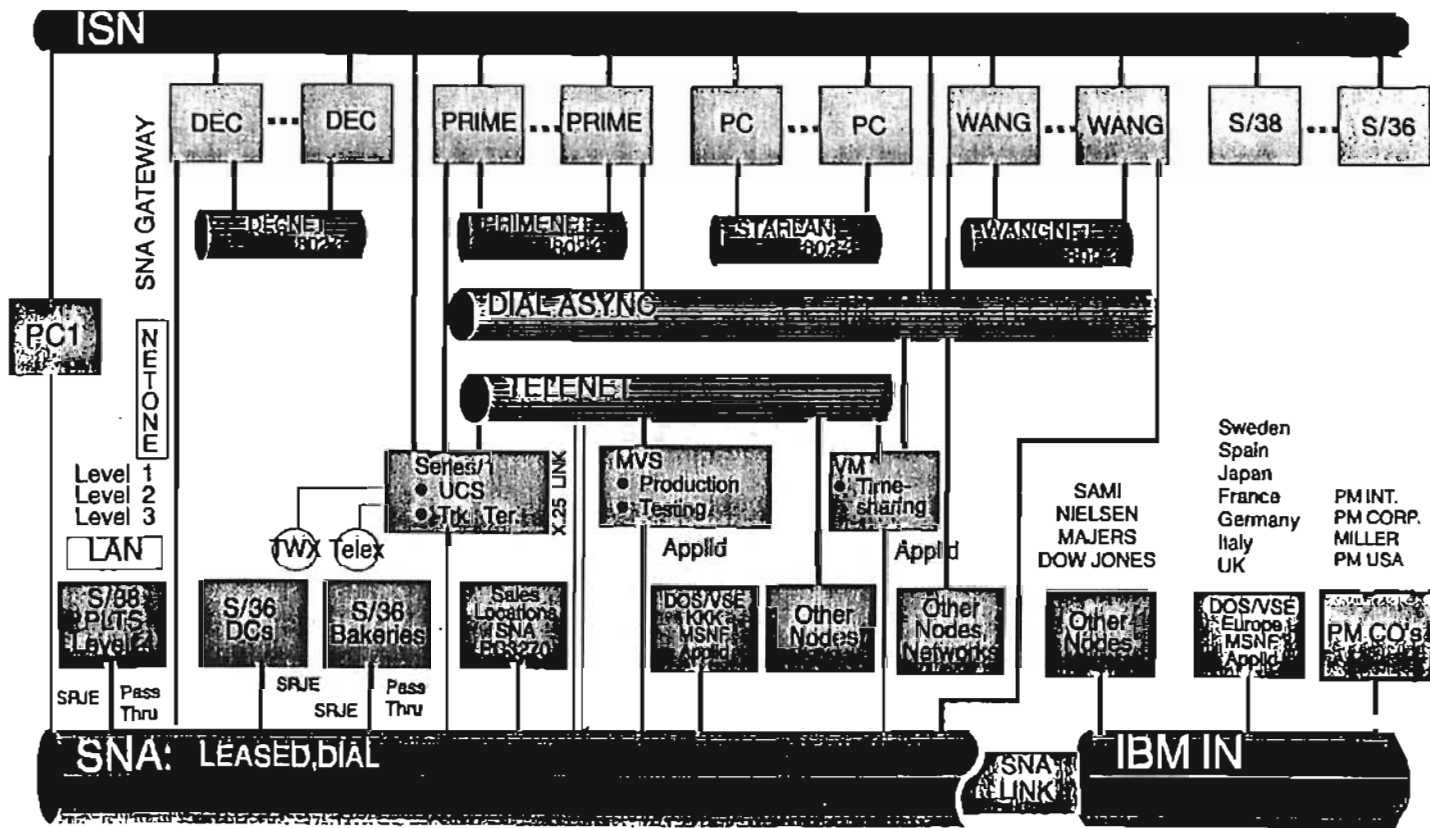# GF NETWORK ARCHITECTURE

Figure 6

IMD feels the network architecture decision is critical since the network defines the connection rules for the computers. Their network planning was done by their telecommunications staff working together with their information technology staff.

Fiberoptic cable is user for all connections between the telephone closets, with copper wire connections to the workstations. They now have under test their future concept, which is to use fiberoptic cable throughout the system. They are now operating at 10MHz with Ethernet, which is reaching the limits of unshielded twisted pair. With fiberoptics they can operate at 100MHz. The size of fiber cable is the same as unshielded twisted pair so it will fit the existing cable runs/conduit. Thus it is much easier to install than shielded cable would be, and fiber has a higher carrying capacity

The telecom group have become Unix experts due to their AT&T background. They have standardized on Unix System 5. They feel the debate about the different versions of Unix is trivial to the users since the interface is the same. One senior IMD manager feels Unix will become the dominant operating system. "OS/2 looks like it is too little, too late; it will be as IBM defines it rather than as users want it. Unix with Starlan is much more flexible."

In 1989 the standard PC for both secretaries and professionals was IBM's PS/2, model 70 and Compaq's desktop or portable; "386" technology with 6—8MB internal RAM and 60—80MB hard disk. "Since memory is so inexpensive, you might as well have it available." Printers were Hewlett-Packard "Laserjets". IBM's PS/2s were preferred so users would be able to shift to OS/2 with "Microchannel".

Macintoshes are used by Public Affairs and a few other departments, due to the superior publications and graphics capabilities. A disadvantage is that the Macintoshes do not communicate quite as easily with the IBM mainframes. The Director of Human Resources has a laptop PC. He can constantly call-up individual personnel records during staff planning meetings.

The divisions/departments have their own PC support staff, hired by the departments. They are backed up by a Corporate Training Center staff. All PC procurements are now signed-off by the Information Technology Department.

A software program implemented in 1989 by selected departments was Metaphor. It has an excellent icon-based user interface that is adaptable for unstructured data, such as marketing information. With Metaphor's Icon interface the user has a totally integrated environment. There is a consistency of key functions so the user doesn't need to worry about which application he is working in. He can change from E-mail to spreadsheet to text. (Note: Metaphor is a small "Silicon Valley" company, started by ex-Xerox managers. IBM invested in Metaphor and received rights to their technology).

An Executive Information System, "Commander" was implemented in some of the Financial Departments. It is good for structured

data such as accounting. It also has several nice features: color coded summary data; able to flip from graphics to numerical data and back again; able to obtain successive levels of detailed data ("drill down") from summary data. Disadvantages are that the single interface is inadequate for various user groups and many of the executives using PCs do not want to work with summary data, they want to see numerical data on Lotus style spread sheets.

Early in 1987 planning started informally, by a group of users, from the "bottom-up", on an international data communications capability. Activists agreed and started looking for a Management sponsor. By mid-87 they started to add structure and get management's OK.

When IBM decided to open their IN network to outside companies to utilize excess capacity, General Foods was the first outside organization to sign-up. They installed PROFS in all of their European offices. The local European offices communicate to IBM's European hubs which are connected to IBM's node in Holland. Communications are to IBM U.S. and then to GF's New York headquarters. Application and end user support is in NY, technical support is in Europe.

The IBM IN net is for E-mail, using PROFS. Previously international mail was written on thin paper and would take 2 weeks. This system went from 0 users in 1986 to 2200 users in 1989. The system was justified on "need to have" rather than economic justification.

Many of the system users had never used a PC before. They were trained on E-mail, document transfer, text-edit, spreadsheet. The training on E-mail was 30 minutes. The training on all other applications was a total of 4 hours. Secretarial training was 1 1/2—2 days. It took about a month of use for the secretaries to become proficient. It took longer for many professionals to see a need and start using the system. Secretarial "feed back" sessions were conducted, which were very useful. It showed the secretaries they were needed and listened to.

There is a separate network for voice communications. They do not have voice store and forward capability on International communications. The same network is used for facsimile with an interface to AT&T Fax and Telex. Users can generate faxes at their workstations and send either as a fax or as a revisable document.

The Corporation has 100 gigabytes of data storage. Working files are on magnetic storage, archival on optical storage. Twenty-five percent of volume is EDI, (Electric Data Interchange), computer to computer. Almost all vendors are now tied into the network. Most quotes come in on E-mail but 85% of the purchase orders are still on paper.

In 1989 GF provided laptop computers to their sales force account executives and supervisory personnel to help reduce the administrative paper work. They realized a 12 percent time savings by reducing the time spent on overhead tasks. The E-mail system allows the account executives to distribute sales and inventory reports as well as binary files.

Present Situation

In 1989 KGF allocated 200 million dollars to "Project 2000". This project is to provide an information system that will serve their needs until the year 2000. Initially they asked their system users what capabilities they would like in their systems. This resulted in concepts that were much too elaborate. The IT staff then went from in-house development of a new system to taking the best available from standard package systems and modifying them for KGF's needs.

They are presently combining all of their distributed centers into five regional centers. The first will be located at Atlanta for the Southeast region.

They are in the process of downsizing their applications. All new development work is done on PCs. All new applications are based on using Microsoft's "LAN Manager". All "traditional" data will stay on the mainframe computer system.

KGF has 30,000 PCs at 700 locations connected to LANs. Two hundred of these are major LANs. Thirty-seven locations are now connected LAN-to-LAN. The concept is to be able to go from any desk to any desk in the corporation.

With the present system files are down-loaded. They are experimenting with client/server systems, with the files residing on the servers. They are using HP's product line for the servers. New PCs are based on Intel 486 microprocessors.

E-mail is not a dominate technology within KGF. They spent years promoting the use of IBM's PROFS, but were unsuccessful in attracting many users outside of the IT organization.

Voice mail has become widely used, so widely used it has reached a point where it has become difficult to reach a human being. As a result, some of executives have become frustrated and are trying to slow the use of voice mail.

Voice mail has brought changes in organizational staffing. There are now five secretaries for 150 professionals in the IT group. This is possible because of voice mail and because professionals are doing their own word processing. Of the five secretaries, two are LAN managers.

KGF's primary outsourcing activity is to arrange for AT&T to manage about 90% of the facilities for their voice system.

KGF now has 12 locations with video conferencing capabilities. They use small rooms, typically a maximum of six people at each location. They feel it is most effective with only 2—3 people at each location. The video conferencing rooms must be booked in advance.

They are the height of "TQM ities". (TQM = Total Quality Management). There are 15—20 TQM committees within Information Technology alone. They use bulletin boards, newsletters, voice mail distribution lists, user meetings, Q&A sessions.

General Foods International, Coffee Worldwide

GFI no longer reports to Kraft. They are now a parallel organization, reporting directly to Philip Morris Corporate Management.

General Foods International, (GFI), has been downsizing their organization for several years. They had 2700 people in the organization, with 250 at corporate headquarters. Two years ago they acquired Jacuard Suchard, UK. and last year they acquired Farabe Marabue in Scandinavia, with $900 million in sales. After the acquisions there are still only 2600 people in the GFI organization, with only 80 at headquarters. The plans are to increase the headquarters staff to 125 people. There are only 14 IT staff at GFI headquarters.

GFI's manufacturing activities were using DEC VAX computers. HP is now the hardware platform of choice for both manufacturing and engineering. There is widespread use of IBM PS/2s and Compaq PCs, 386 designs, going to 486 and planning for 586. The networks are Novell with Novell LAN Manager, PS/2s as file servers.

There is a small but growing Macintosh population. The use of Macintoshes started with the need to create desk top presentations.

In Europe, one IT center in Belgium serves seven countries. IT is still evaluating Windows vs OS/2. GFI's subsidiaries are all "IBM shops" using OS/2; 90—95% of the workstations are tied to LANs.

General Foods International is currently using IBM's IN-NET for worldwide communications. They expect to change to Philip Morris' network in two-three years. It is based on leased lines. If they find the PM network is too expensive, they will change back to IBM to manage their international network.

GFI has a well established set of application standards. They use "SAP" for their mainframe applications. It is from a German vendor. They use IBM AS 400s for integrated manufacturing. Their Computer Associates financial accounting system will soon be changed to SAP.

As an outgrowth of their General Foods-IBM background, GFI is still an IBM "PROFS shop" for E-mail. They are currently evaluating personal computer E-mail systems from Lotus, (cc: mail), and Microsoft. For spread sheets they are considering changing from Lotus "1-2-3" to "One-Up" or "Excel". For text editing they have been using IBM's Displaywrite 4&5, with more users shifting to Microsoft's "Word".

GFI's first EDI applications have just been implemented. Almost 100 percent of the orders from Japan are now communicated via EDI; 35—40 percent of the order volume in Europe is now EDI. GFI is developing a system where orders received from 15 countries will be routed to 140 locations for shipment.

GFI's sales force is using laptop and hand held units to take orders and then communicate the information to the mainframe computer system. They now have 7,000 laptop computers with their sales force. The Italian sales force is on second generation units while France, Germany and the UK sales forces have had units for only 1—2 years.

The laptop computers are used for:

- Customer presentations
- Check inventory on-line
- Place orders
- Confirm deliveries
- Generate invoices
- Sales planning

The systems are individualized by country. First it was Territory level, then District level, then salesmen. In the future the use of pen computers is highly likely. There is a feeling that multimedia costs too much; they are not looking at it as a normal option.

One result of the increasing use of computers by the field sales force during the last two years is that countries that use to have 12—15 sales offices now have only two, and their function is different. Distance will be of little consequence due to the vastly improved communications.

In planning, GFI is looking at "calls-per-day" potential and measuring the resulting sales volume increases. This provides a competitive advantage.

In Korea, GFI gave PCs and software to their 500 independent agents. These are primarily "mom and pop" shops that previously were using ancient abacus. GFI initially installed 164 PCs with the plan to have 400 installed by end of 1993. The PCs can communicate directly into the main frame computer system. They already account for 60—70% of Korean sales volume. The PCs were justified on basis of:

- Sale volume gains
- Inventory deployment strategy
- New product introductions

Comments on Case Study

The evolution of this company's information systems is very typical of developments in other leading U.S. corporations. This company was strongly oriented to mainframe systems and IBM's operating philosophies in the early 1980s. Their strongly centralized IT organization was very competent in performing traditional IT functions, but slow to react to the needs of end users in the various departments throughout the organization. Like most large U.S. corporations, they had an 18—24 month backlog in software development.

When personal computers were starting to be used by some of the professional staff, IT initially provided minimum support since they were not prepared to provide end used support. The Office Automation (OA) Department assisted the secretarial staff with their word processing activities but were not staffed or trained to work with the professional staff on PC applications.

By the time IT established information centers and other end user support capabilities in the mid-1980s, a variety of PCs had been acquired by the advanced end users, with a number of incompatible software programs. It took several years for IT to establish effective company policies and regain control over procurement for end user computing.

DEC's All-In-1 software had become well established with a large group of users while IT was pushing for acceptance of IBM's PROFS as the standard for the Corporate wide E-mail system. By developing a special PROFS user interface similar All-In-1, they largely overcame the difficulty users had working with PROFS.

They have standardized on IBM or selected compatible PCs and specified software programs. As new generations of PCs become available they replace the older models from incompatible suppliers. They still had the problem of communications between various workgroup/departmental systems. By implementing the ISN network, with a protocol converter to the SNA network they established a well thought out solution for this problem.

In the mid-late 1980s they phased out their Wang and Prime systems and standardized on IBM and DEC for their departmental systems. For several years there was a difference of opinion regarding future directions. Some of the IT staff wanted IBM, with SAA, OfficeVision and OS/2 while others wanted to evaluate DEC's All-In-1, Phase II, and stay with a multivendor approach.

As it worked out, neither IBM or DEC were able to deliver satisfactory systems in time. LANs started taking over and are now used throughout the organization, with client/server networks currently being implemented. Continual downsizing of applications, with more powerful servers have replaced most of the departmental systems.

More powerful PCs, the friendly user interface offered by Microsoft's Windows and the greater capability of commercially available application packages have all increased end user computing. In some cases, such as with the European sales force, this has resulted in major changes in organization, management and communications. In the case of the headquarters staff, it has resulted in a staff 50 percent of the previous size, with the same number of employees in the total organization.

Chemical-Manufacturers Hanover Trust Company

Introduction

Chemical-Manufacturers Hanover Trust Company is the third largest U.S. bank, with annual "sales" of over 14 billion dollars. The bank's headquarters are in New York City. Chemical-Manufacturers Hanover was formed in 1991 with the merger of Chemical Bank, (Chem), and Manufacturers Hanover Trust Co., (MHT). At the time of the merger, the two banks were about the same size, each with "sales" of about seven billion dollars. Both banks were profitable, but neither one was growing and they were facing strong competition from much larger Citicorp.

Both Chem and MHT are concentrated in the New York City market although they do serve outlying areas and have international operations. The initial challenge after the merger was to bring the two organizations together in a way that would build on their combined strengths. Considering that MHT alone had 30,000 employees, combining the organizations continues to be a challenge.

During the mid-1980s, MHT changed from a strong centralized organization to a decentralized management organization with five separate companies, each focusing on a specific banking activity.

Figure 7   Manufacturers Hanover building at 160 Water Street, New York, NY

An important consideration in MHT's restructuring were the Information Technology, (IT) functions due to the vital importance of information systems to all of their banking activities. The IT staff were reorganized to follow the banks decentralized organization, with IT groups in each of the five separate banking organizations. The bank also maintained a Corporate IT organization for forward planning, establish technical standards, provide corporate wide IT services and to supplement the decentralized IT organizations.

MHT had advanced information system applications and strong IT capability, due in large part to the continuing support IT received from MHT's senior management. As a result, MHT's IT personnel have been placed in key positions in the merged Chem-MHT organization.

MHT started a major IT project in 1986 with the objective to "automate" the Account Officers in the Business Banking Group. They wanted to provide the Account Officers with desktop workstations that could give them access to data on the mainframes. They would then be able to quickly call up information on particular accounts, customer profiles, banking/credit histories, current loan status or other activities. Whenever a business customer called with an inquiry, the Account Officer could have the critical information on the account displayed on the desktop workstation with only a few keystrokes

The planning phase took place during late 1986-early 1987. They determined:

1 It was inappropriate to have desktop workstations tied directly to central processing units. There would be too much cost involved with training and support.
2 They wanted a "graphic user interface" rather than a "character based interface". In 1986, PCs had a difficult interface, without any consistency between different applications: spreadsheet, database, word processing. It was also difficult to exchange information between the applications.
3 They wanted to stay away from anything proprietary, where they would be "locked into" a single supplier. IBM PCs were selected for the desktop units. Microsoft Windows 386, with ability to run "virtual machine" was to provide the graphical interface. Windows 386 was multitasking. They initially selected Lotus 1-2-3, but later changed to Excel for the spreadsheet program.

In two years 1500 workstations were connected to this network. Using Windows 386, the bank developed customized menus that are in friendly "banking" terms. The spreadsheet, word processing, menu choices are all in user-friendly terms.

All 1500 workstations are "diskless", with floppy disk drives but without hard disk drives. Diskless workstations cost less and require less maintenance. However, the primary reason for selecting diskless workstations was data security. Users cannot transfer files to their individual workstations. The files stay on the network file servers. The application programs are also stored on the servers. Access to data is by password, providing the individual system users with specific rights.

There are 50 file servers on the system. Administrators assigned for each file server are responsible for backing up the system every night. The file servers and desktop workstations can access up to 1.2 gigabytes of memory. They keep "hot standbys" for the file servers in case of emergency. The network is a Novell Token Ring using "Netware". It connects to an X.25 worldwide network modelled after Tymnet.

Accounting Officers use the system to access the "Loan Price Model" and the "Risk Grading Model" as well as for routine office applications. Loan Processing and Risk Grading previously required considerable time and were often incorrect. With the on-line models the Account Officers are guided through the process in a logical, orderly manor. The Commercial Loan System includes an "expert system" module that prompts users for answers so information can be translated into 3270 compatible data. This has increased the quality and completeness of the documents. The result is that the time required to generate loan proposals has been reduced from two weeks to two days.

Prior studies showed that Account Officers spend up to 80 percent of their time on "Administrivia" (miscellaneous administrative paperwork). If this can be reduced by 10—20 percent, it would be very worthwhile. As an example, a typical department uses 20—40 forms which are stored in cabinets. Someone must order the forms and then someone must type them. Now the forms are kept in computer memory, printed by laser printers as required. The bank would like to keep some of the forms electronically, eliminating the need to ever print them.

When the Account Officers network was planned in 1986—87 many of the Account Officers that would be using the system were "computer illiterate". They did not work with computers and did not like them. Now, this information system is a vital part of their activities. All new Account Officers must be computer literate to be considered for this position. After successful implementation, similar systems were planned for the Controllers and for the Business Group Managers.

A future desire is to have forms filled-in automatically from information stored in the database, or provide the data to the professionals workstations automatically or almost transparently. They plan to develop "Executive Information Systems" that are "MONI", Mostly Output, No Input.

Electronic Data Interchange (EDI)

EDI is primarily in the pilot-planning stage. They are becoming educated, gaining understanding. The Corporation has been working with EDI for two-three years in the area of cash management. They have an on-going pilot project to move EDI to PCs for letters of credit/non-credit. It is felt there is high potential for EDI in letters of credit, both domestic and international. They already have an internal system for credit approval on a global basis.

Executive Information Systems (EIS)

In 1989 MHT Information Technology, working with others, developed a "Corporate Information Management Program" that was championed by a Vice Chairman of the bank.

The IT planning group started by identifying the bank's critical success factors: marketing (internal and external), risk mgt., asset liability mgt., profitability. The critical success factors also vary by industry, individual, working environment.

Important factors considered in designing the system were: data integration, timeliness, presentation, quality of data, depth of data needed, "what are the exceptions — what do they mean?"

