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BNR/OCS INFORMATION SHARING SEMINAR FOR: USER DRIVEN DESIGN

Papers presented at the OCS Joint Committees' meeting, December 2 and 3, 1982 at the Conference Center Ottawa

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BNR/OCS INFORMATION SHARING SEMINAR

FOR: USER DRIVEN DESIGN

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THURSDAY, DECEMBER 2, 1982 9:15 - 10:00 Introduction & Northern Telecom's Open World 10:00 ~ 10:15 Break 10:15 - 12:00 Improving Office Productivity through Integrated Office Systems

12:00 - 1:15 Lunch 1:15 -3:00 BNR OCS Field Trial - Mark Dallas - Bob Hudyma 3:00 -3:15 Break 3:15 -4:45 Environmental Issues in Planning

the Office Communications System

- Ray Fortune

- Jim Bair

- Alan Reid

FRIDAY, DECEMBER 3, 1982

9:00 - 10:30	Cost Benefit Analysis for OCS	- Jim Bair
10:30 - 10;45	Break	
10:45 - 12:00	An OCS Case Study	- Jim Bair
12:00 - 1:15	Lunch	
1:15 - 2:15	OCS Technology: Personal Computer	- Bob Hudyma
2:15 - 2:30	Break	• •
2:30 - 4:30	OCS Technology: Local Area Networks	- Bob Hudyma
4:30 - 4:45	Closing Remarks	and the second and the second second second second second

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The OPEN World

A corporate commitment

Northern Telecom's commitment reflects the importance of information to the future of all organizations . . . to business, large or small, government, and others.

Information management is fraught with complexity . . . in technology . . . in the diversity of products . . . and in a bewildering array of suppliers.

It is to this environment that Northern Telecom brings "Open Protocol Enhanced Networks"-OPEN World-universal information management systems through communications.

Communications is the common denominator for effective information management.

OPEN World is intelligent systems that can evolve and grow to meet any communications requirement.

OPEN World is versatile, planned information management . . . communications products and a universal planning framework.

This is Northern Telecom's commitment to information management . . . OPEN World.

Walter f. fight

Walter F. Light Chairman of the Board and Chief Executive Officer Northern Telecom Limited

dennel B. Fitzendel

Edmund B. Fitzgerald President Northern Telecom Limited

OPEN World— Criteria for Planning Information Management Systems

Continuity. Obsolescence is an everpresent problem. An optimum information system carries a guarantee of continuity. It incorporates future developments without becoming obsolete. It handles future growth and new needs not yet identified by the user.

Compatibility. Many components and systems must work together. Equipment from a host of suppliers must be accommodated effectively on one system—an ideal frustrated by different standards, interface protocols and proprietary specifications.

Congeniality. Systems and equipment must be pleasant and easy to use. They must be congenial. This includes careful consideration of human factors in the design of equipment.

Control... must reside with the organization which an information system serves, not with a supplier.

Cost-effectiveness . . . is the bottom line. Long-term financial considerations, as well as initial cost, are an important criterion.

These five criteria are the foundation of OPEN World. They are criteria that Northern Telecom will guarantee in its OPEN World products and features.

Communications— The Hub of the System

Another key foundation of OPEN World is communications.

Effective information management is designed around communications . . . and therefore, around a digital switch.

Digital switches handle virtually any form of text, voice, data or image, since all information can be transformed into a digital bit. A digital switch has a connection to every desk, providing a universal connection, a high-capacity information "pipeline". And with the continuity that Northern Telecom has always built into its digital equipment, its switches will evolve to meet future requirements and technological advances.

The hub of OPEN World is the digital switch . . . the SL Family of PBXs (SL-1, SL-10 and SL-100) and the DMS Family of central office switches.

OPEN World— Northern Telecom's Commitment

OPEN World provides a planning framework, and the elements necessary for implementation . . . terminal systems, connection (or network) systems, and services.

In addition to office and data processing terminals, Northern Telecom will introduce, over the next two years, a family of new terminals. They will range from digital telephone sets with a range of features, to sophisticated voice and data terminals with display capability and more features. They will include additional members of the Displayphone family.