LANs, Departmental Systems

MHT started installing a number of LANs in the late 1980s. The LANs were Novell or IBM "Token Ring". The LANs are connected to a "backbone" which is connected to the mainframe. There are typically 20—40 workstations connected to a LAN. In 1989 the servers were 386 technology, 6MB RAM, 25MHz processor speed. Most have now been upgraded to 486 technology with the trend toward even more powerful servers.

Retail Branch Banking

In 1989 IT evaluated IBM's SAA. They were not sold on IBM's Office-Vision, but did like SAA. Unfortunately, there was no driving force for the implementation of SAA. They subsequently standardized on Microsoft's Windows operating system and are now planning to implement Windows NT.

The Retail Banking Division developed a strategic plan in 1989 for their staff working with small businesses ($3 million—$50 million revenues). This strategy covered hardware, software and training that cost $3 million over two years. They planned on a 32 percent gross rate of return over five years. The goal was to have a workstation on every desk. They started with one stand alone PC per eight users. Initially the users did not buy-in so IT had a "sales job" to do. The following article from PC WEEK, July 31,1989, Page 65, explains IT's philosophy regarding their system users.

Too Much Technology Too Soon Can Choke Users

For all its commitment to new technology, the LAN support staff at Manufacturers Hanover Trust Co. has learned a hard lesson:

"This isn't a computer company, this is a bank," said Jonah Giacalone, information-systems officer. "They [users] aren't here to test out new technology, they're here to work. And if you're going to interfere with them doing work, they're going to throw you out."

Giacalone and other members of the LAN-support staff view their end users the way a vendor looks at its customers—because users "buy" technology from them through chargebacks.

He faces the usual problems of "all these different packages that are supposed to work together and don't."

In addition, the firm has made a commitment to using Microsoft Windows, to give users a graphical user interface and multitasking. But that means giving up many DOS applications that don't run under Windows, or only run slowly.

For example, the firm hasn't found a good database for Windows and doesn't want to spend the time and money to write its own, Giacalone said. The short-term solution is to write macros running under Microsoft's Excel spreadsheet "that sort of simulate a database application" but run too slowly for users.

Manufacturers Hanover also uses a lot of "beta software or software we commission," he said. "We promise people things based on assurances by vendors, and when it doesn't come around we're sitting here with egg on our faces."

Sometimes, it doesn't pay to make users

shift to new technology until it's rock-solid. One network manager was "on the phone crying," said Giacalone, because her Wang Laboratories Inc. VS system was "yanked out" in favor of Windows-equipped '386s.

Though the Wang system ran slowly, users knew how to handle their everyday jobs, he said. With Windows, the LAN manager has "a lot of strange new applications" and system crashes to cope with.

Giacalone's advice is: "Don't make such sweeping policies" about which products users can and can't use. Take it on a case-by-case basis, considering not only the long-term benefit, but the short-term cost for the user.

"There's always a tradeoff, there always will be a balance," he said. "Maybe tip the balance a little more in favor of the customer."   —R.L.S.

They initially installed a pilot project with sales/marketing applications on a LAN. With this pilot project there was one PC for every desk. The PCs were 386 technology, NCR or IBM PS/2s, model 70, with 4MB RAM. Many were "diskless" units while others have 70MB hard disks. The workstations use Microsoft's Windows and are all connected to Novell networks.

By 1990 the Business Banking Group, (BBG) had installed 300 work stations at 15 branch locations. Figure 8 shows this system, "Window on the World".
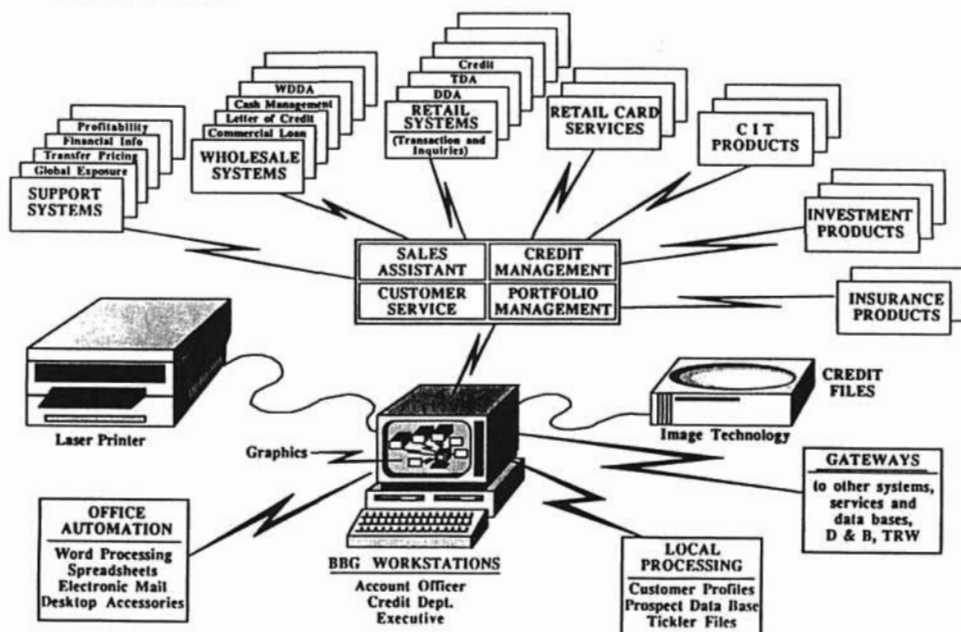

Figure 8   Window on the World

There are four sets of applications:

- Sales assistant
- Credit manager, (loan analysis, risk analysis)
- Portfolio management, (internal analysis)
- Profitability analysis

Most of these were third party applications consisting of standard software packages + custom macro + host applications. All of the applications are accessible from all workstations on the network. Following their installation in 1990 additional functionality was added in 1990—1991, including a wide area network so users can communicate office-to-office.

With the merger, this small business part of the business went to the Chemical Bank staff to pursue, while the MHT Retail Branch Banking group is now focusing on retail consumer banking.

For the retail consumer banking activity, they are starting to implement PC/LAN (Token Ring) systems at each branch bank, based on Windows NT with Unix servers. Each bank will have an application server — Unix — with proprietary software, communications server, O/S 2 links to SNA network, ATMs.

Tellers have 386SX, character based PCs, officers have 486SX PCs with Windows applications. All of the PCs are connected to the Token Ring network. The objective is to capture all data at the source and eliminate paper.

Reports are down loaded in the mornings. Officers can work off-line for report preparation, analysis, or be on-line for transaction processing.

They can annotate data and then up-load it to the mainframe. Very little paper flows to/from the branches. The 450 Chemical branches expect to convert to this MHT system this year. Everyone in the branches has had a workstation since 1987. The new system replaced multiple networks with a single branch network and changed the entire back-end system. While the new system did not provide a lot of new functionality, it did automate the general ledger and there is an electronic reporting system in pilot test.

Originally they standardized on the microchannel PC design. That has changed. Software for the new branch system is "open system".

The bank converted from an NCR mainframe to an IBM system. This enabled them to get rid of proprietary code and clean up the system development process. They are now able to look at new applications and get them implemented much faster.

Files are maintained at the branch for all "household customers", exception data, overdrafts, large deposits/withdrawals.

All of a customer's activities with the bank are maintained in the "Household Account". The Household Account does not keep all transactions, just a list of services used, fees paid. It is necessary to go to the on-line system for the next level of information, such as account activity.

Figure 9   Patricia Valentino, Vice President, Retail Systems

Previously, users were ahead of the IT staff and pushing for more advanced information systems. They are still ahead and pushing on transaction systems, but IT is ahead of users on administrative office systems. It is difficult for users to understand the capabilities of the technology during development of an information system so IT has to lead.

In 1990—1991 the core Branch Manager banking applications were replaced. Now, one statement documents everything happening at the branch bank.

Future plans are to merge the branch systems so they will be able to communicate "peer-to-peer". Further in the future, it is recognized the SNA network does not have the capacity to support new retail credit card applications using image data, similar to American Express credit card statements. Another challenge is how to manage 400+ branches, each with their own data.

E-mail Systems

Chemical Bank uses DEC All-In-1 and Wang E-mail systems, and have started to use Lotus Notes, cc:mail. There are about 13,000 E-mail users; 8,000 use Comet, 3—4,000 use All-In-1, 2,000 on Notes. In two-three years it is expected there will be 20,000 internal E-mail users plus external users.

E-mail policies and plans are established by an E-mail Council, composed of senior bank managers. The major future direction is Lotus Notes and cc:mail. Currently, a "Softswitch" system is used for access to the directory system from the incompatible DEC and Wang systems. There are 125 databases available in their Notes system. They plan to soon be able to dial into this Notes system from home PC systems.

There is a PC/LAN Council establishing policies and plans in this area. They are gradually implementing client/server networks and are starting to distribute data to network servers. Workstations now in use are primarily 386 based PCs. New purchases are 486s, with 8MB RAM, 15—17" monitors.

Outsourcing: The bank currently outsources PC/LAN hardware maintenance, application help desk, LAN support, training.

Multimedia: Chem-MHT is studying potential multimedia applications. The initial application will probably be presentations. Some video conferencing is currently taking place, using special rooms.

They are looking for increased profit through increased services. One approach is to have the customer do most of work; pay bills, funds transfer, etc. In the future they expect integration of customer information, services offered, risk.

Comments on Case Study

The Account Officer network described in the first part of this case study is an example of a successful major network implementation project. To successfully go from zero to 1500 users in two years, on a system with 50 file servers is a major accomplishment. The planning group focused on their primary objectives, limiting the initial scope to the Account Officers. Time was spent in planning and identifying the important application factors and the system architecture.

They correctly identified that having a very friendly user interface was critical to the acceptance of the system. Developing menus using friendly banking terms was an excellent decision. It undoubtedly resulted in faster user acceptance, particularly for those users with limited computer experience.

The decision to use workstations without hard disks is very interesting. It most likely required considerable discussion and analysis since it is very critical to the entire system architecture. In this case it is very logical to keep the files stored on the network file servers. It is important to the systems success that the network and servers are able to respond fast enough to satisfy the users.

Another important decision was to appoint network administrators for each file server. Even though the network companies typically state an administrator is not necessary, it is very prudent to have one.

Connecting the network to an X.25 worldwide network will provide the banks Account Officers and other future users worldwide access to the databases. The bank has a separate worldwide E-mail system.

The last two years of merging the Chemical and MHT operations and organizations has been very challenging for all involved, particularly with staff reassignments and departures occurring. As a result, IT organizations have been divided, assigned new missions, redirected, etc. They now seem to be gaining stability and moving ahead.

Monsanto Company

Introduction

Monsanto is the third largest chemical company in the U.S., following Du Pont and Dow Chemical. Monsanto Company makes and markets high-value agricultural, chemical and food products, pharmaceuticals and other performance materials. Monsanto's headquarters are in St. Louis, Missouri. Monsanto sells its products in more than 50 countries and has 50,000 employees worldwide. The European headquarters are in Brussels; other major facilities are in Brazil and Singapore. Annual revenues are approximately nine billion dollars.

Monsanto is a highly decentralized organization. They maintain a relatively small corporate staff that provides coordination between the operating units. The separate operating units serve Monsanto's principal product/market areas. These operating units have their own president, operating management, manufacturing and sales capabilities. These organizations are:

- Monsanto Agricultural Company. Principal products are herbicides, and in the future, biotechnology crop protection products.
- Monsanto Chemical Company. Principal products include nylon and acrylic fibers for carpets, plastic interlayer for automotive safety glass, worlds largest supplier to detergent manufacturers, the largest producer of rubber chemicals used by tire manufacturers. (Refer to figure 10)
- G. D. Searle & Company. Searle discovers, develops, manufactures and markets prescription pharmaceuticals in major markets worldwide.
- The Nutrasweet Company. Nutrasweet manufactures and supplies sweeteners and fat substitutes worldwide.

Monsanto Corporation has over 39,000 employees in its worldwide operations.

This case study will focus on the information systems activities of Monsanto Chemical Company and on the Corporate activities to provide global E-Mail, groupware and video conferencing systems that will serve the entire Corporation.

Monsanto Chemical Company

Monsanto Chemical Company, (MCC), utilizes hardware systems from IBM, DEC and Hewlett-Packard. The Corporate mainframe is IBM. In the early-mid 1980s the primary secretarial word processing systems were IBM 5520s and the primary professional workstations were IBM PCs. DEC and HP systems were being used in various research, test and manufacturing applications.

KRUMMRICH PRODUCTS AND THEIR USES

As a top quality supplier, the Krummrich plant helps our customers produce the best possible products for you — the consumer. Together, we're helping make your life safer, hassle-free, and more fun.

Monochlorobenzene (MCB)

MCB is a key ingredient in Monsanto Lasso herbicide, which improves farmers' ability to produce our food. MCB is also a raw material used in the manufacture of several engineering plastics.

Muriatic Acid (HCL)
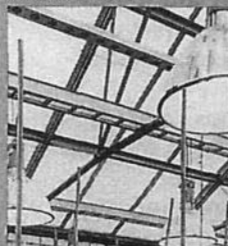
Muriatic acid is used to remove rust from steel (like the steel beams pictured), and to adjust the pH balance in water treatment.

Orthodichlorobenzene (ODCB)

Bath soaps and cleaners are two of the end uses for ODCB.

Orthonitroaniline (ONA)

ONA is an intermediate chemical used in the production of Monsanto Saflex interlayer, which is laminated into automotive windshields to make them shatterproof. Saflex has already saved thousands of lives.

Orthonitrochlorobenzene (ONCB)

Blondie's yellow hair is printed with ink containing ONCB.

Paradichlorobenzene (PDCB)

As a deodorizer, PDCB freshens your home; as mothballs, it keeps your clothes moth-free; as an industrial raw material, PDCB is the building block for PPS resin, a high performance engineering plastic.

Paranitroaniline (PNA)

Farm animals are treated with pharmaceuticals containing PNA. The material is also used in feed additives, and rubber chemicals.

Paranitrochlorobenzene (PNCB)

PNCB is found in non-aspirin pain relievers, Monsanto Santoquin, an animal feed preservative, and rubber chemicals.

Phosphorus Pentasulfide (P2S5)

P2S5 is used in the manufacture of motor oil additives to protect automotive engine parts against wear.

Phosphorus Trichloride (PCl3)

Want to get rid of weeds? Reach for Roundup. PCl3 is a key ingredient in Monsanto's well-known herbicide.

**Santoflexes
4-Nitrodiphenylamine (4-NDPA)**

The tires on your car last for years because of rubber chemicals, which are added to help prevent cracking and deterioration. (4-NDPA is a raw material used to produce Santoflexes.)

Trichloroisocyanuric Acid (ACL)

Taking a dip in the pool is refreshing and safe, thanks to ACL, the main ingredient in swimming pool disinfectants. ACL also adds bleaching power to many home scouring powders.

Figure 10
The Krummrich plant, Sauget, Illinois,
is one of Monsanto Chemical Company's plants,
making chemicals for a variety of uses.

When IBM discontinued support for the 5520 word processing systems and could not offer suitable departmental computing systems, MCC started implementing DEC All-In-1 office systems. The DEC systems consists of a DEC VAX minicomputer with Decmate terminals as workstations. All-In-1 is an integrated office software system that was well received by users in the early-mid 1980s.

In the mid-1980s the Corporation was faced with trying to communicate between several incompatible systems: IBM mainframes, DEC VAXes, different application software programs. At that time the decision was made to install a "Softswitch" system, which acts as a protocol converter between IBM, DEC, other leading hardware systems and between selected application software programs. While this system is quite expensive, (several hundred thousand dollars), and there is a loss of some formats in the translation, it was about the only solution available.

Organization, User Relationships

MCC has an "Office Systems Advisory Group" consisting of representatives from each business unit. Staff at all levels are represented, from secretaries to Directors, as selected by the business unit Vice Presidents. This group meets monthly. It sets directions, establishes priorities, schedules introductions of new programs, has questions answered.

Reporting to the OS Advisory Committee is an "Office System Working Committee". This committee consists of the MIS representative from each business unit and selected MIS staff. The committee meets every two weeks. It was initially established for the introduction of PCs and Word Perfect software. The committee proved to be so effective it was continued. Funding requests are now processed in half the time.

The International MIS organization consists of a Manager for International at MCC's headquarters, who works with the MCC General Manager for International and the MIS managers located in each of the major operating countries. Europe has all IBM systems while the U.S. headquarters office has DEC systems for office applications. The resulting incompatibility was solved by having each organization proceed with its own information systems development and using "Softswitch" for protocol conversion to provide communication between the different systems.

Local Area Networks

While the DEC All-In-1 system was highly regarded when it was introduced over ten years ago, developments in networking technologies have opened new system capabilities. As a result, MCC started installing local area networks, (LANs), in the mid-1980s. Initially these networks were based on 3-COM Ethernet systems, using Compact 386 PCs as network servers. IBM PCs were used as workstations by both sec-

retaries and professionals. They have 1200 workstations with 12 servers on their network. The network physical architecture is designed for each floor and wing of the building so they can monitor the "network stress" or load.

In the late 1980s MCC started implementing an upgrade to their network, to make it a "distributed computing facility". The Compact PC servers were replaced with DEC 3100 minicomputers and the 3-COM software was replaced with DEC's PC LAN, PCSA software. The model 3100 servers use DEC's VMS operating system. Ultrex (a version of Unix) or RISK operating systems can be used. They hope to be able to move their Oracle database software from large dedicated VAX systems to the model 3100 servers in the future. A minimum of 300MB disk storage is required.

There was one major application that, when shifted from the mainframe to the network, more than justified the financial investment to upgrade this capability. Now, software and files are stored on the network servers. Customer files are still maintained on the corporate mainframe computer system so that important data is readily available to the corporate finance/accounting functions and to corporate management.

In the late 1980s, after analyzing their needs and looking toward the future, the company made the decision to provide all of their secretarial staff (285) with IBM PCs having 386 technology, PS/2 model 70, with 4MB of RAM and a minimum of 60MB of hard disk. This required a five million dollar investment. They classify secretaries as "power users". Similar systems are gradually being provided to the professional staff.

The older PCs that were replaced were given to selected staff members, primarily MIS, for use at home. The company also provided a 9600 baud modem and paid the cost of adding another telephone line to the staff members house. They feel this has been a very good investment since it encourages the staff members to do more work at home, primarily on their own time.

The software they have standardized on is Word Perfect for WP, Quatro Plus from Borland for spreadsheets and Microsoft Windows to provide a more uniform and friendly "windowing" user interface environment.

Training

MCC has an extensive training program. They provide training on the following software programs: DEC All-In-1 (integrated software); Word Perfect (WP); Lotus 1-2-3, being replaced with Borland Quatro Plus (spreadsheet); Harvard Graphics (graphics); Paradox (data base).

Basic, intermediate and advanced classes are held. The training department has developed "modules" that focus on specific program capabilities. These modules are typically 1—1 1/2 hours long. There are 12 modules for Word Perfect, which they teach in 3 one day courses,

held about one month apart. Typically there are 10—12 students in a class. They have a separate program for professional training. One continuing challenge is to have those people that need training the most attend classes. They have started going out to some users and training them one-on-one but this is very time consuming. They have found that many staff prefer training classes held early in the morning, starting an hour before normal office hours.

The training department has been looking for translation software that will aid in the translation of worldwide communications. One program that they feel offers both word translation and syntactical translation is "TOVNA", developed by Translation Machines Ltd, Jerusalem. It is distributed in the U.S. by Translation Technology International Inc. and is reportedly used by the World Bank, Pan American Council, United Nations.

Technology

Office systems are exploding into a new range of capabilities. They are rapidly moving to windowing software for a more friendly user interface. They see the growing need for imaging in specific applications such as: personnel files, showing a picture of the employee or job applicant, legal files such as patent applications, competitive and other reference information files.

Two things remain constant, the need for networks and the need for increased bandwidth.

The company's change from 3-COM LAN Manager software to DEC's PCSA LAN software, with 1200 workstations on the LAN, cost 650,000 dollars.

DEC is preferred since they provide a common network with common protocols. Changing to the client-server network architecture is much easier with DEC since PCSA is easier to implement. If they had stayed with 3-COM, the company's IT staff would have had to act as the systems integraters and manage a number of different software vendors when implementing the system. The next big change in local area networks will be the change to fiber optic cable in order to greatly increase the bandwidth.

The company feels that Hewlett-Packard is pushing "Open Networks" when OSI is not really available. HP would be much further ahead if they would also run on DECnet, with HP servers running their office system software on DECnet LANs. It is also felt DEC would be much further ahead if they would unbundle their system so that their network could operate with other network servers and not be limited to VAXes. They feel networking strategy is the critical element.

Monsanto has installed a 9600 baud wide area backbone network in the U.S. This is a "virtually private" network and required an investment of about five million dollars. There is a growing need to increase this network bandwidth to 56KB (T-1 capacity). They have a backbone network in Europe utilizing public packet switching services available

from the European PTTs. The company expects to have a worldwide network in three years, composed of public and private communication services.

As stated above, Monsanto has several largely autonomous companies operating in different businesses; chemicals, agricultural products, pharmaceutical drugs, sweeteners. The Corporation grew partly through internal diversification and partly through acquisition of other companies. The result is a very diverse computing environment. There are three different vendor computing platforms; IBM, DEC, HP. There are 6 or more operating environments with MVS, VMS, MS/DOS, UNIX, Macintosh, HP, and possibly others.

The office environment is even more complex with:

- PROFS, All-In-1, HPDesk, DISOSS, 5520 (being phased out)
- Various word processors — Word Perfect is emerging as a standard
- 14 different E-mail systems, and increasing
- LANs
- Softswitch
- Wide Area Network

Electronic Data Interchange

Monsanto started working with EDI in the early 1980s using proprietary software. They developed their first pilot system using the newly developed ANSI EDI standards in 1985—86.

Initial applications were in procurement and then some transportation applications were implemented. Purchase orders were the first application, then invoices, then functional acknowledgements.

EDI development has progressed so that Monsanto now sends POs, acknowledgements, pricing, gets invoices, pays by EFT, (Electronic Funds Transfer), to more than 60 suppliers. They also have some PO change orders, authorization to pay, remittance advice for payment.

The shipping advice is still a paper document with suppliers. MCC's customers, the auto companies, want advanced shipping notices. This is due to implementation of "just-in-time" manufacturing schedules.

By year-end 1991 Monsanto was working with 383 suppliers/locations. Of these, 321 were unique suppliers, 53 were multiple location suppliers. Monsanto expects continued growth in their use of EDI. They have 700 partners total, 40—50,000 transactions per month. It is increasing at a 40—50 percent annual compound growth rate. Unit processing costs are decreasing at 10—15 percent per year. There are 14 EDI locations.

They expect to increase from 15 to 20 data sets next year. EDI and bar coding are "key technologies". Only 10 percent of all transactions are now using EDI.

Monsanto has good cost data. They charge-out on a per-transaction basis. It is very difficult to quantify the benefits. EDI is generally part of a larger program, such as an overall quality program or customer service program.

Monsanto has just scratched the surface in process redesign. They have revamped their customer service area and accounts receivable. They have reduced the number of people in procurement and have reduced the number of their suppliers and shipping companies.

International EDI

Monsanto sends invoices and bills of lading data through freight forwarders, who add information and send to Europe and Africa. For Monsanto-to-Monsanto transactions they use ANSI standards.

Monsanto operations in Europe and Asia issue POs to Monsanto St. Louis using the internal messaging system. They are trying to convert to EDI standard formats. Their EDI translator will handle both ANSI and EDIFACT standards. They use "Gentran" translation software from Sterling. The syntax translation between the two standards is not a major problem but the directories are very different. They expect that dual standards will exist for some time.

EDI Organization

There is an EDI steering committee with 14 members. They include representatives from Law, Accounts Payable, Corporate Staff, the operating divisions. This Committee serves as a coordinating function. They have bi-monthly meetings. Subcommittees deal with special issues such as security, integration considerations.

The Corporate EDI staff consists of four, including the manager. They obtain support from other groups, such as telecommunication, when required. Corporate EDI is "reactive", providing support to departments requesting assistance. The primary push for EDI is from the Purchasing and Shipping departments. Corporate has standardized on the EDI mapping formats to be used.

The Agricultural and Chemical companies all work with a single EDI gateway located in St Louis. G. D. Searle has their own gateway in Chicago and does their own translation. Searle is now imaging incoming POs.

Electronic Mail System

Monsanto's E-mail systems grew within each operation, based upon the office information system they were using, or based upon local selection with very little corporate control or guidance. This has resulted a wide variety of incompatible E-mail systems. Monsanto's acquisition of G. D. Searle and other organizations added additional varieties of systems.

The current E-mail systems used throughout Monsanto are:

U.S.   IBM: PROFS, System 36, AS/400; cc:Mail; HP Desk; DEC All-In-1,

Europe HP Desk; DEC All-In-1 Mail; homegrown "COMET", (going to cc:Mail)

Asia   IBM System 36

Japan   IBM AS/400, testing cc:Mail

Monsanto installed a "Softswitch" system eight-nine years ago, as a "temporary solution", to try and ease the incompatibility problems between the different E-mail systems. Softswitch is quite expensive, slow, and attributes are lost in the translation, but it was the only logical solution at that time.

In 1991 Monsanto established a task force to recommend a strategy for the development of an integrated electronic communication system that would serve the entire corporation. The goal was that everyone should be able to locate and communicate effectively with everyone else in the organization. Monsanto Integrated Messaging System, MIMS, was the result. Figure 11 illustrates Monsanto's "Vision Statement" for their communication needs.
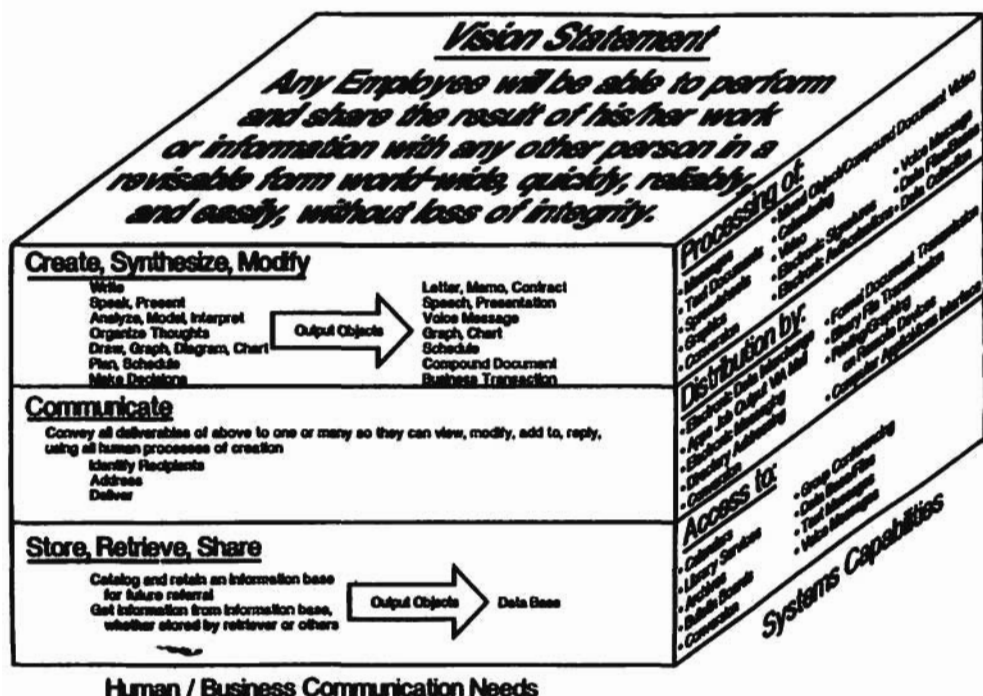

Figure 11 Communications Vision Statement

The plan was to migrate from their mainframe based mail system to LAN based systems. IBM, HP Desk, cc:Mail, DEC All-In-1 (evolving into "Team Links"), will all be connected through an X.400 backbone.

One unfortunate situation is that most of the current X.400 products are based on 1984 standards. The project team is also analyzing the possibility of implementing the X.500 directory system by 1997.

The international standard for EDI communication is X.435. Monsanto expects there will be a merging of X.400 & X.435 with EDI becoming a subset of E-mail communications.

One important consideration for E-mail systems is security. With LAN based E-mail you still need entry into the directory using a password and ID number, the same as with a mainframe based system. Monsanto feels the area of concern with a LAN based system is the capability of the LAN administrator and security of the server files, not user security.

Monsanto had a major staff reduction, (approximately 20%), during 1990—91. One unexpected result was that E-mail message volume skyrocketed. Considering just their DEC systems, there are 2100 All-In-1 users at Monsanto St. Louis. There are 5—6,000 All-In-1 users in Monsanto's U.S. operations. They sent 4 1/2 million messages in 1991.

There are 20,000 E-mail users listed in Monsanto's worldwide directory, (out of a total employment of 38,000). The directory is up-dated every week. They are developing an on-line directory for more than 200 external companies. EXXON and Du Pont were leaders in having on-line directories for external companies.

One example of the use of E-mail is in the sales department. Previously a secretary would send a one page fax to 15 auto companies in the U.S., Europe and Japan. It would take her 2 1/2 hours. Now she uses MCI E-mail-to-fax. It now takes 5—10 minutes and only costs a local phone call.

Monsanto Research is using Lotus "Notes" for small groups and is very happy. DEC All-In-1 has "VAX Notes" which provides capability for group conferencing. Eleven different Monsanto All-In-1 sites use the group conferencing option. It has indexing capabilities, "show me all unread notes", can limit access to a selected group. DEC's system has more administrative overhead then Lotus Notes, but has more "bells and whistles".

The Resins Division moved their headquarters from St. Louis to Belgium last year. To improve communications and hopefully reduce international travel, they installed a video conferencing system with one center at MCC headquarters in St. Louis, one in Brussels, one in Massachusetts. There are mixed reviews on the value of the video conferences. Many people are not comfortable talking into the camera, plus the camera operation is awkward. This is expected to improve as they become more experienced. One requirement is that you must send all relevant data in advance, which is a good procedure for any meet-

ing. (Other companies have found training of participants and a full time manager-operator are necessary for successful video conferences.)

Comments on Case Study

This corporation, and particularly the chemical company, has been in the forefront of implementing new information systems for a number of years. They have been willing to experiment with advanced systems concepts, implementing some and discarding others.

They were in the forefront in implementing departmental systems, using DEC VAXes with All-In-1 office system software, modified for the department's specific requirements. They were early in the implementation of LANs and now are in the forefront in providing their secretaries and other staff with very powerful workstations.

Implementing a "client-server" architecture on their LANs is another example of their willingness to move ahead and remain in the forefront of office system technology. They are now well positioned to take advantage of the new generation of office systems that is emerging.

The Global E-mail committee has a very difficult task. While the problems of bringing the corporation together are partly technical, they are primarily political. There is always the question of how much real need is there for everyone in the corporation to be able to talk to everyone else. It is accepted that over 90 percent of communications occur within work groups and departments.

It is also accepted that there are very valid reasons for different divisions to have different hardware platforms and operating systems. Trying to change these in order to comply with a new corporate policy would be very disruptive.

Corporate guidelines do need to be established so that the different groups may be brought closer together during the 1990s and to prevent actions the would result in further barriers between the operating organizations.

Avon Products Inc.

Background

Avon Products Inc. is a major consumer products corporation with revenues of three billion dollars. Corporate headquarters are in New York. Avon's principal activities are beauty care products and perfumes. These products are sold primarily by a very large door-to-door sales force, famous for its "Avon calling" sales approach.

Avon started a major diversification program several years ago, making acquisitions of several major companies in unrelated fields. These investments turned out to be ill-timed and resulted in Avon incurring very large indebtedness and a sharp decline in earnings. As a result, the price of Avon's stock fell to 50 percent of the value it had 10 years ago and Avon was threatened with takeovers by outside investors.

Avon appointed a new chairman in 1988. The Corporate environment since then has been one of strict "cost control" and "down-sizing". The new management divested the unwise acquisitions and concentrated on Avon's primary consumer products business. Employment was reduced by over 25 percent and the number of Corporate and Group Officers was reduced from 25 to 13. Employment is now about 30,000 with revenues of four billion dollars.

All corporate activities, including Information Technology, (IT), were affected by the reduction in personnel and cost containment policies. A number of new or planned IT projects were cancelled or indefinitely delayed. All emphasis was placed on improving short term profitability.

This austerity program was successful. Avon protected itself from outside takeovers, refocused its organization on its primary business activities, has turned around and is now in a slow growth phase. It is planning for the future and making longer term investments in information systems and other areas.

Information Systems

Avon had always been a leader in implementing advanced information systems. They recognized information systems could provide improved communications, increased productivity and valuable management tools. All through the early and mid-eighties, Corporate Management fully supported the IT Department, providing major resources for new systems development.

During the late 1970s, Avon started development of their own integrated office information system. In the early 1980s, when DEC announced its "All-In-1" office automation software system, Avon be-

came an early user. They installed DEC VAXes with All-In-1 in all of their major functional departments.

Avon was also an early user of personal computers, with IBM or compatible the standard, except that Apple Macintoshes were used by Senior Management and their staff, and by the Electronic Publications Department. IBM's PROFS was used for E-mail. "Softswitch" was installed to tie the DEC All-In-1 systems with IBM PROFS.

By the late 1980s the Corporate IT Department was undertaking a number of major new systems developments. Unfortunately, IT management was "out of step" with the realities of the deteriorating corporate financial situation. IT was running ahead full speed when the corporation was stumbling. It was inappropriate for IT to be making major investments in very advanced system developments, where the financial payoff would be far in the future, if at all, when corporate profits were rapidly declining.

In the process, IT's activities were severely curtailed and their organization was substantially reduced in size. It was necessary to stop a number of development programs where considerable manpower had been invested. Future planning was effectively stopped. Understandably, staff moral deteriorated.

IT was on the verge of completing development of a corporate-wide network for advanced data communications. They had selected a "strategic client" and started implementation of their office automation program. They had an advanced Executive Information System based on two DEC VAX computers. They also had one of the largest relational databases in the U.S. (Refer to figure 12.) There were plans to expand it to include a powerful sales/marketing database. They were ahead of most major corporations at that time in moving to use information technology to gain a competitive advantage in the marketplace. All of these programs were eliminated, or put "on hold" when the austerity program was implemented.

Prior to this major crisis Avon was a very progressive organization, willing to invest in developing new, untried information systems. They were proud to be in the forefront of technology and had implemented several very advanced information systems.

The obvious conclusion is that the IT management must have a very close relationship with Corporate management. Both must fully understand the implications of different decisions and be in full agreement on the directions taken and rate of the investment commitments in new hardware and new system developments.

During the down-sizing phase, the Corporate IT organization was eliminated and their responsibilities were transferred to the various divisions. In one typical division, the Information Technology organization was reduced from 250 to a 150 person "core group".

Considerable development work had been completed on a very advanced system aimed at increasing to effectiveness of the sales organization. On a trial basis, District Sales Managers were provided with PCs

HOST COMPUTING

MMS Databases

Database	Description	Organized by	Comments
National Campaign Work File	Representative selling history by campaign	Representative; campaign	History updated every campaign
Product Detail File	Product sales by category and sales class	Campaign; representative	History updated every campaign
New and Estimating Representative Tracking System	Representative selling history summarized by district and major representative segments	Campaign; district; representative segment	Campaign history; planned for 4 years (based on data storage space available)
Marketing Summary Table	Product sales by category and sales class	Campaign; district; representative segment	Only most recent quarter available
Demographic and Business Database	Demographic business and market data	District; census tract	Updated on an irregular basis

Figure 12

for use at home. The concept was that this would make it easy for them to access the advanced sales/marketing information database that was being developed. As an example, they had been doing market segment analysis, all accessible by PCs. As with other new programs, this development was stopped.

Information Technology use to budget for new systems. Now it is up to the end users to obtain approval for these expenditures. Previously, IT staffed up for new projects. Now they wait until a project is approved and then they typically use outside consultants. Last year they had 90 external consultants working on projects, now they have 20.

Present Situation

Avon has recovered sufficiently to make new investments in IT on a longer term planning basis. They reestablished a Corporate IT Department. They have just consolidated data processing at their Rye, New York facilities, moving work from five regional centers. They feel this has saved Avon $3,000,000.

Previously, the regional centers did the billing, inventory control, customer files, etc., using IBM 4381 computers. These activities are now consolidated on the IBM 3090 mainframe located at Rye, with remote access and remote printing of invoices. The networks use IBM SNA. They have been upgraded to increase reliability.

There are Ethernet LANs located at the five regional centers and at corporate headquarters in New York City. There are 1,000—1,500 nodes on these LANs, all interconnected. Workstations are IBM or compatible, 386 and 486 designs, and a small but increasing number of Apple Macintoshes. Notebook computer systems are available for travellers.

The Manufacturing and Finance Departments still have centralized departmental system architectures based on DEC VAXes, using DEC's All-In-1 integrated software system.

Each Regional center also has a Token Ring network with IBM R 6000s. This system is used for imaging invoices before they are sent to customers.

The Marketing Department recently received approval to install a 70 gigabyte DB2 database system that will be used for marketing segment analysis.

Avon considered outsourcing their data processing functions but turned it down. They determined it was better for them to centralize data processing instead. They are evaluating outsourcing PC support and Help Desk requirements.

Avon has decided to shift user applications to client/server networks, (C/S). They approached it as a major change in their information system management philosophy. One motivating factor in the decision to shift to C/S is that development only requires 25 percent of the time it would on a mainframe system.

The major change in philosophy is that IT should act as trainers so users can develop their own applications using specific standard application programs, such as Excel.

C/S is an architecture. It requires well defined methodology. As a first step, Avon created a C/S architecture document. Creating this document cost $150,000. It was a concept document. C/S architecture should be driven by needs.

The C/S document states that servers should be RISK design. An addendum to the document lists products currently available, such as RISK servers, (which are IBM RS 6000, DEC 5000, HP 9000). In the future it will only be necessary to upgrade the product list to keep the document current.

In 1991 Avon bought eight different servers for evaluation. These servers had 16MB RAM, 1GB hard disk, used Sybase DBMS. In 1992 they "rolled out" C/S application products.

Applications have three major components:

- Graphical User Interface, GUI. (A few users can do it)
- DBMS — keep in IT
- Reporting — this is what users do best

A critical component of Avon's C/S model is to assign different tasks to those best qualified to handle them, giving as much as possible to the user level. Hold a minimum number of meetings. Let users develop spread sheet reports and then IT will provide SQL statements to access the database and maintain security. It is important that SQL program development be assigned to a SQL expert.

The functionality on the server is the same as on the mainframe. Avon centralized all servers in their computer room, using fiberoptic connections. Rye, N.Y. is now Avon's only computer center in the U.S.

A new marketing application on the C/S system requires 3/4GB of memory. It replaces a variety of reports previously prepared manually or on a PC. Marketing came to IT with spread sheets showing the data they desired. There were very few meetings and no requirements analysis; the spread sheets did it. IT's primary concern was how to structure the database so the data would be easily accessible and easily up-dated. IT's goal was to design the database so a user can click on one or two Icons to get desired data.

This application is now being tested by Marketing. One contact in Marketing is responsible for making incremental updates to the database.

E-mail is not used very much. There are about 200 E-mail users on a DEC All-In-1 system. The Human Resources and the Finance Departments have standardized on Lotus cc:mail.

Avon is currently providing 10—20,000 hand-held terminals to their independent sales representatives which will allow them to enter orders and then transmit them to the mainframe on a daily basis. The sales representatives currently can use a voice mail system to check the status of orders, shipments, and to check if they owe Avon any money.

Electronic Publications is a major activity at Avon. They have a staff of 100 people, including designers and copywriters, producing a new publication every two weeks. Avon is the third largest publisher in the U.S., after Reader's Digest and TV Weekly. They are currently struggling to automate 26 separate campaigns. One book per sales campaign is supplied to all of the sales staff.

In the future Avon expects to use multimedia for customer and sales representative training. They also hope to distribute data on CD-ROM discs. Avon's new President recognizes that IT technology is needed to help Avon meet his objectives.

Comments on case study

Avon has really gone from one extreme to another. During the mid-1980s they seemed to have unlimited development budgets and IT proceeded to develop systems with very advanced concepts, without regard for the financial justifications. At the time of Avon's serious financial restructuring, IT had under serious consideration the development of the largest data base system in the U.S., outside of government.

The financial restructuring brought the opposite condition, with all spending stopped, without considering the consequences. As a result, they lost valuable IT developments and it cost them more to stop them then to continue.

Avon is now on a logical path, with coordination between Corporate and IT management. IT is correcting the years of too restrictive spending and upgrading their information systems in a thoughtful manner.

PepsiCo

Introduction

PepsiCo is a large, diversified multinational organization with major operations in beverage and "snack food" products and fast-food services. Total revenues are in excess of $13 billion and the company has more than 300,000 employees working at its facilities worldwide. Pepsi is competing with Coca Cola in beverages, McDonalds in fast foods, and numerous companies in snack foods. The Corporation has enjoyed steady growth with high performance standards and is strongly oriented towards marketing.

PepsiCo's beverage products include Pepsi, Mountain Dew, 7 up; Frito-Lay snack foods include Fritos, Chee-tos, Doritos, Lays, Ruffles, Tostitos; fast food restaurants include Kentucky Fried Chicken, Pizza Hut, Taco Bell.

Ten years ago PepsiCo had a centralized management structure with mainframe dominated information systems. Since the mid-late 1980s they have been moving toward a highly decentralized management structure. Each division has a president and develops its own plans and goals in accordance with its objectives and operating environment.

The Corporate headquarters staff has been reduced to approximately 600 employees, of which 60 are in Corporate Information Technology. All possible decision-making has been "pushed out", to the Divisions and Regions.

The working environment within the organization is highly motivated with a willingness to try new approaches and search for more efficient methods of operation. The decentralized management structure provides an entrepreneurial spirit with the opportunity for different work groups to develop their own procedures for their tasks.

The corporate challenge is to keep all of the decentralized operations highly motivated, but working together, with common procedures where appropriate. Corporate Information Technology has a very important responsibility keeping the information systems consistent and compatible throughout the organization.

Figure 13

Background

In 1986, PepsiCo was a seven billion dollar corporation with 100,000 employees and 125 people on its Corporate IT staff. It was an "IBM shop" that was evaluating the benefits of "three tier" computing.

At that time the IT Department did not see any corporate level tasks the mainframe could not satisfy. They were implementing PROFS for E-mail and expected that within two years everyone in the corporate organization would be using PROFS. (They were very wrong, both regarding the mainframe system and PROFS.) Corporate senior management wanted to install a LAN, against IT's recommendation.

Secretaries used Wang word processing systems, which were starting to be replaced with stand alone IBM PCs. Many of the secretaries did not like the PCs since they could not share work as they had been doing on the Wang systems.

One group, the Treasury Department Forecasting group, hired a capable IT professional so they would not have to rely on Corporate IT for applications development. They developed a decision support system that provided senior management with the operating results from ten divisions in both graphical and tabular form. The results were displayed in 200 graphs and ten reports.

The Financial Analysis Group installed an Ethernet LAN, against IT's wishes. All 26 staff had their own PCs and were connected to the LAN so they could share spreadsheets. They were able to install this system only with the strong backing of the Chief Financial Officer.