OPEN World is the ability to connect. Northern Telecom's program includes a high-speed digital connection to every desk, using existing telephone wiring to form a high-speed local area network. In addition, compatibility will be enhanced by the ability to support other manufacturers' equipment and systems, through plans to accommodate key standards and specifications used by others. Northern Telecom will, in effect, provide a gateway to a diversity of equipment and systems.

Northern Telecom is working with major data processing manufacturers

to ensure mutual product compatibility. It has also taken the innovative step of offering to license certain key interface standards to other manufacturers. Information services which enable people to function more effectively are a key element of OPEN World. Many services have already been introduced. More are planned within the coming two years . . . multi-media conferencing, for example, for deskto-desk meetings involving the spoken word and text or image.

The end result is versatile information management, planned in a considered fashion, that conclusively meets five criteria: Continuity, Compatibility, Congeniality, Control, and Costeffectiveness.

This is the commitment of OPEN World.

In the Northern Telecom lexicon, "OPEN World" is our latest concrete advance towards the Intelligent Universe.

OPEN World is the combination of Northern Telecom's planning framework, products and features for universal information management systems based on enhanced communications.

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background information

Products, Systems and Services for the OPEN World

As part of the introduction of the OPEN World, Northern Telecom unveiled development plans for a number of products and services. The company made commitments in three general areas: terminals, connections and services.

Terminals

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Early in 1984, Northern Telecom will introduce an OPEN World Family of terminals. They will range from simple electronic telephones with a few features, to more sophisticated telephones with display capability and a large number of features. There will also be a new family of terminals growing out of the company's highly successful Displayphone, which combines voice and data communications in a single desk-top unit. The new family will include integrated voice and data terminals with larger screens, a keyboard for full-time professional use, and many other features.

A year later, Northern Telecom will introduce an even more powerful terminal that will include graphics and image capability, as well as voice and text.

Connections

The growth in the use of terminals and the transmission of graphics and images will require higher capacity connections between the various devices. Northern Telecom will fill that need in stages. First, in 1984, the company will add modular enhancements to its digital switches that will provide a digital connection with a capacity of up to 64 kilobits (thousand bits) per second. This increased local connection capacity will be available through either the DMS Family of central office switches or the SL Family of business communications systems.

In 1985, Northern Telecom will substantially increase the bandwidth used on twisted pair wire, the same wire which telephones use and which is already installed in almost every building. Northern Telecom has demonstrated in the lab that two-pair wire can carry data in excess of one megabit (one million bits) per second. This capacity is more than adequate for most requirements. Under the direction of a digital controller, the existing telephone wiring can become a very powerful local area network.

In those specialized applications where even higher speed transmission is required, Northern Telecom has committed to providing a gateway connection that can connect commercial local area networks into the rest of the system.

In addition to the provision of its own terminals, Northern Telecom has also committed to accommodating the equipment of other manufacturers on OPEN World systems. It will do so in several ways. First, as recently announced, Northern Telecom has taken the innovative step of offering to license, at a nominal one-time fee, some of the key interface specifications for its SL-1 business communications system. In October, Northern Telecom announced that it was making available the asynchronous data interface specifications. This is a first among telecommunications equipment manufacturers.

Second, Northern Telecom is working closely with leading manufacturers of data processing and office automation equipment to ensure compatibility. The company recently announced cooperation agreements with Sperry Univac and Digital Equipment Corporation; other such agreements are in negotiations.

Third, Northern Telecom's OPEN World system will support a number of proprietary protocols, including IBM's Systems Network Architecture (SNA).

Finally, Northern Telecom will support equipment using X.25, one of the key international protocols for packet data communications.

In total, these programs will make it possible for a wide range of systems and terminals to communicate with each other through the medium of a Northern Telecom business communications system.

Services

Northern Telecom also revealed its plans to offer a variety of OPEN World enhanced communications services. They will be implemented by software, generally, and will be available through either a DMS-100 central office-based system or a system controlled by an SL PBX. These services include:

- Integrated Messaging Service, already introduced on SL-1, which allows calls and messages to be recorded in a central file for subsequent recall when the called party is available.
- Teleconferencing, which will allow users to simultaneously share voice, text, graphics and images on their desk-top terminals in an interactive teleconference session.

 Advanced Integrated Data Base Management Systems, which will allow electronic storage and retrieval of voice, text, graphic and image files.

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 Multi-media Messaging, which will permit messages to be left and retrieved in text, voice, graphic or video form.

Together, these terminals, networking systems and services represent a significant commitment by Northern Telecom to the development of complete information management systems.

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background information

The OPEN World

The OPEN World announced by Northern Telecom represents a significant departure from traditional approaches to the design of information management systems.

"We are designing and building as open a system as possible, with the ability to handle most types and brands of equipment, and the ability to undertake most information management functions on one integrated system," said Edmund B. Fitzgerald, president, Northern Telecom Limited.

"Some suppliers and manufacturers are selling proprietary systems, in effect locking in users by making it difficult for them to connect other makes of equipment to the system. The result is a chaotic situation, with many types and makes of equipment and systems, many of them incompatible. Our approach is the opposite, as the OPEN name implies."

OPEN stands for Open Protocol Enhanced Networks. The OPEN World includes a number of elements:

- A planning framework, which provides a guide to those considering or planning systems for information management. As a guide to the planning, five key criteria (the "Five C's") are identified (see below).
- The development and introduction of a communicationbased design for information management systems, with an OPEN World digital switch as the system "brain" or controller. That switch may be a Northern Telecom SL Family business communications system (or PBX), or a Northern Telecom DMS Family switch in a telephone company central office.
- The development and introduction of communications terminals and other equipment designed specifically to work within the OPEN World.
- The development and introduction of OPEN World services and features, primarily through software modules that can be added to existing Northern Telecom systems to provide a variety of information services.

Introduction of the OPEN World included announcement of specific plans for a number of networking capabilities, products, features, and services.

The Five C's

Five criteria form the essence of the OPEN World planning framework. The OPEN World systems, products, services, and features developed by Northern Telecom will all meet these five criteria.

1. Continuity

With the explosive pace of developments in office equipment, data processing, and telecommunications, obsolescence is a potentially serious problem. An optimum information system is one that ensures continuity, and that can incorporate future developments without becoming obsolete.

Continuity is exemplified by the telephone network. Every element, and every technology added to the system, rates with the elements already in place. For instance, today's digital switches work with earlier generations of switching technology, such as step-by-step or crossbar.

It is this heritage of continuity that Northern Telecom is applying to the development and implementation of integrated information systems. Its digital switches, for instance, are constantly evolving rather than being outdated by new generations of equipment.

2. Compatibility

In an integrated information system, all products and systems must be able to "talk" to each other and work as a harmonious whole, regardless of the supplier.

This is an ideal that is frequently frustrated by the diversity of different standards, interface protocols, and proprietary specifications.

Compatibility is another distinctive characteristic of the telephone network, and part of Northern Telecom's technological heritage. The fact that one can call to virtually anywhere in the world, from any telephone, with the call passing through numerous different switches in different countries, is a triumph of compatibility.

This is the result of strong and recognized standards and protocols (such as dialing systems), and of a dedication to the concept of compatibility. It is this dedication that Northern Telecom is applying to the development of integrated information systems.

3. Congeniality

Unless entire systems, and component elements, are easy to use, and acceptable and attractive to the people intended to use them, they will be ineffective.

Congeniality is nowhere better illustrated than in the telecommunications industry. The telephone network is an enormously complex technological machine, yet it is so simple that a child can use it. The complexity is invisible.

Congeniality has always been a prime factor in the philosophy that Northern Telecom applies to the design of its products and systems. It is a prime factor also in its design of information management systems.

4. Control

Control of the information system must be firmly in the hands of the organization and people it serves. Ultimately, the information system may become the foundation of the organization itself. The organization, rather than a supplier, should dictate the design and the further development of the system.