By 1989 the corporate revenues had grown to 13 billion dollars. The centralized management structure was in the process of being replaced with a highly decentralized management structure. Each division has its own president and develops its own plans and goals in accordance with its corporate objectives and operating environment. The corporate headquarters staff had been reduced to approximately 700 employees, with the IT staff still about 120.

PCs had spread throughout the corporate organization. Most professionals had PCs on their desks, and a majority of the secretarial staff's Wang word processors had been replaced with IBM PCs.

The Corporate IT organization was still strongly oriented toward IBM systems. They did not like IBM's mid-range system 38s and 36s, but would not accept DEC or HP minicomputer based systems since they were concerned about compatibility. As a result, few if any departmental systems were ever installed.

Due to Corporate IT's "mainframe orientation", the corporation was slow to install LANs, but by 1989 LANs were starting to be widely implemented.

The Accounting Division had been hiring experienced information systems staff from the Corporation's Information Technology group as well as from outside the Corporation. They wanted their own information technology capability, responsive to their needs rather than hav-

ing to compete with other Corporate activities for assistance from the Corporate IT group.

With this IT capability, the Accounting Division undertook a number of software/system development projects that previously would have been performed by the Corporate IT group. Accounting felt the IT work they did was completed faster, with better results due to the very good communication between the system developers and end users.

Since project specification, scheduling, authorization and acceptance was all within the Accounting Division there was a minimum of justification, coordination or interaction with other company activities. In particular there was a minimum amount of interaction with Corporate IT since Accounting was concerned their IT development activities would be delayed or restricted.

The Accounting Division even converted the General Ledger accounting program residing on the corporate mainframe from MSA (Management Science America) programs, to McCormick and Dodge programs, another leading mainframe software supplier.

This major year long project was undertaken by Accounting since Corporate IT was fully occupied with other urgent projects and would not be able to perform this work for some time in the future. Also, Accounting felt they could complete the task much faster, with much less expense than Corporate IT.

The Corporate Information Technology Group felt threatened by having major system development projects being undertaken by functional departments. They felt this would lead to a lack of corporate direction and control, leading to a diversity in technical approaches, documentation quality and user support.

After meeting with Senior Management, Accounting was directed that they could work with 4th generation languages, but no COBOL programming. Accounting was directed to hire accounting personnel rather than IT personnel.

Corporate IT recognized they had to have a new relationship the decentralized business units. Corporate IT changed from a highly centralized management culture to a flexible, decentralized approach. Now, Corporate IT places project managers in the business units and invites business managers to make presentations to the IT staff. They are also open to business units hiring Corporate IT staff and are willing to hire business unit staff for Corporate IT.

As a result of this policy, one IT staffer spent more time at his Treasury Department office than at his office in IT. A joint Treasury/IT team was developing a new cash management system. It was initially planned to go on a mainframe, but that solution would have required more than two years. After searching for available software packages they ended up with a PC based system that was implemented within six months.

Key management personnel within the Accounting Division felt strongly that IT knowledge is essential for their staff and that individ-

ual Departments should be responsible for developing their own systems. This is now commonly accepted. But just a few years ago was heresy to many Corporate IT organizations.

In 1989, IT felt the future direction was toward the IBM OS/2 PC operating system with microchannel architecture and SAA. (They have since abandoned this in favor of Microsoft DOS/Windows.)

This corporation does not use E-mail very much. They have PROFS, but it isn't used much outside of the IT organization. E-mail is used at PepsiCo's headquarters — Microsoft Mail in a Windows environment. They can attach Excel spread sheets to their E-mail. They are using Microsoft's "Schedule Plus" to arrange meetings. Some organizations have very active voice mail systems. (AT&T Dimension systems).

Another department within the corporate headquarters organization is Financial Analysis and Reporting (FA). They provide information for Corporate Planning. FA analyses market share, geographic, internal data. The work they are doing includes an annual "Performance Envelope" report. It is a 12 year forecast with 5 year history, (17 years total). It involves very large Lotus files. There is operations data, capitol expenditures, with conservative-moderate-aggressive forecasts for each operation; about 200 spreadsheets.

FA uses "Corporate Class", a software program they acquired from another large corporation that had developed it for their own use. FA started using it at the urging of the Chief Financial Officer. There are a set of graphs for each Division, 10 per Division, about 800 total. These are done each period, (30 days), printed on hard copy. They are now on-line.

The Executive VP likes time-series graphs, flashed on screens. Many of PepsiCo's executives still do not use PCs. FA worked with "Fast Star" to develop the graphics program. They take the data from Graph Talk on Lotus. The data is presented four graphs per page. They can create new graphs and can print them on a Calcomp plotter.

Their major food service division is writing the program for an Executive Information System to analyze data gathered from hand held data entry devices used by several thousand travelling "routemen".

PepsiCo Corporate Headquarters

PepsiCo's Corporate mainframe is an IBM 3090; going to a model 600J. It is used for General Ledger and Fixed Assets. Corporate activities use only 20 percent of the capacity, with their major subsidiary, Pepsi-Cola, taking the remaining 80 percent.

The Headquarters staff is fully networked, with 550 PCs on Novell networks. They have file servers and increasingly, database servers, client/server applications. As an example, their personnel system is almost all written in "Oracle" on C/S; they update the mainframe every night.

The Treasury Planning and Tax Departments are using "Power Builder" for their C/S applications. PepsiCo is changing from paying the IRS a quarterly estimate to paying monthly on actual performance, using a payment model. They are saving millions of dollars with this approach.

The IT organization has two secretaries for 55 people. They have a practice of trying out new software with their secretaries first.

Three years ago the secretaries' Wang word processing systems were just being phased out and only 50 percent of the professional staff had PCs. Now, everyone at headquarters has a PC using Microsoft Windows, C/S, E-mail, presentation tools, PC projection screens.

Three years from now they plan to have fiberoptic cable to every floor and put all network servers, except print servers, in a centralized DP room for increased reliability and security. (Almost like returning to the old "glass house" approach.)

Users want Windows, C/S, ad hoc queries. Most users spend a few hours every day on their PCs. They started buying 386 — 32 bit PCs in 1987; now have 386s and 486s and are looking ahead to 586 — 64 bit PCs.

Professionals and secretaries use the same model PCs. Currently they are buying only 50 MHz, 486 designs, with 8MB RAM, 100MB hard disks, 16 inch color VGA monitors.

Everything important is kept on the servers. The servers are 330MB with 1GB hard disks, which are backed-up every night. All of the servers have CD ROM drives. They subscribe to publications on CD-ROMs, such as Microsoft Library, a dictionary program that will say the word as well as display it.

Figure 14 PepsiCo's Corporate headquarters, Purchase, New York

PepsiCo has a fairly homogeneous IT environment using IBM PCs or clones. They feel Apple Macintoshes are more virus prone. There is new virus protection software designed for networks and servers. It continually scans the data and sends alarms.

They are starting to experiment with some simple multimedia applications combining sound and data. They feel it is early for multimedia since they do not see worthwhile applications at present.

Pepsi-Cola Inc.

Pepsi-Cola is the major subsidiary of PepsiCo. Pepsi-Cola's Headquarters is located in new facilities at Sumit, New York, thirty miles from PepsiCo's older headquarters at Purchase, New York. Pepsi-Cola is involved with the bottling programs and retail marketing programs for the Pepsi-Cola drink products. (Most bottling and distribution for retail consumer markets is conducted by independent bottling companies.)

Pepsi-Cola has gone from decentralized to centralized management of Finance, Sales, Marketing. Emphasis is on the customer. (Upside-down triangle, with customers on the top and the president on the bottom.) IT is centralized with all application development work done at headquarters. Field system analysts are located at headquarters and travel to field locations to support and install systems.

Pepsi-Cola sells over 350 different products. Previously, customers could get up to five invoices. National accounts want one bill.

Like many U.S. corporations, Pepsi-Cola is currently involved in a major program "reengineering" their business processes. The primary objective is to increase competitiveness. Technology is an important part of this program.

Business areas they are examining are:

- Supplier Management
- Customer Order Fulfilment
- Marketing Equipment (Vending Machines) — Supply and Service
- Performance Management
  - External Reports
  - Internal Reports

In the reengineering program, all of the "content people" are field people — ranging from route drivers to regional managers. The development is being driven by the users. Program management is not looking just at IT, its working on the entire process, culture. IT is just one piece.

As a first step they looked at the various processes. Then they developed "Visions". They would then analyze "how to do it". As an example, the vision might involve the management of fixed assets. They broke the tasks into pieces that could be handled in 12 weeks. A team of 8—12 people were formed, working full time for 12 weeks on a task. They also used outside consultants.

They have "Rapid Application Development", use "Power Builder", Sybase for database, "Legacy System" for existing systems. All development is done with "Windows". Previously, Pepsi-Cola was using OS/2 as a PC operating system and looking forward the implementing IBM's SAA, (System Application Architecture.) They now have standardized on Microsoft's DOS/Windows operating system.

Applications are going out in waves. The first applications went out at the end of 1992. Then every 3 months. These are pilots. Lab —> field simulation lab —> pilot in 9 months. Then they have the national roll-out.

It was necessary for IT project management to continually guard against "scope-creep". The business people do not fully understand the problems of application development.

Steps to process improvement:

- All 26,000 employees educated
- Find process that touches the customer
- Talk to customers
- Develop improvements that can be measured
- Implement
- Review with customers

Pepsi-Cola found 16 "core" work areas that affect their customers. These are measurable. They seek continuous improvement. They expect there will be major outlays for new equipment as a result of their reengineering program.

Figure 15 Anne Beall, System Development Manager, Pepsi-Cola
Using laptop computer with desktop PC display

Pepsi-Cola has phased out all of their data terminals. All desktop units are PCs, most are IBM PS/2s, mod 70s; some Dell 486s. Everyone is tied into networks, based on Novell's X.25 network communication system. They plan to change to client/server networks. Since their facility is relatively new they have fiber to each desk throughout the building.

Pepsi-Cola continues to use voice-mail more than E-mail. Pepsi-Cola is using Microsoft's E-mail program and Excel for spreadsheets.

Pepsi-Cola has HP platforms in different areas. They use "Speed-ware" for 4GL development, with Sybase on HP systems, DB2 on the mainframe. As noted above, they use the IBM 3090 mainframe at PepsiCo headquarters.

Pepsi-Cola is not involved in any major information system out-sourcing at this time. They are using a service offered by American Express for travel expenses. They use AX cards on trips to charge all of their expenses. AX does all of the paper work, deposits funds into their accounts. Pepsi-Cola also outsources PC installations.

Comments on Case Study

This company has experienced a major change in its organizational structure, from centralized to decentralized. This change has required the Corporate IS organization to change its approach to systems development. It has changed from centralized, mainframe oriented applications to becoming more of a support organization to the decentralized business units and PC oriented applications. Payroll and other corporate data bases are still maintained on the mainframes.

Corporate IT almost lost control of application systems development as the business units moved ahead with their own developments with inhouse staffs. By providing project leaders with offices within the business units and at IT, they have been able to "bridge the gap" between IT and the business units. The IT project leaders become accepted as part of the business unit staff and culture.

This Corporation did not install minicomputer based departmental systems and has been somewhat slow installing LANs with connectivity to their mainframes and other LANs. Their IBM orientation kept them focused on PROFS for E-mail and other office support functions. PROFS has proven to have an interface that is too difficult for non-IT staff to be comfortable with. It is seldom used outside IT organizations. They would be farther ahead if they had implemented other E-mail and office support systems several years ago.

Levi Strauss & Company

Introduction

Levi Strauss is a very old California company, started during California's gold rush days in the 1850s. For many years Levi's only product was blue denim jeans. The company became so successful that the name "Levis" has become synonymous with denim blue jeans throughout the world.

During the last decade Levi has been aggressively diversifying into other leisure time clothing as well as offering an increasing variety of Levi jeans. At the same time Levi has been expanding its worldwide manufacturing and distribution capabilities.

Levi has four distribution centers in the U.S., shipping products directly to their customer's retail stores without the need of independent distributors or middlemen. Internationally, Levi operates through 14 semi-autonomous "affiliates" located in the different geographic markets being served.

The U.S. supply/manufacturing side consists of 62 Levi owned sewing centers. Levi also works with a number of independently owned sewing centers and "finishing centers" for stone washing and other finishing services. Purchasing is centralized at corporate headquarters in San Francisco. Denim, some in 20,000 pound rolls, buttons, labels and other sundries are shipped directly to the various sewing centers. The international affiliates are responsible for their own manufacturing requirements.

Levi has long had a reputation as a very forward thinking, progressive company. This applies not only to its products, but to its human relations, social/community relations, customer/supplier relations.

This forward thinking management attitude led Levi to develop a marketing strategy based of leadership in customer service. As part of this strategy, Levi has implemented a family of retailer services, with the trademark "LeviLink", based on electronic document interchange, (EDI). This case study focuses on the LeviLink family of retailer services, which are dependent on EDI and bar codes.

Electronic Document Interchange

Levi interviewed their top retail accounts, Sears, Mervins, etc., in the mid-1980s to identify how Levi could improve their business relationship. One of the primary answers was that these retail organizations wanted to exchange documents electronically.

Levi started with electronic POs, with their top three accounts. Next the retailers wanted electronic shipping notices, invoices, electronic funds transfer, (EFT).

After exchanging documents electronically with these three large retail accounts, each with different formats and different communication systems, the need for industry standards become apparent. About 1985 a consortium of retailers and suppliers established an industry committee to develop suitable standards. The result was "VICS", Voluntary Inter-industry Communication Standards.

EDI was a major part of VICS, but other things, such as bar coding were also included. Bar coding, following the lead of the grocery industry, has become very important throughout all areas of the retailing industry. The Universal Product Code, (UPC), formats are used, registered with the Uniform Code Council. Bar codes make it easy to collect POS data electronically and then communicate it electronically.

Bar code data is also the foundation of inventory control systems, shipping data systems, sales and marketing analysis, etc. The UPC are used throughout to identify products. POs, shipping documents, advance ship notice, POS data, inventory information, invoices all are based on bar code data.

Inbound data, such as POs, are converted from VICS data formats to Levis order entry system formats, compatible for their IBM mainframes. The VICS data identify customer, products, quantities, ship-to information, prices. After conversion to Levi formats, the PO is treated like any other PO. (Levi still receives POs in different forms and formats, ranging from hand written paper to electronic.) Levi's order entry system then identifies the distribution center the products are to ship from.

Levi bought an EDI translator to take data from the internal Levi data formats and convert it to VICS standards, and also take VICS standard data formats and convert it back to Levi data formats. Levi uses IBM System 3090 mainframes, all located at corporate headquarters in San Francisco.

Levi's initial translator was installed in 1985. It was supplied by Transsettlements, a Georgia company. At that time they were the only supplier of translators that worked with mainframe systems and VICS standards code. Transsettlements started in the trucking industry, where EDI was first used. They are no longer in business.

Levi outgrew the Transsettlements software and in 1990 installed a "Translator MVS" from Ordernet. Levi also started using the Ordernet network.

The trend during the last ten years has been for more Levi involvement in retail marketing. Previously, Levi would simply ship the products the retailers ordered. The marketing and sales programs were completely up to the retailer. Now, Levi is involved in displays, advertising programs, which products to feature at different times, inventory levels the retailer should maintain in order to serve their customers.

One of the services Levi developed was a "store model" providing the product mix and inventory levels for different sizes of stores, different geographic locations. With this service, retailers send point-of-

sale data electronically, Levi generates a suggested PO which is sent to the local sale representative. The sales representative obtains the retailer's approval, (signature on the PO), and notifies Levi headquarters electronically. Levi then restocks the retailers inventory. Paperwork is kept to a minimum.

In the United States Levi offers a "Portfolio of Services" covering the entire business cycle. These are value added services offered at no charge to Levis' retail customers; they are an "advantage of doing business with Levi". "LeviLink" is Levi's trademark for these services. The services offered to retailers include:

- Vendor marking.
- Electronic purchase orders
- Model stock management
- Advance ship notices/bar coded carton labels
- Electronic invoicing
- Electronic funds transfer
- Retail electronic data interchange solutions
- Sell-through analysis and reporting system

A statement in a LeviLink brochure is:

> "The Difference Between Getting By And Getting Ahead
>
> The future belongs to retailers who do the best job of streamlining their operations and offering consumers what they want, when they want it. And with LeviLink, the future is now...
>
> LeviLink is not a one-size-fits-all program, but a package of individual electronic and bar coding services you can implement over time to meet the special needs of your operation. So if you've been taking a close look at the increasingly critical costs of paperwork, human error, over-stocks and stock-outs, take a closer look at LeviLink. A more profitable tomorrow begins with calling 1-800-FOR LEVI today."

The name of the LeviLink strategy is "Quick Response"; QR get products to the retailer as fast as possible. The cost justification for Levi's "Quick Response" system in the U.S. has been increased sales due to better customer service. The average sales per retailer has increased 25—35 percent. With this impressive performance record this system development program has received full backing from senior management.

Quick Response represents a new way of doing business. It is based on a high level of trust and partnership between Levi, its customers and its suppliers. It is essential to have the strong support of top management. Quick Response started with requests from major retailers, followed by a commitment from Levi management to be the industry leader.

Levi's EDI group is part of the corporate IT organization. The senior IT manager is on the corporate executive management team. Levi's EDI organization has two functional areas:

1 Systems Group
   Develop and maintain the QR system services:
   Order Entry System
   Model Stock Systems
   EDI Systems

The Systems Group has a staff of 20 people, located at corporate headquarters in San Francisco.

2 Services Group
   Handle the business side. Sell retailer on using the QR services, recommend the services the retailer should use, help the retailer implement the services.

The Services Group has a staff of 20 people and is also located at corporate headquarters in San Francisco. They travel a great deal working with retailers. There are thoughts about locating some of the Services Group staff in decentralized locations to place them closer to the retailers.

It takes 30—90 days to turn-on the service with a retailer. They implement one document at a time. They start with the inventory management functions: POs, ship notice, model stock plan-with Levi restocking recommended inventories. The next group of documents to be implemented are money: invoices, EFT and acknowledgements.

It is important to have only one EDI group for the entire company, providing EDI applications throughout the corporation. There is a need to keep EDI, ANSI X12 knowledge focused. Levi has been very active in their participation in industry wide standards organizations.

VICS standards are a subset of ANSI X12. The VICS standards provide functional acknowledgement for every document received.

From 1987 on Levi has spent time implementing trading partners. They now have 400—500 trading partners and are processing 500,000—1,000,000 electronic documents per month. This results in a major reduction in paper.

In 1988 Levi started to focus on the manufacturing side, with their raw material suppliers: denim, buttons, labels, tags, etc. A set of supplier services was developed. Levi sends electronic POs for fabric, sundries. Suppliers send electronic ship notices, with shipments going to various Levi sewing plants.

Industry councils have been established in the manufacturing area: TALC, (Textile Apparel Linkage council), and SAFLINC, (Sundries And Findings Linkage Council). Now there are industry approved standards for POs, ship notices, invoices.

Levi now has about 85 percent of its fabric suppliers and 40 percent of its sundry suppliers on the electronic service for POs and ship notices. Electronic invoice services are new this year and just being implemented.

Levi has an internal network, system-to-system, for documents and E-mail. All of the distribution centers and Levi owned sewing centers are on this internal network. Data sent on the network is not to VICS standards.

International Operations

Levi operates internationally through 14 "affiliate companies". The affiliates are subsidiaries of Levi, operating in different geographical areas. Each affiliate is a profit center, with its own sales, manufacturing, developing some of their own products, operating semi-autonomously with a license to use Levi's name. Affiliates are located in Japan, Australia, New Zealand, Mexico, Brazil, Canada, Sweden, Italy, Spain, Belgium, Greece, Poland, among other countries.

All of the affiliate companies use HP systems. Information systems for all affiliates are developed by the International IT group in San Francisco. This group develops and maintains the general ledger system, DBMS, customer files, payments, sales systems. The affiliates add individual differences. The International IT group maintains 16 different variations for some programs.

Levi and the affiliate companies are now in the process of developing an overall strategy that will work for the affiliates. International EDI is just getting started. Implementation of "standard systems" is difficult since each affiliate has its own operating procedures, often dictated by local government requirements or sociological considerations. In addition, the affiliates have different information system capabilities. Levi recognizes that it is not realistic to try to implement identical systems in different countries, such as Sweden, Greece and Brazil, in the same time period.

Levi has established a "Global Quick Response" committee to leverage Levi's U.S. experience to their international business. They started with the "Model Store Stock System". This was ported from the IBM MVS system Levi uses in the U.S. to the Hewlett Packard system used by the international affiliates. The first implementation is in Sweden.

The Levi affiliate in Japan has just installed an automated warehousing system providing "one day shipping" after receipt of a PO. In Japan there are two basic types of retailers Levi works with. There are the very large, high volume, highly sophisticated organizations and the very small, local "mom and pop" stores that might order only one pair of jeans at a time. Levi wants to be sure they can serve both types of retailers in an effective way.

Future

Levi's future EDI focus will be :

- International
- Internal QR
    - Manufacturing process
    - Physical distribution
    - Increased through-put

Currently the accounting linkages are batch oriented. In the future they would like to have "real-time EDI".

Comments on Case Study

Levi lives up to its reputation of leadership and marketing know-how with the LeviLink system. Levi has been in the forefront in promoting EDI and this system provides a very good example of possible benefits from EDI. The fact they are electronically processing 500,000—1,000,000 documents a month is very impressive. That represents a lot of paper that does not have to be handled, along with major time savings in document processing.