The ability of the organization to select and operate diverse products and systems to meet its requirements and to control its costs is paramount. The products should be the building blocks that make up the information system the organization needs. Another important element of control is the capability to ensure maximum operating efficiency of the information system itself, through the provision of traffic analyses, for example.

5. Cost-effectiveness

The ultimate and most important criterion of any system is its cost-effectiveness. Long-term financial considerations, as well as the initial costs, are important. The elements of continuity, compatibility, and control have a significant bearing on cost-effectiveness. It is, in effect, the bottom line factor.

The OPEN World represents Northern Telecom's commitment to develop and introduce systems and products that conclusively meet these five criteria, and thus assist users as they plan and build systems for the management of information in their organizations.

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news release

Toronto, Ontario, November 8 -- Northern Telecom Limited has announced a \$1.2 billion (Canadian) five-year research and development program that will result in "open" information management systems based on digital communications controllers. The "open" system will be able to accommodate most types or makes of equipment, and will allow all major office communication functions to be undertaken on one integrated system.

The \$1.2 billion will be spent on developing what Northern Telecom is calling OPEN World (Open Protocol Enhanced Networks) products and services. The OPEN World comprises a planning framework to assist users to plan and build their own information management systems, and includes the provision of telecommunications products, services and features for the implementation of such systems.

The Northern Telecom announcement included plans for a number of new voice and data terminals, for a series of services and features for information handling, and for enhanced networks based on digital communications technology that will evolve to accommodate future requirements.

"Presently, there is chaos in the telecommunications market, with many suppliers offering an array of systems, products and services, many of them incompatible," said Walter F. Light, chairman and chief executive officer of Northern Telecom Limited. "The result is an enormous waste of resources, and systems that are inefficient."

Under the OPEN World concept, an organization should be able to manage its information-handling needs -- including data processing, voice and data communications, word processing and communications, and the exchange of image communications -- as one integrated system.

It should be able to do so without discarding existing equipment and without locking itself into a single supplier, by using OPEN World products and services as the system building blocks.

"We are committed to the development of a universal, open system, that will handle many types and brands of equipment, and evolve in a planned fashion to protect against obsolescence," stated Mr. Light.

In Northern Telecom's OPEN World, information management systems will be designed around the communications function. A digital switch, either in a telephone company central office or on a user's premises in the form of a business communications system (or PBX), will be the hub or controller of the system.

"We are evolving our DMS-100 Family of telephone switches and our SL Family of PBXs as OPEN World products to meet these requirements," said Edmund B. Fitzgerald, president of Northern Telecom Limited. "We are also developing many other products, services and features that will make the OPEN World a reality."

The Northern Telecom announcement included a number of specific plans for the development of network systems, products and services.

- The existing telephone wiring already installed in most buildings will be given increased transmission capability to become a high-capacity "information pipeline" extending to every desk. This will be done through further evolution of the SL Family of PBXs. Within three years, digital distribution with a capacity of more than one million bits a second will be available on existing wiring.
- Northern Telecom is offering to provide some of its interface specifications for a nominal fee to other manufacturers, to enable them to design equipment that will work cost-effectively in an SL-1 PBX-based system. In addition, Northern Telecom is negotiating cooperation agreements with a number of major data processing manufacturers to ensure maximum compatibility of equipment. The first two agreements, with Digital Equipment Corporation and Sperry Univac, were announced in October.
- The ability to include many types of equipment and sub-systems will also be enhanced by the provision of "gateways" to other suppliers' proprietary local area networks, and by plans to support systems using the internationally accepted X.25 packet data communications interface, and, for example, interface to IBM's proprietary Systems Network Architecture (SNA).

- Plans for a number of new OPEN World communications terminals were announced. They will range from digital telephone sets, with a number of features, such as information display and added calling services, to more sophisticated voice and data terminals with a large number of features. There will be new members of the Displayphone family of terminals. Northern Telecom's Displayphone was the first combined voice and data terminal, with a video screen for information display and a retractable keyboard. The new Displayphone terminals will include sets with larger screens, and keyboards for full-time use.
- Evolution of the central digital switching "brain" of the system will make possible a number of new services and features, implemented mostly through software modules. These will include services such as voice and data conferencing, enabling users to hold desk-to-desk "conferences" that include the exchange of text or data, as well as voice communications. Multi-media messaging, permitting users to leave a "message" in the form of voice, text or image for retrieval by the recipients, will also be provided.

"All products and services of the OPEN World will meet five key criteria," said Mr. Fitzgerald. "They will provide continuity, by evolving to avoid obsolescence; compatibility, to enable diverse components to work together; congeniality, to ensure that equipment and systems are easy to use and attractive; control, to ensure optimum performance of the system; and cost-effectiveness, which is the bottom-line criterion.

"We are announcing our OPEN World concept, and many of the specific plans, to enable users to plan and build for the management of information in a more rational fashion," stated Mr. Fitzgerald.

Northern Telecom Limited is the largest manufacturer of telecommunications equipment in Canada and the second largest in North America. It is also a significant manufacturer of information processing equipment. Revenues in 1981 were \$2.6 billion. It employs about 35,000 throughout the world and has 49 manufacturing plants in Canada, the U.S., England, Republic of Ireland, Malaysia, and Brazil. Its shares are listed on the Montreal, New York, Toronto, and Vancouver stock exchanges.

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background information

telecom

Communications -- the foundation of the OPEN World

Northern Telecom's OPEN World approach to the management of information is built on the foundation of communications.

The prime functions to be undertaken by an information management system -- including voice communications, data processing, text and document handling, and image and video information exchange -- all depend on communications.

Other suppliers approach the office automation market from the office equipment or the data processing perspective. However, these approaches do not have the universality or the flexibility of systems designed around communications.

In the OPEN World, an information management system is designed around a Northern Telecom digital controller, which may be an SL Family business communications system (or PBX), or a DMS Family central office switch operated by a telephone company. Both are capable of providing OPEN World services and features. The digital PBX or central office switch functions as the system controller.

The effectiveness and the cost benefits of this approach stem from these factors:

- An OPEN World digital PBX or switch will have the ability to handle virtually any form of information (text, voice or image), since the lowest common denominator of all information is the digital bit.
- 2. An OPEN World digital PBX or switch can connect many diverse sub-systems together, including systems for voice communications, word processor communications, data communications, and, eventually, video communications.
- 3. The OPEN World digital PBX or switch already has a connection to virtually every desk. As part of the OPEN World program, this universal connection will evolve into a high-capacity "pipeline" capable of handling a wide range of information.

(4000)

The alternative to this universal connection, proposed by a number of suppliers, is the installation of a special "local area network" for information transmission in an office or within a building or a local community. Typically, these local area networks consist of a "ring" configuration, with computers and terminals connected by means of coaxial cable, or some other special high-capacity wiring. This necessitates installation of another wiring system in buildings, in addition to the existing telephone wiring.

The OPEN World approach can be represented by a "star" configuration, with all terminals and computers connected to the central hub (the digital PBX or switch) by means of the existing telephone wiring. The costly rewiring or special wiring of buildings is avoided. The twisted-pair telephone wiring becomes, in effect, a powerful local area network, which will be capable of carrying more than one megabit (one million bits) of information a second -- more than adequate for most applications. Where a local area network of the ring type is also needed, an OPEN World "gateway" will provide access to such systems.

4. The Northern Telecom OPEN World products, such as digital switches and PBXs, will evolve to meet future requirements and to accommodate future technological developments, thus providing continuity and avoiding obsolescence.

An OPEN World information system designed around a digital switch or PBX as the controller will meet the five key criteria of continuity, compatibility, congeniality, control and cost-effectiveness.

The digital switches around which Northern Telecom is designing its information management systems are the DMS-100 Family of central office switches and the SL Family of PBXs. Many of the services and features will be offered through both systems, giving users the choice of obtaining these benefits through their telephone company (where DMS switches are used and such services are offered), or through procurement of their own SL PBX.