LeviLink has become a key part of Levi's marketing strategy since it "binds" the retailer to Levi products with the model store inventory program and automatic restocking through the Quick Response program. The LeviLink systems group receives strong management support since they have been able to demonstrate a definite increase in Levi's sales as a result of the program.

Union Oil Company

Introduction

Unocal, (Union Oil Company of California), is a major U.S. oil company with headquarters located in Los Angeles, California. Total revenues exceed 10 billion dollars from world-wide operations with about 1500 employees at the headquarters location. Unocal is the 10th largest oil company in the U.S., behind such giant organizations as 100 billion Exxon, 60 billion Mobil Oil, 45 billion Chevron.

Unocal concentrates its retail activities in the western states and stresses premium products and service rather than discounted prices. It focuses on customers willing to pay a little more for Union's products and services. Unocal's strategy has been to retain a loyal group of customers while competing against aggressive giant organizations in the very competitive oil industry.

Unocal had substantial restructuring six years ago as a result of an attempted "takeover" by outside financial interests. In successfully fighting off the takeover attempt the company incurred major debts, which depressed earnings and reduced funds available for capital investments. Lower crude oil prices the last few years have also had a negative effect on financial performance.

As a result of the lower earnings there have been staff reductions, particularly at headquarters, and a slowing of capital investment. The company is now recovering financially and looking ahead to increasing capital investment and upgrading those areas that had been neglected during the last few years. Information Technology is planning a major step forward after being relatively stagnant during this period of reduced earnings.

Office Systems

Unocal's office information systems were primarily based on Wang hardware. They acquired Wang word processing systems in the late 1970s and subsequently upgraded them to Wang's OIS, (Office Information System).

Up until two years ago they had 40 Wang OIS systems worldwide, tied together with Wang "Mailway" software to provide E-mail for 500 users. The Mailway controller was a Wang VS system (VS-1), located at Corporate headquarters that was also used for word processing by 60 users at headquarters.

They sent a number of long documents such as geological reports over this international network. The Wang "Office" system supports Mailway so that documents prepared on Office can easily be sent via Mailway.

Some of the staff had IBM PCs (or clones) and utilized PROFS for E-mail. The Wang Mailway system acted as a bridge to PROFS. PC users could dial into the Wang system to send and receive documents.

The Office Systems staff trained Wang users on Wang Office, while the IT (Information Technology) staff trained PC users on IBM's PROFS. Surprisingly, a number of managers used PROFS. (Typically, PROFS is used primarily by computer system professionals due to its difficult interface).

Unocal had difficult support problems with Wang. They often felt their staff knew more than the Wang staff trying to help them, particularly for the "PROFS bridge". Wang was also very slow in providing changes to the calendaring system. It required more than one year, which is much too long. One strength of Wang was their very good E-mail system.

The Wang network was not a problem until three years ago. Then, their Wang VS 1 system (the network controller), was down for almost a month in order to install additional disk memories. The 60 staff using the VS 1 for word processing could not use their desktop workstations or access their files on the system disks for a month.

During the month the VS 1 system was down the E-mail system was not in operation. Users resorted primarily to fax and telex communications to replace E-mail.

More and more, secretaries do very little word processing. It is being done by the professionals. Secretaries are doing data entry, graphics, other more advanced tasks.
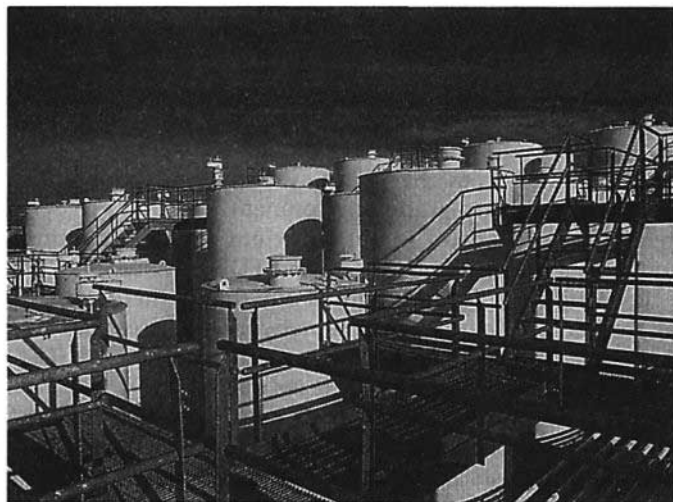

Figure 16 Unocal petrochemical plant

Information Technology (IT)

Unocal shifted entirely to PCs during the last two years, installing PC networks to replace the Wang OIS/VS networks.

With the phase-out of the Wang systems the Office Systems Department functions were taken over by the IT staff. Many of the Office Systems staff became "Business Analysts" working for IT and acting as an intermediary between IT and the end users.

The company considered IBM's OfficeVision but the Office Systems staff felt OfficeVision was too much; it would overwhelm the users. They wished they had the opportunity to show IBM what office system users really wanted.

They did not look at Hewlett Packard's "New Wave" office system and so it was not considered. Digital Equipment Corp. was successful in convincing the President of the Science and Technology Division, (which is at a different location), to install a DEC All-In-1 system. They communicate through PROFS. The Corporate IT staff wanted them to buy IBM.

IT selected Ethernet architecture, with Novell "Netware" network operating system as a Company-wide network standard with Compaq 486 servers. They have standardized on TCP/IP for interchange protocol. The local LANs are tied into a "wide area network" with 97 servers-gateways.

The primary PCs they are using are lower cost IBM clones. The current standard has a 386 microprocessor, 4MB RAM and 80MB, or more, hard disk. The professional staff use laptops (Toshiba) on the road for geological reports. Microsoft's Windows 3.1 has become the standard PC operating system.

Some departments, such as the Law Department, have migrated to client/server, (C/S) networks. They have 60 nodes on their LAN, with a majority of the lawyers using PCs. The Law Department is using Paradox data base management system. They are using "Perfect Solution" as a front end system for document management. This provides a "stepping stone" from the Wang systems but, unfortunately "locks them into a difficult up-grade environment".

IT feels that 9600 baud is not sufficient for data communications. T-1 bandwidths are required. They want FDDO (fiberoptic) "dark wire" in any new building. (A dark wire is one that is there, but is not being used at this time). They see future network requirements as 100MHz. Both twisted pair and fiberoptic wires will be a needed. The costs for connecting fiber are expected to decrease quite a bit.

IT expects telecommunications costs between offices across the country to increase significantly. Now people are just looking at the network installation costs. They are ignoring the network support costs, which are a major factor. In addition, networks need an administrator, plus a backup administrator, full documentation and automatic backup. Training is required. In most cases these cost are not being considered.

They would like a "mesh" (or "matrix") network so that if one link is down, another can be used. This will be a major cost. All of their Corporate Divisions around the world are installing networks.

One thing that slowed the decision to change from Wang systems was that the President of Unocal evaluated the Wang system and the IBM PC system for his personal use several years ago and selected Wang. A Wang VS 5000 system was installed in the President's Office in 1988. It is used primarily for calendaring and E-mail. Both the President and his Secretary have Wang workstations. The President also has a PC at home. He (and his wife) can dial into the Wang VS and look at his commitments on the calendar.

The President's system is setup so that he can access the worldwide E-mail system, but access to his system by outsiders is very restricted.

A file management system was setup on the President's system. It is used for list applications by the President and the Executive Staff; (There are 2000 names on their Xmas list). "Q&A" was selected for the file management software.

Telephone Services

The company has a Network Task Force and a Standards Committee. Their goal is to become "Protocol Independent".

Ten years ago the telex system consisted of model 28s and 32s in the message center. The teleprinter network went through a hub in Hong Kong leased from Cable and Wireless, UK. It was 1/2 speed and 1/4 speed, free-wheeling.

When they migrated to Wang Office in the mid-1980s it eliminated the need for the teleprinter network. They started communicating Wang to Wang, using AT&T's long distance voice network at 2400 baud.

They developed interfaces between Wang and their telex system. The International Record Carriers (MCI, Western Union, TRT) developed interfaces to go from Wang to their format.

The Corporation is now using AT&T, MCI and TRT. They use AT&T and MCI for internal communication. They use TRT for external messages, "Wiscgate" for "wild telex" service. They have 400—500 telex addresses in an on-line directory. Users simply address the telex on the workstation and it is automatically sent.

With the migration to Novell PC LANs there was a need for a software package so messages would be properly directed. They had several directories; Wang, PROFS, DEC. These had to be merged into only one directory. This eliminated the need to have full time staff on-line to "sort" E-mail, which had been the case.

Their main communications switch is a Northern Telecom SL-1 XL set for 2000 lines, (max 5000). This serves the 1500 staff at headquarters. They have never put data through the SL-1. They tried the "data module" for the SL-1 but the data people did not like it. The new SL-1 data

module might be good enough to reconsider. Another major oil company is using the SL-1 for data.

Unocal uses a packet switching network, such as Infonet to tie together their PCs at many international locations. Infonet has more nodes at strategic international locations than IBM's IS net. They still have a lot of internal telex/fax to reach some remote locations.

The Corporation has national contracts with NEC and Fujitsu for fax hardware The western region generally uses NEC while the Eastern region uses Fujitsu. NEC and Fujitsu faxes seem very comparable. They are migrating away from the message center to putting fax machines throughout offices. The Group 3 designs made a major difference; the "handshake" confirms connections, alerts sender of "blank page" transmissions.

Comments on Case Study

This is an example of an organization that had "fallen back", behind the leaders. They were late in implementing new hardware and application systems. Their scientific and technical systems were kept up to date, but their office systems did not really advance for several years. They have now moved forward and could "catch up" in the next one-two years with proper planning. The staff is very knowledgeable; they just did not have the budgets or resources that are necessary.

Unocal represented an organization with an Office Systems Department that evolved from a Word Processing activity and was separate from the IT Department. An Office Systems staff with a word processing background typically does not have the technical knowledge to move forward with networks and integrated systems at a rapid rate. They do have excellent understanding of the user requirements and the training and support requirements. Two years ago Unocal integrated their Office Systems and Information Technology staffs, balancing the technical knowledge with the user support knowledge.

Sears Roebuck and Co.

Introduction

Sears is one of the largest retailing organizations in the U.S., vying with Wal-Mart Stores for the title of "Largest". Revenues are about 50 billion dollars with 350,000 employees nationwide. There are 7500 employees located at headquarters, near Chicago, Illinois.

This case study will focus on the Merchandising Group. It is organized with 10 regional offices and 72 district offices serving more than 400 retail stores.

This company recently underwent a major reorganization. With the prior organization, the Store Managers were responsible for all of the merchandising operations in their stores as well as the store's operations. All employees in a store reported, through Supervisors, to the Store Manager. The Store Managers reported to District Managers, who reported to Regional Managers, who reported to the General Merchandising Manager at Corporate Headquarters. This very conventional organization structure had been in use for many years.

In 1989 the company realigned the Merchandising Group into six vertical business areas, (hardware, furniture, sporting goods, etc.), catalog sales, parts and service. Each business area is operated as separate businesses.

Within each store there are managers for each of the six vertical business areas. They report to District Managers for their business area, who report to business area Regional Managers, who in turn report to Merchandising Managers at Corporate Headquarters responsible for vertical business areas. The store managers are now responsible for the store operations, but not the merchandising programs.

The effect is that where there were 10 General Merchandising Regional Managers, there are now 60 Vertical Business Regional Managers. Similarly, the number of District Managers has increased from 72 to 432. The effect on the organization, the reporting requirements and managerial relationships has been extreme. The organization had to make these adjustments while continuing to operate at full speed in a very competitive environment.

The changes in the requirements for the Corporate Information Technology organization were equally dramatic. Rather than reports focused on individual store operations, reports are now required for each of the six vertical business areas in each store and merchandising area.

In addition, the need for rapid, effective communications for both messages and reports/documents has greatly increased. With all of the new managerial reporting relationships there was an urgent need to develop a close working environment throughout a highly decentralized, nationwide organization.

Sears has had very close business relationships with IBM for many years. (As an example, they jointly own the Prodigy Information Service.) Their information systems are 98 percent IBM. The corporate information system is highly centralized on an IBM mainframe computer. One of their key applications on the mainframe is RIM, "Retailing Inventory Management".

Each store has dumb terminals tied to an IBM System 1 in-store computer. On the system is E-mail, telephone & E-mail directories, "E-library", IBM "RMDS", (Report Mgt. & Distribution System), which provides access to operating reports electronically.

With the change in the Merchandising Group organization, the IT organization now has nine separate departments, aligned to the separate business areas or to functional activities, such as: Finance, Personnel, Credit Card, Distribution. The "End User Computing" Department acts as an internal resource to the nine user oriented IT departments.

The information system reporting requirements are somewhat different for each of the separate business areas. IT had to move very rapidly to install new systems in order to satisfy the needs of the individual business areas as well as the needs of the corporation as a whole. They were forced to rapidly develop new systems, run a 3—4 month test and if it worked they moved very quickly to implementation, often on a broad scale.

Local Area Networks

Sears had used departmental systems, in some cases IBM System 36s, in a few cases IBM 5520 word processing systems. They had some IRMA cards for communication with the mainframe. They started implementing IBM Token Ring LANs in 1989.

They tried using the System 36s as network servers, with Sears' own software. It did not work so they changed to PS/2s, mod 80s as their network servers. They also investigated "media-less" workstations, with a System 36 as server. This approach did not work.

The System 36 requires two-four hours/workstation local administration. With LANs, the workstations have a card that automatically identifies individual workstations. Most of the technical support for the LANs is provided by a specialized group that is located at a remote facility.

The LANs are connected through IBM 3174s. There are two control rooms at headquarters to connect to their wide area network and to the mainframe system.

The End User Computing group expects IT systems to evolve into "work group" systems serving people with similar needs, rather than departmental systems. They look on "LANs-workstations" as one technology. So they feel they are going from three tier (PC-Sys 36-Mainframe) to two tier (LAN/PC to Mainframe).
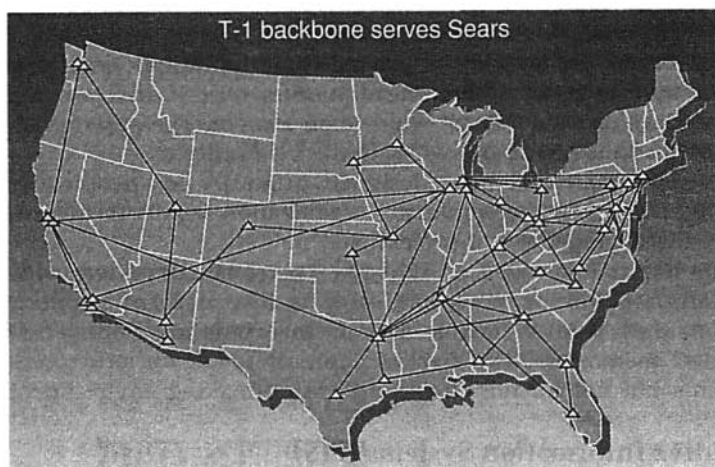
T-1 backbone serves Sears

Figure 17

Secretaries had been working on typewriters, System 5520 WP systems, or dumb terminals on System 36 departmental systems up until the late 1980s. They now work on PCs with IBM Displaywrite software.

Due to its close relationship with IBM, Sears conducted major tests of IBM's OfficeVision. From the secretaries viewpoint OfficeVision was overkill. Workstations require 28MB for OS/2, 60MB for OfficeVision.

Electronic Mail

Sears installed an E-mail system in 1990 that now has 15—18,000 users nationwide. With the new organization the District Managers have no "physical" office or secretarial staff. They are supposed to be on the road all the time, using the local offices as necessary.

For the "Business Communication Project", (E-mail), some of the End User Computing staff spent 60 days working with the vertical business representatives in the field, training four per region. These people then acted as trainers for their regions. When the system initially went on-line, 16,000 people had been trained.

E-mail usage has become extremely strong. The E-mail system is on a dedicated IBM 3090 model 600. They have added an abbreviated version just for sending notes, that is open to outside vendors.

IT found they needed to issue an E-mail "Etiquette" booklet to outline proper manors in using the system. People were sending E-mail messages in increasing volumes since it was so easy, with copies to everyone who might be interested. The District Managers were becoming overwhelmed with messages, copies etc. The organization had to start developing some restraint in E-mail usage so that only those directly involved received messages.

Voice Mail

To help satisfy the need for improved communications, Sears installed a voice mail system at their headquarters offices and two regional offices. They use the "Octel" voice mail system. The system has 3000 users at headquarters and 3—4000 in the field offices.

The voice mail system is designed primarily for people who are travelling. The new "streamlined" organization results in more travelling by the managerial and professional staff.

Sears has standardized on IBM PS/2 personal computers with 8MB RAM and a 60MB, or more, hard disk. In their decision support environment they want a flexible system, incorporating floppy disk and hard disk memories. "The diskless approach is OK for structured environments but not for unstructured decision making environments."

Executive Information Systems (EIS)

During the late 1980s Sears used Executive Access System, a mainframe based EIS for their operational data. It provided all numeric data. They now use "Executive Decision". It is personal computer based and uses a mouse for commands. The system has the ability to "drill down". As an example, after looking at a summary of the sales figures, users can request results for regions, or go to the next level of detail at the districts, or down to the individual salesmen or products. Some of the executives are more comfortable using numbers, while some now prefer graphs.

Sears also worked with Artificial Intelligence Corporation on their "Intellect" expert system. They use it to select the top 10 performers and for other specialized information.

They also evaluated "Teleview" or TPX, from Ducane Systems. This system allows you to switch between applications with one button.

In an effort to automate procedures and reduce paperwork Sears implemented an "electronic expense" form. Users fill out their expense forms on their PCs and electronically forward them for approval and processing.

Legal Department

There are 68 attorneys and 81 clerical staff in the Corporate Legal Department.

The Department IT Group had to very gradually "break-in" the attorneys and some of the secretarial staff that were set in their ways. They put games on the PCs, like Wheel of Fortune or Jeopardy, so the new users could become familiar with using their PCs in a friendly, non-threatening environment.

A majority of the attorneys now regularly work with PCs on a network. The Legal Department's Information Services Group administers the network.

They have centralized legal services covering:

- Field legal services
- Employment Practices
- Marketing
- Product Liability
- Real Estate and Construction
- Credit and Related Financial Services
- Buying Relations/Operating Matters
- Los Angeles Regional Office
- V.P. General Consul and Staff

They have Kurzweil optical scanners in the Information Center. These scanners can recognize almost any font. The scanners are used to revise real estate leases, contracts, lengthy documents. The Legal Department has built up a data base of these documents.

Two facsimile machines have been installed in order to reduce their courier budget. They now fax documents to other offices around town instead of having them delivered by courier.

The Legal Department installed an optical storage system to replace a large part of their paper storage in filing cabinets. A motivating factor was that they moved to new headquarters offices and it was much easier to move an optical disk system than hundreds of filing cabinets.

They back-up their systems at least once a day; some are automatic, some require human intervention. It is an "ownership" issue that varies with the specific applications. There is a centralized E-mail coordinator.

For one major legal action they created a computerized litigation support system. A relational database software package was developed and all of the evidence in the case was coded. Temporary help was hired to enter data so it could be retrieved by fields. Full-text depositions are on-line. They bought "Summation" for the depositions, with retrieval by subject, author, etc. There is a full text search. They created the data base within six months, a real success story.

Comments on Case Study

This Information Systems organization has been facing a monumental task. During the last few years IT investments were limited, particularly in the office systems area. They urgently needed to have up-to-date systems for communications, report processing and document handling for a very large decentralized organization at a time the organization itself was undergoing a massive restructuring.

The managers in the field need effective communications and report processing systems in order for them to function efficiently in the new operating environment. Since they are travelling a high percentage of the time they must be able to access their files from any of the

stores or offices, send and receive messages, file reports, retrieve operational data.

Similarly, management at headquarters and the Regional Offices must be able to communicate with the District Managers, store personnel and each other. In the very competitive retailing environment, management needs to have visibility of the day-to-day operations in order to move quickly to adjust their merchandising programs and strategies.

Information Technology has to provide the "tools" for the new organization to function effectively. IT had minimum time for testing or evaluation and limited resources for training and support. In addition they were starting from a relatively low level of information system knowledge on the part of most of the users. There was a relatively low level of personal computer penetration in the organization. Most of the professional staff and secretaries had been working with dumb terminals, if they had anything.

The speed with which the LAN-PC systems were installed, concurrently with the installation of an extensive E-mail system is truly remarkable. They investigated different options as network servers and quickly made the necessary decisions on how to proceed. It appears their decisions were correct, in accordance with the management policy of maintaining an "IBM computing environment".

Implementing this many systems on such a rapid schedule certainly resulted in many difficulties with the systems, the facilities and most importantly, with the users. The fact that these have been overcome and system development is continuing is a tribute to this IT organization.

ICA Handlarnas AB

ICA-Handlarnas is the joint name and symbol for a cooperative of 2,800 independent grocery retailers all over Sweden — the ICA Retailers. They form Sweden's largest nationwide network for the distribution of food and groceries.

Total sales of ICA Retailers were approximately 57,500 million SEK in 1991, accounting for over 33 percent of the Swedish food and grocery market.

The ICA Retailers own ICA Handlarnas AB, partly as members of the ICA Association, (ICA Förbundet), and partly as individual shareholders. ICA Handlarnas AB owns two main companies, ICA Partihandel AB and ICA Detaljhandel AB.

ICA Handlarnas AB is responsible for the administration of the ICA Association and for coordination of matters of common interest to ICA operations including information, public affairs, consumer and environment matters, Group accounts, financial administration and development projects, computer strategy, reports and international contacts.