The SL-1 reached the milestone of two million lines in service in 1982, making it the most successful digital PBX in the world.

There are three members of the SL Family. The SL-1 serves up to 5,000 lines. The SL-100 can serve up to 30,000 lines, and the SL-10 is a packet switch for data networks, speeding information around the system in the form of uniform-size "packets" of data.

The SL-1 was first introduced as a PBX primarily for voice communications. Today's SL-1 and SL-100 are versatile voice and data controllers. In addition to telephones, the SL PBXs support data terminals operating up to 19.2 kilobits asynchronously, or 56 kilobits synchronously. They also handle communications for integrated voice and data terminals, such as the Northern Telecom Displayphone, and act as network controllers for systems covering a number of geographical locations.

Similarly, the DMS Family of digital switches are the most widely used in North America.

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The OPEN World integrated information management system being developed by Northern Telecom is depicted, with a variety of systems, equipment, networks and services under the control of an SL PBX controller, on one integrated, evolving system.

AN OVERVIEW OF

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1/12/82

OPSP

INTEGRATED OFFICE SYSTEMS

James H. Bair Manager Office Systems Research

Bell Northern Research Mountain View, California USA



OSR .

OPSP

A LOOK AT IOS

TREE

TO IMPROVE PRODUCTIVITY

Mountain View

BNR

OSR

CERT

OFFICE AUTOMATION IS CRITICAL BECAUSE WHITE COLLAR WORKERS ARE HALF OF THE TOTAL U.S. WORK FORCE

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\$376 billion

	blue collar	
	50.2%	
(manu	facturing, industrial labor	•)
		in l
	white collar	
	. wille collar	
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LABOR AND INFORMATION COSTS HAVE INCREASED OVER THE PAST DECADE



*Rate of information cost increase is based on labor & information volume increases



CAPITAL INVESTMENT TO SUPPORT LABOR AND RESULTING PRODUCTIVITY COMPARES UNFAVORABLY FOR THE OFFICE




THE CURRENT STATUS OF OFFICE AUTOMATION:

- Heavy existing automation of structured information & data through DATA PROCESSING
- Some of the text is being processed through WORD PROCESSING
- Little of the text is being communicated through ELECTRONIC MAIL
- Almost none is available through MANAGEMENT
 WORKSTATIONS

WHAT IS WORD PROCESSING?



OUT TO BE: MAILED, FILED, HAND-DELIVERED, COPIED, DUPLICATED, DISTRIBUTED



EXAMPLE OF CLAIMED PAYOFF FOR TYPICAL CURRENT WORD PROCESSING:

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EXAMPLE OF "BENEFIT" CLAIMED FOR WORD PROCESSING



.

Postal Service

CAMINIT L

Deliver

Preparation:

Storage:

Electronic Mail

2-4 days national 1-3 weeks international

1 day overnite capability 1-3 hours batch

Document preparation Envelope, stamp, and mail Mailroom processing

Paper in file cabinet Machine readable storage

Benefits summary:

- Faster + more timely delivery
- Less clerical labor
- Easier storage + less space
- Substitute for phone when needed.



WHAT SIGNIFICANT OPPORTUNITIES EXIST TO ADDRESS THE REMAINING WHITE COLLAR LABOR COSTS?





COMMUNICATION CAN BE SUPPORTED 3 WAYS:





AREAS OF POTENTIAL PAYOFF FROM COMPUTER MAIL IN THE AUTOMATED OFFCE:

SHADOW FUNCTIONS due to unpredicted time
 WAIT + RECYCLE TIME from interruptions
 NOTATION TIME for records of communications
 MEDIA TRANSFORMATION between

paper, phone, meetings, etc.

Potential Time Savings • minutes per day 30 ^V

60

10

possible 116 total (1 hr. 56 min.)

16

Depends on degree of substitution for phone, meetings, + travel.



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OFFICE AUTOMATION APPLICATIONS DEPEND UPON THESE RESOURCES

....

- COMPUTER MAINFRAMES MAXIS
- MINICOMPUTERS
- MICROCOMPUTERS
- PERSONAL TERMINALS AND COMPUTERS
- DATA COMMUNICATIONS
- MANAGEMENT

OFFICE AUTOMATION CAN SAVE MARAGEMENT & PROFESSIONAL TIME



OFFICE AUTOMATION IS MORE THAN TECHNOLOGY



OFFICE AUTOMATION IS THE NEXT MAJOR OPPORTUNITY FOR PRODUCTIVITY IMPROVEMENT

- THERE ARE MAJOR COST INCREASES IN LABOR AND INFORMATION
- THE COST OF TECHNOLOGY IS RAPIDLY DECREASING
- WORD PROCESSING HAS IMPROVED TYPING PRODUCTIVITY
- COMPUTER MAIL HAS DEMONSTRATED POTENTIAL PRODUCTIVITY GAINS
- INTERPERSONAL COMMUNICATION SUPPORT OFFERS HIGHEST PRODUCTIVITY ADVANTAGES

REALIZING OFFICE AUTOMATION PRODUCTIVITY GAINS:

- depends on a mature system and interface design
- depends on comprehensive, integrated support of whole organizations
- requires overcoming user resistance
- requires the development of new office methods and procedures
- requires planning an evolutionary approach

BNR-OCS FIELD TRIAL USER NEEDS ANALYSIS

OFFICE COMMUNICATIONS SYSTEMS OBJECTIVES

• USER NEEDS ANALYSIS FOR GENERIC OCS

• CASE STUDY: BNR-OCS FIELD TRIAL

OCS OBJECTIVES

'' OFFICE DESIGN....SHOULD
BE INFORMED BY AN UNDERSTANDING
& APPRECIATION OF THE NATURE OF
OFFICE WORK.'' (HAMMER & CO., 1980)

COMPLEMENTARY TECHNOLOGIES

o INFORMATION PROCESSING AND RETRIEVAL

• ENHANCED OFFICE COMMUNICATIONS

INFORMATION PROCESSING

- . HIGH VOLUME OF TRANSACTIONS
- STRUCTURED IN FLOW AND IN CONTENT
- TAILORED TO SPECIFIC ORGANISATIONAL REQUIREMENTS
- FOCUS ON INFORMATION TO DRIVE DESIGN OF TECHNOLOGY

ENHANCED OFFICE COMMUNICATIONS

• GENERIC OFFICE SYSTEMS

 FOCUS ON BEHAVIOUR TO DRIVE DESIGN OF TECHNOLOGY

FOCUS ON USER BEHAVIOUR

- TYPICAL OFFICE WORKERS SPEND 50% OF DAY IN COMMUNICATIONS
- MANAGERS AND PROFESSIONALS SPEND 65% TO 95% OF DAY IN COMMUNICATIONS
- MANAGERS AND PROFESSIONALS REPRESENT 60% to 70% of OFFICE LABOUR COSTS

OCS FEATURES

- ENHANCED TELEPHONY
- FILING
- ELECTRONIC MESSAGING
- SHARED VOICE AND DATA
 CONFERENCING
- FORMS

REPORT PRODUCTION

 ACCESS TO DATABASE AND DATA PROCESSING

PERSONAL ADMINISTRAT-

ION SUPPORTS

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WHY USER NEEDS ANALYSIS?