ICA Partihandel AB is responsible for purchasing, distribution and the ICA Retailers' joint marketing operations. Six regional companies are responsible for day-to-day operations in their regions. Local operations are handled by distribution centers. ICA Partihandel AB partly owns Viking Fruit AB.

ICA Detaljhandel AB is responsible for location/establishment of new stores, financing, transfers, technological updating, training of retailers and their staff, as well as consultancy services in operational and financial matters. Their operations are distributed in the geographical areas.

ICA Detaljhandel also handles retail store operations in trades other than food. These are: Ellos, a leading mail order company in the Nordic countries, Lindex/Gulins with 233 ladies' and men's wear stores, and 104 Duka glass and china stores. ICA also has a 45% share in the Norwegian supermarket group Hakon-gruppen.

The ICA Group of companies, (excluding retailer owned stores) had 1992 sales of approximately 43,400 million SEK, with about 17,300 employees. In the future they expect that government protection for agriculture products will decrease. As a result, the number of suppliers to the Swedish market is expected to greatly increase; (at present, there are strong monopolistic coop food producers — i.e. dairies).

Retail food stores in Sweden tend to be smaller, with a smaller assortment of goods then in Germany or other parts of Europe. With reduced protection and better transportation, foreign competitors will be able to enter the Swedish market. Hamburg is closer to Southern Sweden than Stockholm is.

Looking to the future, ICA management developed a Corporate Strategy to position ICA so it will be able to grow and prosper in the future competitive environment. This new strategy relies heavily on the implementation of new, up-to-date information systems. A number of ICA's senior executives are former MIS managers and recognize how information technology can be utilized to help ICA gain competitive advantages. With their new programs, ICA worldwide has lowered margins 30% since 1990 and further improvement is expected.

Warehousing, distribution and merchandising systems

A central part of ICA's investment strategies is the implementation of new warehousing and distribution concepts. One of the goals of this new strategy is to significantly reduce delivery times and handling costs of grocery and fresh food items. With reduced delivery times, retail stores would be able to reduce their inventories and carrying costs.

A fundamental part of the new strategy is the development of completely new, up-to-date information systems, starting with their warehouse/distribution system. Arthur Anderson helped with the system specification and design. The investment in new software is about 500 million SEK. The new system is over half way to completion and expected to be fully implemented in 1994.

The store inventories were divided into faster and slower selling items. Then, the 21 regional warehousing centers that used to carry everything were streamlined so there are now 16 regional centers handling the faster selling goods. (In 1994 the number of regional centers will be further reduced to 11.) In addition, two centrally located warehouses handle the slower moving goods.

A central part of the new warehousing strategy was the implementation of "cross-docking" distribution concepts. ICA recently opened their first cross-docking distribution facility at Helsingborg, in the south of Sweden. They receive daily deliveries from suppliers, which are cross-loading directly into trucks for each of the 16 regional warehouses. The retail stores can receive daily deliveries from the regional warehouses, in many cases, the same day the goods were received at Helsingborg. The larger stores often get shipments direct from the cross-docking terminal.

ICA expects the new cross-docking approach will enable them to lower their inventories significantly, particularly for dry goods and frozen goods. The goal is a 50% reduction of the inventory of the assortment handled via the cross-docking terminals. Now there is 250 times turnover for fruits and vegetables at some distribution centers, such as Stockholm, but only 25 times turnover for dry goods. Future cross-docking facilities are planned for Stockholm and Gothenburg.

The cross-docking system relies heavily on bar codes. ICA is pressuring the European grocery industry for more bar code standards and to put bar codes on pallets. When a pallet arrives at the cross-docking

terminal it could have bar codes that in the future could even identify the store it was to be shipped to.

The new cross-docking terminal is on a client/server (C/S) network. A C/S network has been implemented for six of the Regional companies. Next fall 16 of the distribution centers will be on DB2, CICS for the merchandising and selling systems.

ICA has been placing orders electronically to their 80 major suppliers for the past 15 years. They have been using Swedish EDI, (Electronic Data Interchange), standards. They are now switching to a subset of the recently developed European standard, EDIFACT.

Today, ICA's computer systems consist of an IBM 390 (ES9000) mainframe computer for part of the country, a Unisys mainframe system for part, 20 IBM AS/400 minicomputer systems for part and an older IBM S/38 minicomputer system for the import business.

In the future they would like to consolidate data on the IBM 390 system, use IBM 3270 terminals for transactions with part of Marketing using DB2 database software. A growing part of the system will have PCs running OS/2, tied into C/S networks.

Retail store system

ICA is also developing a new store retail sales system, a new back-office financial-administrative system and an ICA card system, with interconnecting networks between these systems.

- Network #1 will be between the offices and the warehouses. It will be used for voice, fax, E-mail and data communications.
- Network #2 will be from the IBM mainframe system, using X.25 communication protocol, to connect the largest 1,500 retail stores. The store computers, payment computers and handheld terminals will be connected to this network. It is now in the process of implementation and the plan is to have 1,500 stores on the network within a year.

This network will also be used for training, financing and other administrative tasks. Since the network is based on X.25 standards, it can also be used to communicate to the post office, bank, betting (lottery) company, as well as outside suppliers. (ICA stores buy about 75 percent of their needs from the ICA warehouses and the remaining 25 percent from outside suppliers.)

Back-office administrative system

ICA is currently testing a new back-office system for the retail stores. It is based on using a C/S network, the same system as the wholesale companies. In a few years there will be 1,200—1,500 stores on C/S networks.

The human side of using the technology is the critical factor. With the new back-office system, a user on the C/S network will not know, or care if he is on the store system or interacting with the wholesale system.

The stores have a choice of several suppliers for their checkout/POS retail system, however ICA specifies the back-office system. There is a clear interface between the checkout/POS system and the back-office system. The retail system is interfaced to the back-office C/S system so all sales data, credit card data, etc. is captured.

The retail stores now take inventory using hand held terminals with wands reading labels on the shelf. This data is loaded into the current back-office system and printed-out for the store owner to review and order items he wants. In the future, stores might generate orders directly from the checkout/POS data.

Orders are sent to the distribution centers. Goods are shipped and an electronic invoice and shipping notice is sent to the store. A paper shipping notice is supplied with the shipment. When the goods arrive, bar codes on the boxes can be scanned and the data compared with the electronic invoice.

Three times a year ICA provides stores with an analysis of their purchases from ICA. This analysis includes price margin data and also highlights major ICA items the store is not currently using. The stores provide sales figures to ICA.

ICA offers bookkeeping and other services to the stores. The store owner can obtain daily volume and profitability data using the back office system. To do this the store must enter all ICA items into the system.

The new back office system provides all data relating to sales of goods, data on stores own campaigns, any separate pricing, volume, cash accounting for each register & checkout clerk, profitability models, i.e., if you raise prices on selected items, what is the change in profitability.

ICA card system

ICA has established their own card system. It has been very successful, with over one million cards issued. While a large investment is required to design and implement a card system, it can be a very powerful marketing tool.

Many customers, particularly those making the greatest number and largest value transactions, appreciate the convenience of using cards. There is an increasing reluctance to carry large amounts of cash and customers will normally prefer the retail establishments where they can use a card.

Having their own card system provides ICA with a mailing list and monthly communications with these customers, constant marketing reminders. It also provides a source of valuable "on-line" marketing statistical data on customer purchasing preferences and trends. The

success of special promotions can immediately be evaluated, changes in buying motivations can be identified, effecting procurement and distribution planning.

The ICA card is a credit card or a prepayment card, (debit card). The card holder can put up to 8,000 SEK into the ICA card system. The purchaser is notified if the cost of purchases exceeds the remaining balance. Card holders receive a balance statement each month and at checkout the customer can ask cashier to determine the remaining balance.

Card holders can exceed their balance up to a set limit. ICA pays interest on positive balances, (at higher rates than the banks). The card holder pays interest when there is a negative balance.

The retail terminals in the stores are on-line to ICA card headquarters. Users punch-in a four digit PIN, (Personal Identification Number) for security against unauthorized use. Transactions are faster using the cards than paying cash. ICA's target is to have 50 percent of their transactions by card.

Comments on Case Study

ICA is an example of an organization that has identified its future business environment, the threats and opportunities, and taken effective action to position the organization for future success. It has made major investments in information technology.

Two outstanding examples are the warehousing, distribution and merchandising system, integrated with the cross-docking facilities, and the ICA card system. Both of these systems support major management strategies, providing ICA with important competitive advantages.

It requires management to have a depth of knowledge of information technology to understand how IT can effectively be used to further the organizations business and marketing strategies. ICA is fortunate that several of its senior managers have this knowledge and commitment to information technology.

ICA's use of information technology compares favorably with the most advanced companies in the U.S. or Europe. As expected, it is necessary to continually improve and upgrade, but this investment in IT should provide ICA with a strong competitive position in the coming years.

Svenska Handelsbanken

Handelsbanken is one of Sweden's most respected banks. In 1992 it was the most profitable major bank in Sweden.

Handelsbanken is composed of eight regions supervising 500 branches. There are about 5,500 employees. The bank is organized with a very flat, "horizontal" management reporting structure; there are only two levels between the Branch Manager and the bank's Managing Director. Each branch is a profit center and the organizational philosophy is that "the Branch Manager is king".

Handelsbanken's information system consists of two IBM 3090 mainframe computers running MVS and VM operating systems, TSO for program development, DB2 for databases, SNA for network communications.
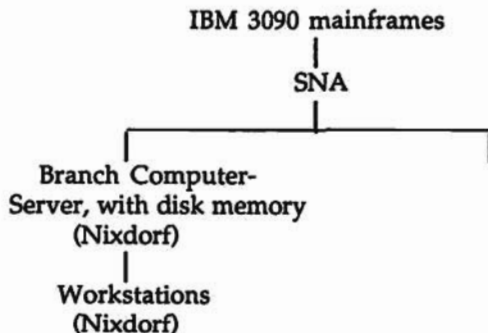
The information system has the following architecture:

IBM 3090 mainframes

SNA

Branch Computer-
Server, with disk memory
(Nixdorf)

Workstations
(Nixdorf)

Figure 18

Handelsbanken lived with their older teller system for 17 years. They started investigating new information systems in 1980 and installed the present system in 1982—83. At that time, to obtain the system they desired, they felt they "had to develop it themselves". The basic system philosophy is that all branches have the same type of computer hardware and are able to run all of their applications on this one system. They now have 300—500 internally developed application programs. All applications have a "standardized" interface for the users.

All users now have identical workstations. With the prior system there was a special terminal for the bank tellers, another one for opening new accounts and a third one for word processing (WP). Now, everyone in the branch has the same workstation; able to reach all of the different applications.

There are over 4,000 user workstations on the system. Each workstation has two processors, a display, two keyboards, a printer and a

card reader. One processor has same operating system as the branch computer/network server, DIPOS, and is used for the Nixdorf banking-customer information system. The other processor has an Intel 8186 microprocessor with 1MB RAM and a 40MB hard disc running the MS DOS operating system for WP and other office administration tasks.

Each processor has a separate keyboard, one for bank teller applications, one for administrative applications. The printer is capable of printing pass books or letters. These workstations have about 200 "soft keys" which makes it very convenient for users.

The user workstations are connected to computers/network servers located at each branch office. The branch server is used for communications, file storage, printer control. These servers have 2MB RAM, 2X65MB hard disc memory systems. A maximum of 32 terminals can be connected to one server.

The branch servers are multi-tasking, allowing the users to run four different applications simultaneously, with four windows. Users have windows for some MS DOS applications, others for the Nixdorf banking applications. As an example, users can evaluate and run a 3270 terminal application in one window and can also run Videotex in another window.

The server memory system stores the electronic journal entries for all of the workstations in the branch office. The authority system for the branch is also stored on the server. The branch system is backed-up every day, disc to cassette, which is manually sent to headquarters.

All of the customer files are stored on the corporate IBM 3090 mainframe computer system. Customer accounts, etc., are automatically down-loaded to the workstations as required. When the transaction is completed, files are up-loaded back to the mainframe.

There are 180 different forms stored in the system memory. Users can display the form they require and simply fill-in the blanks. This ensures uniformity of forms and procedures, which enables a broader span of management control. Users can give a banking customer's account number and the system will automatically fill in the customer name and other information from the database.

A convenient feature of Handelsbanken's system is that workstation users can access government files for real estate data, perform calculations for real estate and other assets, create balance sheets, mortgage payment calculations.

One of the newer applications is to buy and sell stocks electronically. The system will communicate directly with the stock exchange, automatically make the buy/sell transaction and obtain an acknowledgement.

The Information Technology Department, (IT), is currently updating the deposit system. The present deposit system was developed 20 years ago and operates in assembly language. The new system will use COBOL 2, DB2 and will be much more efficient, easier to update, with more flexibility.

Handelsbanken's E-mail system uses the Swedish "Memo" system. E-mail is used primarily for short memos. The bank branch offices use other programs to send filled-in forms as well as for other documents, long memos and letters. Users can always see the message area of their workstation display so they are alerted to any incoming communications.

When users perform administrative applications the workstation functions as a stand alone system. The bank uses a Swedish WP program, "Royal Base" since they felt the Nixdorf WP program was inadequate.

Branch management can review the branch operations on a daily basis to assess profitability, volume of transactions, other operational data. Most branch management reports are sent electronically from the branch to headquarters. Very few internal reports are now sent on paper.

The bank headquarters is organized by functional business units, such as Finance, Personnel, Purchasing. IT is organized into similar functional areas to provide more effective support to the business units. The business units are also adding IT specialists of their own so they can do more of their own IT work. More and more, the business unit staffs are defining and developing information systems for their functional areas. The interaction of the Business Units and Information Technology is as follows:
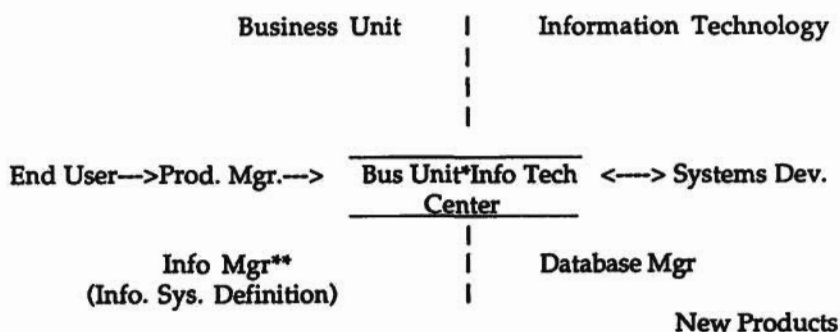
```
            Business Unit     |     Information Technology
                              |
                              |
                              |
                              |
                         _____
End User--->Prod. Mgr.--->  Bus Unit*Info Tech  <----> Systems Dev.
                              Center
                         _____
                              |
              Info Mgr**       |      Database Mgr
        (Info. Sys. Definition)|
                              |
                                           New Products
```

Figure 19

* This Bus Unit/Info Tech. Center should provide:
    Product Management
    Specification Analysis
    Testing

** Information Manager (Info Mgr) within the Business Units must be in close coordination with other Business Unit Info Mgrs. The Finance Info Mgr must be in close coordination with the International Info Mgr, Branch Operations Info Mgr. The Info Mgrs should interact with the Bus Unit/Info Tech Center, Database Mgr etc. The Database Mgr interacts with Systems Dev Dept, Center, Info Mgrs, etc. The bank's regional organizations have staff specialists that work with the branch staffs to "order" systems/software from the system development department.

It is felt the infrastructure of information lays the technical base for systems development and new products.

The branch administrative system is limited since it uses 1983 technology. Similarly, the word processing system has limited functions due to the limitations of the Nixdorf hardware. These systems have only 440KB RAM available for application programs. While this is enough for the Royal Base word processing program, it is not sufficient for a number of more recently develop word processing programs. These newer WP programs, such as Word Perfect, incorporate advanced functions requiring more memory.

The data system is easy to use due to the "help" key. Newer employees are taught MS DOS systems in school so they rapidly learn to use the system.

In Sweden, customers are provided a printed account statement every two months. Checks are not returned to customers in Sweden, they are stored at the Branches. Many people don't even have a checkbook. (Note: This is quite different from practices in the U.S., where customers receive monthly statements that include all checks processed for that account, and a checkbook is a vital part of the banking relationship.)

Looking to the future, Handelsbanken's Information Technology staff would like:

- Easier transfer of data/documents between the DIPOS and DOS systems
- Improved relationships between the different real estate databases
- Better access to the "Clearing House" computer

IT is now developing application software programs so they can be converted to different operating systems, such as OS/2 or Microsoft's Windows.

When Handelsbanken acquired the Nixdorf system in 1982—83 they figured on a ten year life. The ten years are up. Handelsbanken now expects to use this system another five-eight years. They plan to begin selecting a new system in two-four years and then start the very major task of converting the 300—500 application programs that they have developed in-house over the last ten years.

Comments on Case Study

Handelsbanken's system architecture was a very forward looking approach in the early 1980s. The concept of having the same system able to run all branch applications, with a standardized interface for the users was very advanced. Similarly, the concept of having multiple windows was very advanced. Most computer users did not obtain this friendly user interface until Microsoft's Windows program became available in 1990, (Apple Macintosh users obtained it in the mid-1980s.)

It is a tribute to Handelsbanken's Information Technology staff and the bank's general management that they could see the value of developing such an advanced, integrated system. The fact they are able to operate with a minimum of paper reports between the branch operations and the central office is a very desirable achievement. Many of the other features incorporated into their programs clearly increase branch office productivity and enable them to provide increased services to their customers.

By being in the forefront, Handelsbanken had to develop most of their applications in-house to obtain the advanced capabilities they desired. Now this becomes a limiting factor. The memory capacity and speed of the 1982 Nixdorf hardware limits the capability of the software it can accommodate. There have been three-four generations of new microprocessors during the last decade, since the Intel 8186 design used in this system.

Most organizations are currently buying PCs with "486" microprocessors, with four times the RAM and hard disk memory and eight times the speed of the Nixdorf design. Word processing, spread sheet and other application software with many desirable features is now commercially available. Unfortunately, it cannot be used on the Nixdorf systems due to the memory limitations.

Handelsbanken is planning to upgrade their hardware systems in five-eight years. While this seems like a long time, it will require several years to convert-replace the 300—500 in-house developed software programs. The bank wisely understands it must proceed in an evolutionary manner so there will be minimum disruption to the day-to-day business. The concern is that competitors with more powerful computer hardware and software offering more capabilities will have information systems providing them with competitive advantages.

AB Electrolux

Electrolux is one of the world's leading producers of white goods. It is also the largest, or the second largest, company in the world in floor-care products, absorption refrigerators for caravans and hotel rooms, food-service equipment, industrial laundry equipment, forestry and garden equipment, refrigerator compressors and car safety belts.

The Electrolux Group had worldwide sales of 79 billion SEK in 1991, of which approximately 88 percent was from outside Sweden. Electrolux operates in some 50 different countries with 600 companies and 130,000 employees.

Electrolux expanded very rapidly during the second half of the 1980s with a number of major acquisitions. This was followed by a comprehensive program to streamline the Group's structure and an investment program in new plants and new generations of products. During the past ten years the Electrolux Group has made over 50 acquisitions and divestitures.

This magnitude of organizational change, in a highly decentralized, worldwide operation poses major challenges for the management of information technology. Information systems have to satisfy the widely varying needs and cultures of local managements operating in five major business areas in 50 different countries and also supply the needs of Corporate Management in Stockholm.

Electrolux's Corporate Information Technology (IT) Management has wisely selected the approach so they:

- Establish Corporate standards for computer hardware, communications and primary software
- Promote a uniform "information systems strategy"
- Devote most of their effort to consulting with the operating organizations

The Corporate IT staff consists of only six people, all senior level, who spend the majority of their time away from corporate headquarters working with the operating companies. Part of their operating philosophy is that: "Establishing policies is easy. Keeping them 'live' takes continuous monitoring and work."

Corporate IT regularly visit the major companies, the problem companies and all newly acquired companies. They leave the successful companies alone. Their goal is to visit every company every three years. They are seldom able to keep this schedule due to extra visits made to the "problem" companies.

Electrolux's Information System Strategy is as follows:

- Local responsibility for Data Processing
  It is the responsibility of the local company operating management to procure, install and operate an information system which will satisfy their specific needs, following the established Corporate IT policies, with guidance from Corporate IT as required. All purchases exceeding $100,000 require Corporate IT approval.
- In-house Data Processing preferred
  They prefer to keep the data processing operation in-house for strategic and security reasons. In one case, where there was a problem situation, they did depend on outsourcing. They outsourced an operation with 137 people and then reduced the internal staff to 37. The situation is now under control and they plan to start bringing the applications back in-house in the near future.
- Standardization to simplify Group efforts
  In 1984 Electrolux had 76 models of computers from 32 vendors and an unknown variety of incompatible software. They have now revamped their computer architecture to establish IBM AS/400 minicomputers as the focal point for Electrolux's information systems.
- Coordination for increased Group benefits
- System Package Philosophy: avoid costly, time-consuming internal development. (FTS, SA, REX, EFS, MHS)
- Integrated systems for communication to benefit from available information
- For computers, buy IBM or compatible equipment. For peripherals, make best choice depending on price/performance, service, etc.
- AS/400. Consider minicomputer solutions, IBM AS/400, to take advantage of the large selection of low priced, high performance, software products available and other low cost factors
- Personal computers should be IBM or compatible equipment
- For Process Control or "closed loop" type of systems without interface to other major information systems, make best choice depending on price/performance and service
- For CAD/CAM systems, choose the IBM CATIA system. Integration, communication, and need for a Group standard are the main reasons
- Communication directions:
  - IBM SNA protocol
  - File Transfer System, FTS
  - Message Handling System, MEMO
  - General purpose cabling system (e.g. IBM cabling system)
  - Public Networks or Official Carriers
- Leasing agreements or hardware depreciation shall be based on 36 months, due to the rapid technical development
- If possible, take advantage of existing Volume Purchase Agreements to obtain best price

Electrolux currently has the following systems:

- Hardware Platform
    Seven "Mainframe" Companies (to be reduced to three)
    400 IBM AS/400
    30 IBM S/36 & S/38
    60 non-IBM
    200 IBM RS/6000
    20 IBM S/9370
    400 CAD Workstations
    15,000 Terminals
    10,000 PCs
- Application Platform
    Group Financial Reporting
    Executive Information System
    CAD/CAM — CATIA, AutoCad
    MRP — PRMS, Fourth Shift
    Distribution — REX, WMS, LPS
    Service Administration — SA
    Quality Reporting — KA38
    Communication Software Setup
    Lotus
    WordPerfect
    Ventura
- Communication Platform
    SNA based "LUX-NET"
    Network — 500 nodes
    4 Communication Centers
    IBM 3090, 370 MVS + identical software
    MHS — MEMO, AS/400 OFFICE
    FTS, FTS 2 — File Transfer Systems
    RS — Routing System (EDI Support)
    ICS — Interactive Communication Support
    DTS — Drawing Transfer System

REX, WMS, LPS were all developed in-house. They are considered "strategic systems". REX was developed by the distribution operation; it is an excellent system. WMS is a warehouse system and LPS is a truck loading system.

FTS, File Transfer System is also an Electrolux in-house development. The original FTS was taking too long so they have recently completed a new file transfer system, FTS 2. It enables files to go "computer-to-computer", dramatically decreasing transfer time. There are currently four test installations of FTS 2. In the future they plan to have a more transaction oriented system.

Ventura is a system for service documentation reports. SOP is a Sales Order Processing system. Mobiltex is for data over radio. Europe

is behind the U.S. in utilizing radio bandwidths for data communication.

The MRP system provides data about four days after the end of the month. In the future they will have on-line EIS, (Executive Information System). The EIS they are working with is "Pilot Lightship".

The Group financial reporting system is a PC based program that guarantees accuracy of consolidated reports. The latest software release is automatically down-loaded to the distributed PCs.

Electrolux initially standardized on OS/2 as the PC operating system of choice, but have switched to Microsoft's "Windows". They are also switching away from AS/400 OFFICE.

Electrolux has 400 IBM AS/400 systems installed, worldwide. They selected the AS/400 design since it offered good performance, was a "strategic" IBM product with good future upgrade potential. IBM provides global support for the hardware and there is a large amount of economical software available for AS/400s. There are no global suppliers of software, therefore there are no real global software solutions.

It is felt that mainframe computer systems are dying. Most mainframe systems could be replaced with "down-sized" systems during the next four years. However, some mainframe applications have a lot of staying power. Replacing applications when there are 2,000 or more users on a network, even those applications 20 years old, is a major undertaking.

Corporate IT is trying to avoid installing client/server networks at headquarters. With client/server networks, users are more dependent on network availability. Operations are more expensive with a mainframe-centralized solution but development of new application software systems is less expensive.

LUX-Net: nodes in different countries tie into local country networks.

There is horizontal integration through the company and throughout the different Electrolux companies. Corporate IT promotes commonalty before functionality in the infrastructure area so companies can work together. Also, they choose suppliers that have staying power. Training 500 user organizations on a new program is a major consideration.

Electrolux focuses on communication services to exchange data rather than networks for interaction. They have standardized on the Swedish MEMO system for electronic mail. Users can send messages from any desk to any desk. This E-mail system is a file transfer system with the data sent to a mail box for "store and collect". With decentralized management and computing you don't need major, high speed communication networks, at least not today.

The RS 6000s are used only for CAD work. The 9370s are being phased out and replaced with RS 6000s.

JIT 90 (ODETTE) is one of many EDI solutions. Electrolux started using EDI in 1985 with transport companies to order trucking services.
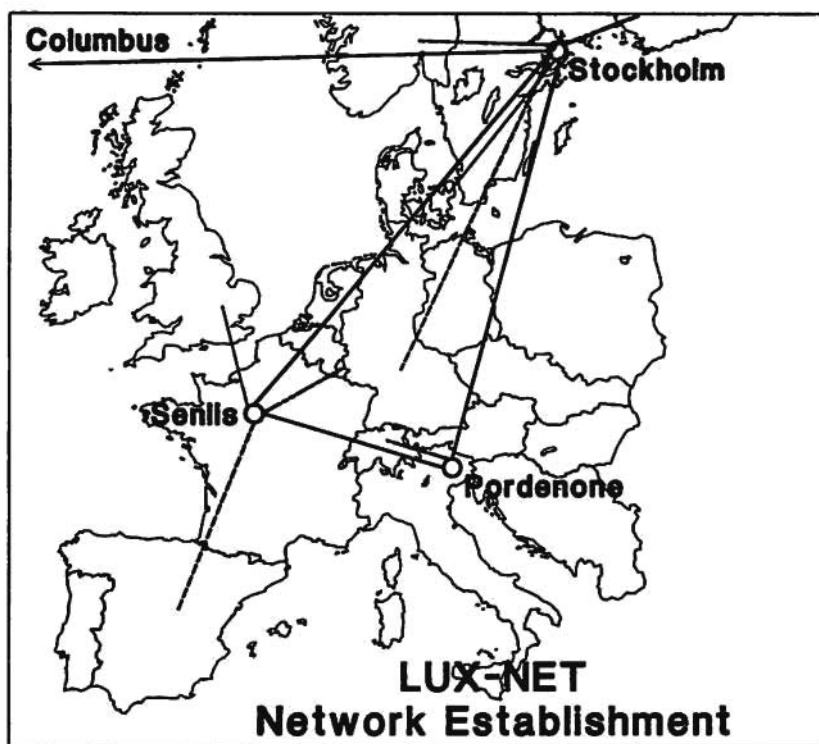
Figure 20 LUX-NET Data Transmission Network

They are now using EDI to advise delivery. Electrolux has started to use EDI to suppliers to advise immediate production needs.

European manufacturers have closer relations with their suppliers than is the normal situation in the U.S.; to controlling suppliers and forcing very short delivery times. In some cases Electrolux has reduced lead times to less than one hour.

Some Electrolux companies are starting to use laptop/notebook computers. Three hundred fifty salesmen in the U.S. now have laptop computers for sales call reports and order entry applications.

A new project Electrolux is working on with Telia is video conferencing on personal computers. Until recently, the bandwidth required for suitable video communications made video conferencing very expensive.

Elektroservice

Elektroservice is the Electrolux organization responsible for responding to customers calling for product service.

There are three information systems of critical importance to Elektroservice. These are:

- Service administrative system
- Spare parts delivery system; administration of stores.
- Spare parts documentation

All of these systems are interrelated. The information systems have customer data stored by phone number. When a call is received they can display:

- Preliminary time of call
- Customer name and address
- Products, models and date of customer's purchase
- Potential spare parts required, (30 most frequently used, by model)
- Computerized planning schedule of servicemen. Their target is to have 85% of the problems solved on the first call.

In Sweden, Elektroservice receives 400,000 service calls per year. The service system is run on five interconnected AS/400s, plus one AS/400 for spare parts administration. All 60 service stations are on-line to the computer system.

The service system feeds data to the IBM mainframe that maintains the statistical quality control program. This application will be moved to the AS/400 systems some time in the future.

Elektroservice has a pilot project to provide portable computers to their servicemen so they can have a PC in their car and can take it into the customer's house.

Comments on Case Study

Electrolux has long been noted for being a very successful worldwide organization, with 600 companies located in 50 different countries. They operate with highly decentralized management and a very small headquarters staff. Their approach to information technology follows this operating philosophy, with management and responsibility for information systems resting with the decentralized operating management, guided and assisted by a very small, senior-level Corporate IT staff.

Electrolux's choice of information systems, both hardware and software, is heavily influenced by the need for compatibility and communications between the many different operations. With the policy of "commonalty before functionality", the selection of IBM's system AS/400s as the basic computer architecture to be used throughout the organization is excellent. As stated above, IBM is the only computer supplier able to offer "worldwide" system support, and the AS/400 is an excellent system, with proven reliability and with a wide range of available software.
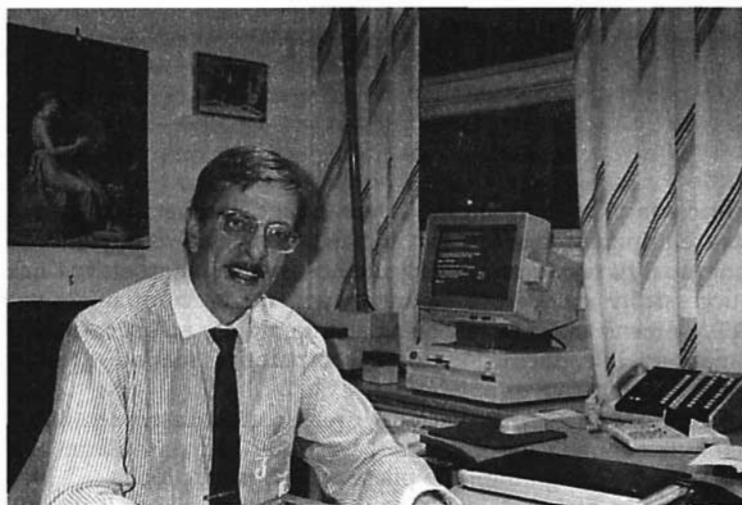
Figure 21 Janerik Hård, President, AB Elektroservice

Electrolux seems to have clearly established its IT objectives, consistent with Corporate objectives. An example is the LUX-NET network. They have focused on communication services to exchange data rather than networks for interaction. As stated above, with decentralized management and computing you don't need major, high speed communication networks, at least not today.

Electrolux's management philosophy has enabled to become a successful worldwide organization, operating in very competitive market areas, against very large, well financed organizations such as General Electric. Electrolux's information technology reflects this management philosophy and should serve its very diverse and constantly changing IT requirements very well.

Telefonaktiebolaget LM Ericsson

LM Ericsson is an outstanding international supplier of telecommunications equipment and systems. It has an enviable reputation for producing quality products meeting the needs of the market. LM Ericsson is successfully competing against much larger companies, such as AT&T, Siemens and NEC, by being able to rapidly adjust to ever changing markets, introducing products incorporating the latest technology at a much faster pace.

An example of the fast pace now required: Ericsson recently had a portable telephone project where it was only 18 months from the start of the product design until the phase-out of production!

Ericsson is a highly decentralized organization, giving it flexibility to respond rapidly to changing market requirements and new opportunities. At the same time there are strong corporate policies that provide a unifying environment.

Information systems are a vital part of Ericsson's corporate strategy. Lars Ramqvist, President and Chief Executive Officer, stated in the introduction of the 1993 edition of Ericsson's "Information Systems/Information Technology Policy and Guidelines:"

> "Ericsson must be a market and service-driven, entrepreneurially structured organization with the ability to rapidly adjust to ever-changing markets, but at the same time must be perceived as one solid, strong and unified body.
>
> To facilitate our acting in a coordinated way, we need firm corporate policies, covering a wide range of areas.
>
> Information Systems (IS), Information Technology (IT), and Administrative Development (AD) are such areas where I see us building a boundary-free Ericsson company for the changing 90s, leading to creative and fruitful cooperation between our Business Areas and our Local Companies. This is to keep us the leading international supplier for telecommunications networks throughout the 90s — a decade of changes, dynamic risks, threats and opportunities, where superior tools in the IS, IT and AD areas, maintained and interpreted through Ericsson Corporate Information Systems Committee (ECIC), its Operating Committee (ECIOC) and its Working Groups, are prerequisites for our success."

Ericsson formed ECIC in 1989 to provide a common approach within Ericsson for IS/IT. The ECIC typically meets 2—4 times a year. The Operating Committee, ECIOC, has a limited number of members, representing the Core Business. They are heavily dependent on the Work Groups and International Reference Group. Figure 22 shows the organization responsible for developing Ericsson's IS/IT Policies and Guidelines.
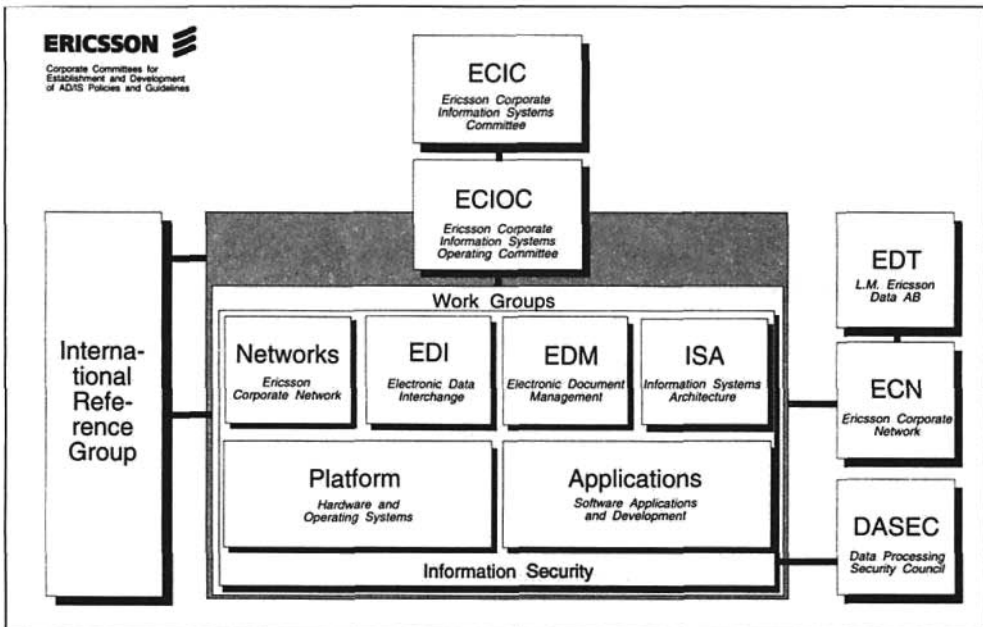

Figure 22

Ericsson has the largest computer center in Scandinavia. Their mainframe computers consist of several IBM model 3090s. Distributed computers from several suppliers are primarily Unix-based, especially in engineering and software development.

Ericsson, like other high technology companies, feels it is strategically important to have access to a communications network for rapid information transfer. Ericsson Data is responsible for the operation of the Ericsson Corporate Network (ECN). ECN consists of a mixture of dialled-up communication lines, leased lines, multiplexed leased lines, radio links and Ericsson's own networks.

ECN covers Sweden, the rest of Scandinavia, the Netherlands, England, Ireland, Spain, Italy, the USA, Mexico, Canada and Australia. ECN is monitored on a 24 hour, year round basis.

Previously, Ericsson had a SNA network for communication with their IBM computers and DECnet for their DEC VAX/PDP computers. Today, a number of computers, including numerous SUN workstations are using the TCP/IP communication protocol. These activities have built up networks of their own.

The networks between the SUN computers have been interlinked and a number of VAX and IBM 370 computers supplied with TCP/IP communication have been connected to this network. This means that the three networks have been interlinked so that from any terminal/workstation you can reach any other terminal/workstation or host in the network

Ericsson's IT vision is: "Any information can be easily accessed, processed and communicated by anyone (authorized) from any node in the same way to anyone and any asset, anywhere in the network." The recommended Architecture is shown in figure 23.
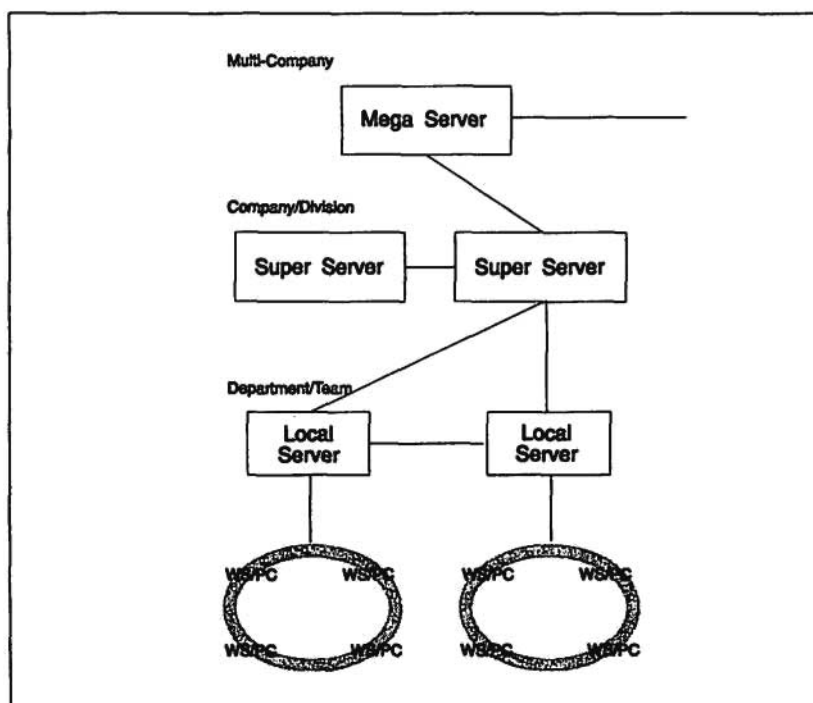
Topology

Figure 23

Today the Mega Server environment is characterized by a large number of users, a large variety of applications and huge databases. It is expected the Mega Server of tomorrow will evolve from a multi-purpose computer towards more dedicated usage as a large database server. A few of Ericsson's common applications, like CSDD and MEMO will remain on the Mega Server. The Mega Servers will form major hubs, connected to other Mega Servers and to Super Servers. Many applications will move from the Mega Servers to the Super Servers, while applications for use by Department and Team organizations will reside on the Local Servers.

Ericsson feels the client/server model, in an open systems environment, is the proper direction for the 1990s. This will enable them to take advantage of the increased cost/performance ratio in personal computers and workstations by moving the processing of information closer to the user.

While Ericsson feels the client/server model and open systems approach is the future direction, they also feel change must be evolutionary. "Consideration must always be given to protecting present investment." Whenever decisions for new or expanded IT investments are taken, a cost/benefit analysis should determine whether it would be better to continue along the present path or more efficient to move to an open systems approach.

Most of Ericsson's computing is based on proprietary operating systems like MVS, VM and VMS. Whenever new applications are planned, the open systems approach is preferred. POSIX-compliant and XPG-3-validated Unix-systems are the preferred choice in most cases.

The "Look and Feel" of the user interface defines how the user interacts with the system. Until now most applications have had their own names for functions and function keys. To obtain a more friendly user interaction, standardization is needed.

Ericsson feels there are two graphical interfaces which have become defacto standards on Unix systems, Open Look and Motif for workstations. Both have their base in the X-Window System which is the recommended window platform for WSs. For PCs, Microsoft's Windows, (MS-DOS), and the newer Windows NT are defacto standards. IBM's Presentation Manager (OS/2) was recently deleted from the recommended list. It is felt the Motif and Windows systems are similar enough to make it possible for users to easily change between them.

It is felt that diskless PCs will become more and more common. They will provide reduced cost, increased security and improved control. IBM 3270 and ASCII terminals have no real graphic capabilities. They may be acceptable in situations where only limited functions are required and low cost is important.

Ericsson has 6,000—7,000 workstations, largely in the development area. These are primarily SUN workstations connected to the TCP/IP LANs, with the LANs interconnected globally. Most of their work-

stations are diskless, with the software on the server. They feel they are saving 20—25% over the "terminal-to-mainframe" approach.

With global networks and common software, development programs can have a design team with members located in various countries work together. A recent example was a major project to develop software to support PABXs. It was too large a project for the available staff in Sweden, so the design team included staff from design groups in Texas and Europe. Close cooperation was possible with network communications.

Ericsson's design software/development tools are proprietary, developed by a 150 member staff. The design system was entirely mainframe based. It has recently been moved, a module at a time, to the LAN servers.

Ericsson identifies applications that offer a "competitive advantage". These applications should be designed in-house. Applications not identified as offering competitive advantages should use state-of-the-art commercially available standard packages.

There is major use of E-mail within Ericsson's worldwide organization. There are 20—25,000 terminals/PCs on the networks and virtually all are MEMO users. Ericsson developed the MEMO electronic mail system 12—13 years ago, working with SAS and Volvo, and later Telia. The Swedish Post now offers MEMO on a network service which Ericsson runs. There are 2,500 companies using this service. MEMO has become a standard throughout Scandinavia.

A recent Gartner Group report favored MEMO as a low cost alternative to other commercially available E-mail software packages. One feature of MEMO is that you always get confirmation your message was read. The LAN version of MEMO is now available.

Ericsson wants to keep the cost of data processing down by selling services to outside organizations. They can supply IBM computing power, network, etc.

Ericsson is changing from producing analogue products to digital products. With digital products, more components are purchased from outside suppliers. This increases flexibility and reduces the manufacturing labor required.

Ericsson uses the ISA-concept to make it possible for management to take responsibility for modules of integrated IS.

A "Model Factory" is a series of standard systems that are integrated. Three years ago Ericsson saw that EDI would be the "glue" that could integrate systems. They developed a standard file transfer system. One year ago they started to implement EDI technology.

The quality system, inventory system, MRP, warehouse control, availability are all connected to an EDI server.

Ericsson feels the current EDI servers on the market are inadequate. Very few will give acknowledgement back. They are using EDI in simple form, without translating. At present the file transfer is too depen-

dant on human interaction. They would like interactive EDI, which should be available in 2—3 years.

Ericsson makes major use of EDI. They have as many as 1,000 outside EDI partners;, including both suppliers and customers.

Ericsson has continually measured manufacturing costs since 1990. Costs are continually coming down. They initially installed the EDI system in three factories, now have it in six. Costs have been reduced up to 50%.

Ericsson's Terminal factory is running without any manufacturing orders. They perform against work standards and analyze variances weekly. They provide the Financial Department with consolidated data.

In the next three years Ericsson expects to dramatically change their manufacturing methods, which will greatly reduce the amount of labor required. "If you have an excellent forecasting system you can run a factory from a PC."

One interesting result of their integrated system is that information volumes are going down. With short lead times and less inventories, the need for quantities of information decreases; the "best" information flows faster.

The "philosophy" in manufacturing is: lets eliminate unnecessary information systems. The only "value added" systems are:

1 Purchasing
2 Putting components on boards

All other systems are "cost added". They might help to control operations, such as by providing traceability or QC, but they basicly add costs.

Comments on Case Study

LM Ericsson is a "world class" company with a history of successfully competing with some of the leading companies in the world, AT&T, Siemens, NEC. Their information system is similarly world class, as expected of an advanced electronics and communication company.

They maintain a decentralized, entrepreneurial environment, with sufficient standards to provide necessary coordination. Being able to conduct a successful advanced PABX design project, with members of the design team located on different continents, is outstanding.

Ericsson's recommended network environment, with Mega Servers at the multi-company level is excellent. The IT vision that "Any information can be easily accessed, processed and communicated by anyone (authorized) from any node in the same way to anyone and any asset, anywhere in the network," and their progress in fulfilling this vision is also excellent. Ericsson's information systems and technology will compare favorably with any other leading organization in the world.

Apiron Information AB

Apiron Information AB was formed in January 1991 by the merging of three cooperative data processing companies, KFDATA, (KF), Conor Information, (OKP) and Konsumdata, (Konsum Stockholm), into a single company. Apiron is a full service information processing company with 650 employees, annual sales of 700 million SEK.

The name "Apiron" was selected for the new organization since it is Greek for "endless; without limitations; space". Apiron was formed to create an organization with the size and capability to work with a wide spectrum of systems and customers.

Apiron* is a subsidiary of KF Tjänste, which in turn is part of KF Ekonomiska Förening, (KF Economic Association). Apiron's owners are KF Tjänste, OK Petroleum and Riksbyggen.*

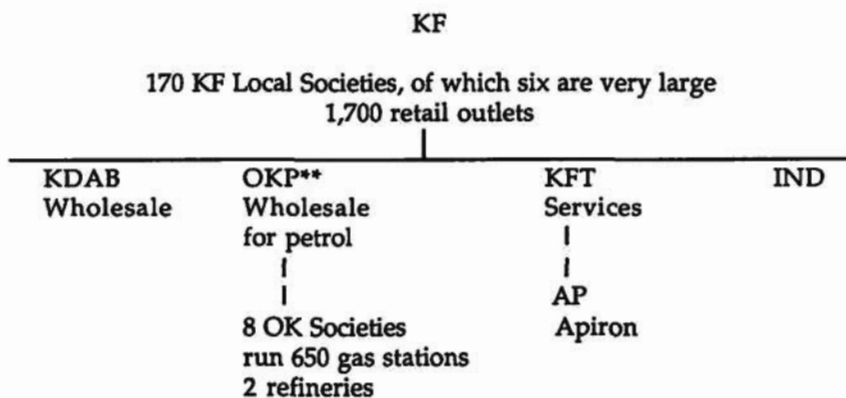KF Ekonomiska Förening is a major Swedish retail cooperative. The KF organization is as follows:

KF

170 KF Local Societies, of which six are very large
1,700 retail outlets
|

KDAB	OKP**	KFT	IND
Wholesale	Wholesale	Services	
	for petrol	|	
	|	|	
	|	AP	
	8 OK Societies	Apiron	
	run 650 gas stations		
	2 refineries		

Figure 24

---

*   Subsequent to the case study interviews, KF sold Apiron to Electronic Data Systems, (EDS). Since July 1, 1993 Apiron has been operating under the name "EDS Sweden AB".

* * OKP is 52% owned by KF, 24% owned by the Finnish State company and 24% owned by the Swedish State.

The KF group's computer systems consist of:

- Three IBM 3090 mainframe computers
- Fifteen IBM AS/400 midrange computers
- A number of DEC VAX minicomputers at KF headquarters running DEC's integrated office automation software, "All-In-1"

The AS/400s are separate, dedicated systems, not connected to the mainframe computers. There are user terminals/PCs connected to the AS/400s. Some of the KF societies, (the six large ones) operate their own AS/400s, running general ledger, etc.

Apiron's primary focus is providing information services to the KF family of organizations. The KF companies acquire computer services from a number of different organizations. Apiron would like to increase its share of KF's computer services to become the dominate supplier. Apiron is also interested in developing new business outside the KF group of companies.

Apiron services include working with a customer to prepare specifications for a new system and then designing and providing the system. Finally, Apiron will operate and maintain the system.
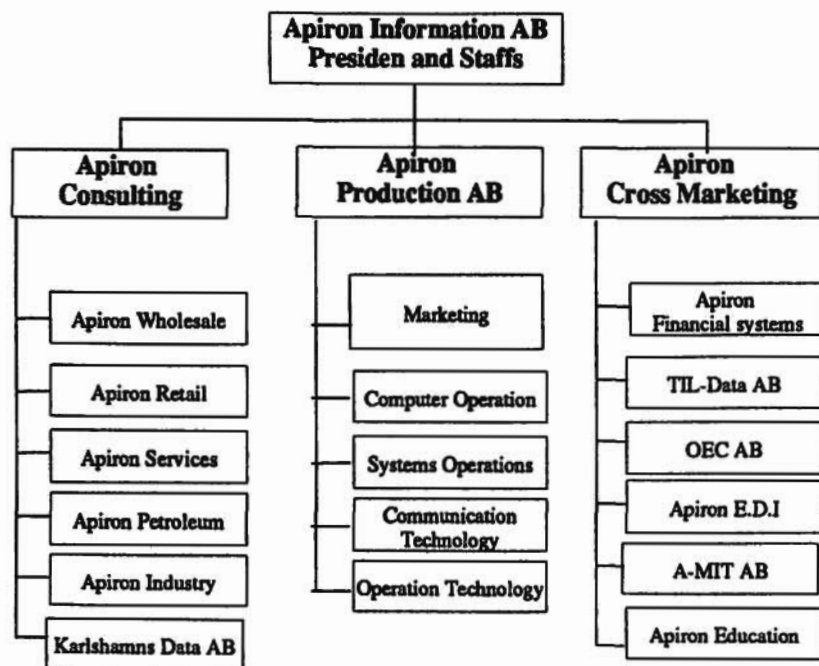
Figure 25 depicts Apiron's organization.

Figure 25

One of Apiron's major customers is OK Petroleum and OK-Societies. The OK gas stations, in addition to gas pumps, have convenience stores selling several thousand items. These store items are supplied by a separate organization from OK Petroleum. Information systems are needed for sales data, credit card processing and verification, inventory control and reordering of stock, local administration.

Apiron has developed an advanced information processing/communication system for OK, named "OKTOPOS". It is a "two level point-of-sale system" that captures sales information from the pumps and from the cash register. This data goes to a local computer that is connected on-line to the mainframe computer system through a new communication system.

OK now has on-line transaction handling for the sixty-five percent of gas sales that are paid by credit cards. Ninety percent of the credit card purchasers use PIN (Personal Identification Number) verification for the transaction.

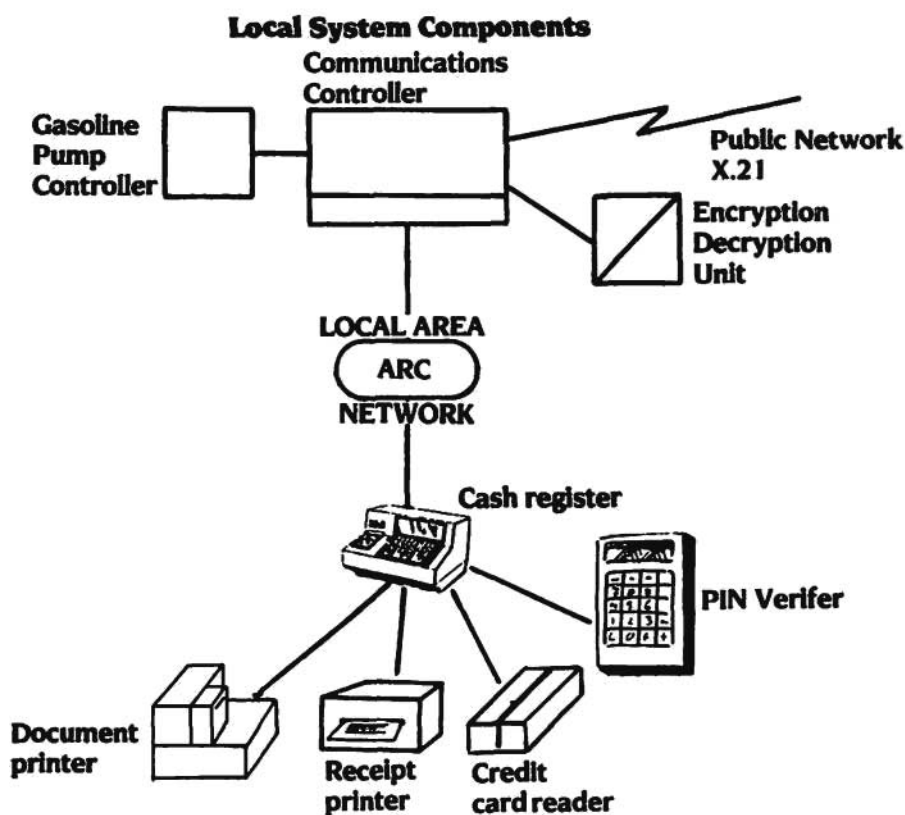The local OKTOPOS system components are shown in figure 26.

Figure 26

Work is underway to change the communication system from X.21 to an X.25 "global" network. It is planned that there will be 4,000 ports on the network. The system also communicates with Swedish banks for PIN verification, to automatically debit users accounts and for "black list" control.

OKTOPOS System Highlights:

- Central price look up unit
- Detailed stock-book on-line
- Central audit trail unit
- 400MB optical disk for event logging
- Local processing power for administration
- Communication to mainframe
- Reports taken without interfering with the rest of the system
- Program down-load
- Programs in high level language
- Online magnetic card handling, including black list control
- Multiple cash registers possible; theoretically up to 250 connections
- Controlling "satellite" gas stations. Up to seven automated gas stations can be connected
- Connection to banking systems

The OKTOPOS system has a capacity of 35 transaction per second, 280 million transactions per year. It has actually processed 226 million transactions per year, 1.6 million invoices per year, 1.3 million transaction per year with banks and credit card companies, with 99.9 percent up-time. This is a very high level of reliability.

Apiron is starting to implement EDI (Electronic Data Interchange) at OK. OK is now using hand held terminals to capture inventory/sales data. This is then sent to the mainframe system in batch mode. With the new EDI system they will be sending the inventory/sales data on-line to a "mail box" in EDI format. Then a stock reorder and packing list are generated and transmitted electronically to the store. The store checks the packing list and acknowledges it electronically. This authorizes the shipment and automatically generates the invoice. The invoice is still prepared on paper to satisfy Swedish accounting requirements.

Comments on Case Study

The OKTOPOS system development was a major undertaking. It is a very advanced transaction processing system with extensive communications capability. It demonstrates Apiron's ability to design and implement complex information-communications systems. It is understandable why EDS acquired Apiron to enter the Swedish information services market.

It appeared Apiron was just coming together following its formation through the merger of the three data processing companies in 1991. It also appeared the KF organization's relationship with Apiron was more a "customer to independent supplier"; rather then being fully committed to working closely with Apiron as part of the KF organization. As a result, the acquisition of Apiron by EDS could be beneficial for both the KF and Apiron organizations.

Sveriges Riksdag — Parliament of Sweden

The Swedish Parliament has developed and implemented one of the most advanced governmental information systems in operation in the world.

Work started on this information system in 1985. By 1989 a network covering six Parliament buildings had been installed. Acceptance of this initial network was quite strong from the beginning. Of the 850—900 governmental staff that were in these buildings, 600—650 were using the network in its early stages of development. Following the initial installation, local area networks, (LANs) have been installed for different governmental departments, such as Agriculture, Transportation, etc.

The Parliament's information system is now interconnected with the departmental networks. There are over 2,500 users/nodes on the system and a common user directory has been established for easy E-mail communication. Ninety-five percent of the 349 members of Parliament use the information system.

Most of the members of Parliament have PCs at home with the capability of accessing the system. They prepare "motions", propose legislation at home and send it in for comments or for editing and printing. They can also send facsimiles over the system.

There is a Training Department to assist users of the information system. There is also a "Help Desk" users can contact for assistance.

Swedish Parliamentarians do not have staffs. Typically, five members will share a secretary. There is a research department available for all of the members. Party leaders have small staffs and it is expected that in several years each legislator will have a personal assistant. With this minimal staff, the information system becomes particularly valuable to the Parliamentarians.

System users are able to check on the status of special bills and monitor what's happening in the Chamber. System users are also able to communicate with outside parties and access about 300 external computerized databases such as Reuters, (where news and financial information is updated every five minutes), Dialog, Comshare. The external connection is X.400. (Only a few Swedish companies have moved to X.400 at this time.)

The system is presently restricted to government use only. Public access is planned for this year. This access will initially be limited to selected databases, such as all Swedish laws, Parliamentary data. System security will prevent external users from accessing restricted governmental data.

This governmental information system has resulted in changes to the administrative staff organization and the way work is performed. The system handles over 6,000 E-mail messages per day when parliament is in session. At present the system does not have "voice mail" capability, but this is planned for the near future.

As can be anticipated for governmental work, a major use of the system is to communicate long documents. Often, various sections of large documents are prepared by different work groups and then combined. A Xerox graphics program is used to incorporate graphics into the reports.

Completed documents are sent by E-mail to the composer group and then printed on Xerox 300 dpi laser printers. Authors are able to electronically "cut-and-paste" documents and often can reuse paragraphs from previous reports stored in the computer's memory. There are cost savings due to the reduction in labor involved in the preparation of documents and the much faster production time cycle.

This information system is based on Digital Equipment Corporation, (DEC), VAX computers, tied together in VAX clusters, with "Ethernet" local area networks. Almost all of the government departments have DEC VAXes, with its character based system. Most users interact with the system through terminals. These are gradually being replaced by personal computers. Printers are distributed throughout the governmental offices, shared by small groups of users. In addition, each Parliamentarian has a laser printer at home.

The primary application software used on the system is DEC's "All-In-1" integrated office automation software. The most important application is word processing. The second most important application is E-mail. There is a large text database of two billion characters, (2 gigabyte), to facilitate the distribution of large documents, Parliamentary papers. "Trip" software is used for searching text documents. Unix software is being used more and more for new system development.

DEC uses CD-ROMs for software distribution. There is consideration that in the future, as CD-ROM drives become more widely used, Parliament might use CD-ROMs to distribute public databases.

At this time Parliament does not do any "out-sourcing" of its information services requirements. All system needs are performed by the in-house IT staff.

It is recognized there is a need to improve system security. Currently there are 400 system users authorized to call-in and access the system. Now there is an "automatic call-back" security check. In the future, as the system becomes more open with an increasing number of users, a different level of security will be required. The automatic call-back system may be replaced with a "smart card" log-in, or "dynamic password" with specialized equipment.

Future Plans include replacing the user terminals with personal computers and change to a graphical user interface using Microsoft

"Windows" operating system, Microsoft Word and Excel for word processing and spreadsheets.

There are also plans to upgrade the LANs to be client/server networks, which will provide faster, more efficient system operation. This transition will take several years to implement. DEC's new integrated software "TeamLinks" is also being considered as a replacement for the aging All-In-1. The TeamLinks file manager would be used instead of Windows and TeamLinks' "MailWorks" would be used for E-mail.

The Parliament system currently uses personal computers based on Intel model 386 microprocessors with the network servers using the more powerful model 486 microprocessors. All new PCs will be 486 designs. There are tests being conducted with an ISDN communication system, with 64 KB connections to homes. Now modems operating at 300 baud are used for communication from the Parliamentarian's homes.

There is also a test program with a pilot client/server system having 50 nodes. There are plans to proceed with installation of client/server networks. With the client/server system, application programs would be kept on the network servers rather than individual PCs. This increases program security and ensures that all users are using the same versions of the application programs. All data on the servers would be automatically backed-up every night.

With the future client/server system, all of the servers will be located at one site, with distributed, local printers. This will further increase security as well as system reliability, since operation will be under the direct control of information technology professionals.

A new, high capacity communications network is also being planned, using fiberoptic cable for the backbone with twisted-pair wire to the user nodes. This network would cover six to seven building blocks.

Several years ago a laser system was installed for communications between two buildings. The lasers are mounted on the building roofs and communicate for a distance of about 500 meters. The lasers were a more convenient and less expensive approach than installing an underground coaxial cable, however, communications are sometimes effected by wind and snow.

The laser system has a 10 MHz bandwidth. It is felt that at least 100 MHz bandwidth capacity will be required in the future and there is no solution available today except by using fiberoptic cable. In a few years it is expected system users will want to send multimedia data, (data, graphics, pictures, video, voice), in color, which will require the higher bandwidth capability.

Comments on Case Study

This is an excellent system, well conceived and well implemented. Any system the reduces the need to keep printing drafts and revisions

of long documents, and distribute hundreds of pounds of printed copies is welcome progress.

Enabling members of parliament to work at home and yet be in full communication with associates and other governmental staff provides a work environment with less disruption and more thoughtful consideration of major issues. It undoubtedly results in better governmental policies and decisions, reached in much faster time periods.

The future plans to open the system for access by outside users is certainly commendable. This should provide closer communications and understanding between business, the public and governmental activities. Naturally, advanced security systems will have to be implemented to protect vital governmental data.

The move to client/server networks, the increasing use of Unix, consideration of CD ROMs for distribution of government data are all moves in a positive direction. It is hoped that DEC's TeamLinks is a quality upgrade for All-In-1, with a friendly, graphical user interface. It is also hoped there will be numerous application software programs developed for this program, to extend its usability.

Closing Comments

Alvin Toffler said: "We are drowning in information and starving for knowledge." It is clear that success in the 1990's will belong to those who learn how to use the information that the "Information Age" is making available. One of the objectives of presenting these case studies is to assist in understanding the use and management of information.

Background

This project is a continuation of a series conducted for TELDOK analyzing the development of information and communication systems. Prior study projects were conducted in 1983, 1986, and 1989. For the first time, this project includes case studies of leading Swedish organizations; (only U.S. organizations were included in prior studies). It is felt the inclusion of the Swedish organizations greatly enhances the study, making the results more relevant to the management of Swedish organizations.

When this program started in the early 1980s the focus was on "Office Automation", (OA) systems. At that time OA typically consisted of word processing systems used by secretaries and early versions of personal computers used by some of the professional staff.

Major changes have taken place during the past decade. Office Automation systems evolved into "Office Information Systems", (OIS) which has evolved to include virtually all information and communication systems used for the administration, management and business activities of organizations.

During the last three years there has been rapid acceptance of Microsoft "Windows" software, proliferation of specialized application software, growing implementation of multivendor networks and an increase in the influence of end user organizations on system selection. This has led to increasing use of multivendor systems and the rapid growth of system integration services.

Personal computers are continuing their rapid growth in power. The market's acceptance, and even "need" for this ever increasing power is very impressive. Processing speeds and memory capacities now considered routine would have been at the limits of our imaginations just three years ago. It is easy to predict that in another three years PCs will be at least double their present capabilities, in smaller, more reliable, very portable packages. Software and user interfaces will also be a generation ahead.

The major change in the last few years has been the growth of networks and communications. This area will continue to have major changes in the next few years. Pocket sized "personal digital assistants" and wireless networks, will make it easy to communicate with anyone, anywhere, anytime.

Methodology

The research approach for this project was similar to the prior studies. In-depth case studies were prepared. The data for these case studies is based on personal interviews with key staff members of these organizations. Interviews were conducted with both "information system professionals" and system "end users".

This project included case studies for eight major U.S. and six major Swedish organizations These organizations were selected to represent different industries and approaches to automation. Six of the U.S. organizations were included in all of the prior studies, providing a continuing historical record of IS development.

Acknowledgements

The participation of the case study organizations is greatly appreciated. In particular, special thanks to the management and staff of the Swedish organizations for their participation. The interviews required considerable time, often at inconvenient schedules, interfering with other important demands on their time. Thank you.

Many of the illustrations contained in this report are from corporate literature and reports of the case study organizations. Again, thank you.

Thanks are also due to TELDOK for sponsoring this series of projects. They are the organization making this project possible.

This project was conducted by Alan Purchase, Managing Director, Alan Purchase Associates. Mr. Purchase was the Project Leader for the prior study projects. Mr Purchase takes full responsibility for errors or omissions; they are certainly not intentional. Considerable effort was taken to have all of the data correct. Unfortunately, in the fast paced 1990s, numerous changes take place between the time of the field interviews and the final printing of the report.

THE END.

TELDOK was initiated in 1980 by the Board of Telia AB, then Swedish Telecom, to *facilitate early and easy-to-read documentation on the use of telecommunicating information systems.*

TELDOK aims at documenting, as early as possible, working applications of new information systems and arranging study trips and seminars directly related to this task

TELDOK's aims include to...

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- Publish, distribute, and–where needed– translate to Swedish, while comparing to the Swedish situation, information on the use of new telecommunications systems at work
- Arrange study trips and seminars directly related to the preparation and dissemination of information pertaining to practical applications of telecommunicating information systems at work

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