- DESIGN PRODUCTS
- IDENTIFY OPPORTUNITIES
- EVALUATE
- IMPLEMENT

IDENTIFY OPPORTUNITIES

MAP OCS INTO ORGANISATION

• SELECT TEST SITES

EVALUATION

-

• OPERATIONAL BENEFITS

 CHANGES IN USER BEHAVIOUR AND ATTITUDE





IMPLEMENTATION

- USER ACCEPTANCE
- TRAINING
- USER SUPPORT SYSTEMS

CRITICAL AREAS OF USER NEEDS APPLICATION TO PROVIDE

- DESIGN
- OPPORTUNITIES

EVALUATION

• IMPLEMENTATION

ASSESSMENT OF ORGANISATIONAL BENEFITS

 BEHAVIOURAL NEEDS OF END-USER

CASE STUDY

USER NEEDS ANALYSIS FOR THE BNR-OCS FIELD TRIAL

- IMPLEMENTATION PLAN
- TARGET ORGANISATION
- USER NEEDS METHODS
- RESULTS AND RECOMMENDATIONS

EXCISE BRANCH

- TORONTO REGIONAL HEADQUARTERS
 - 340 STAFF
 - FOUR LOCATIONS
- OTTAWA HEADQUARTERS
 - 170 STAFF
 - . TWO LOCATIONS

IMPLEMENTATION PLAN

- BASIC SERVICES
 - 100 PEOPLE
- ADVANCED SERVICES
 - SAME TEST SAMPLE
- LARGE-SCALE IMPLEMENTATION
 - UP TO 2000 PEOPLE

ACHIEVEMENTS

- GENERAL OPPORTUNITIES IN EXCISE
- TEST SAMPLE FOR BASIC AND ADVANCED SERVICES
- OPPORTUNITIES FOR OCS EXPANSION IN EXCISE
- EVALUATION PROCEDURES
- IMPLEMENTATION ISSUES

GENERIC METHODS

- ORGANISATION SCAN INTERVIEWS
- GROUP INTERVIEWS
- QUESTIONNAIRES
ORGANISATION SCAN INTERVIEWS

- 35 MANAGERS
- CONTEXT
 - OBJECTIVES
 - PRODUCTIVITY
 - MEASUREMENT

GROUP INTERVIEWS

• 66 STAFF

-

PERCEIVED NEEDS

• SPECIFIC EXCISE BRANCH APPLICATIONS

QUESTIONNAIRES

ALL STAFF

HIGH RETURN RATE

USER NEEDS METHODS

• WORK ACTIVITIES

• COMMUNICATION NETWORKS

.

• PERCEIVED NEED FOR OCS

• ATTITUDE AND ACCEPTANCE

WORK ACTIVITIES

- OVERALL OCS OPPORTUNITIES
 IN EXCISE
- TEST GROUP SELECTION



WORK ACTIVITIES	EXCISE		BREWER	HORNE	BOOZ- ALLEN
IN-PERSON COMMUNICATIONS	51		51	65	49
READING AND WRITING	25	1	26	24	33
TELECOMMUNICATIONS	13		6	9	11
OTHER ACTIVITIES	11		17	2	7

COMPARISON WITH PUBLISHED FINDINGS (% TIME)

WORK ACTIVITIES AND TEST GROUP SELECTION

CRITICAL FUNCTIONALITY

- EXPECTED DEGREE OF SYSTEM USE
- SUBSTITUTION POTENTIALS
 - IN-PERSON COMMUNICATIONS
 - TELECOMMUNICATIONS
 - WRITTEN PAPER-BASED COMMUNICATIONS
- BALANCED NEEDS FOR VARIOUS ASPECTS OF OCS

RANKED PRIORITY OF GROUPS

RANK	GREATEST NEEDS
GROUP A	MESSAGING, TELEPHONY, FILING, REPORT PRODUCTION, CONFERENCING
MANAGERS	MESSAGING, TELEPHONY, CONFERENCING, FILING, FORMS, CALENDARS
GROUP D	TELEPHONY, REPORT PRODUCTION, CONFERENCING, MESSAGING
SUPERVISORS	MESSAGING, CONFERENCING, TELEPHONY, FORMS
GROUP H	TELEPHONY, DATA ACCESS

COMMUNICATION NETWORKS

- VOLUME OF COMMUNICATION
- TEST GROUP SELECTION
 - O INTER-CITY LINKS
 - o INTRA-CITY LINKS

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Excise Study - Inter Unit Communication - Phone



Excise Study-Inter Unit Communication-Face to Face



Excise Study-Inter Unit Communication-Memo

PERCEIVED NEEDS AND ATTITUDES

- SPECIFIC APPLICATIONS FOR OCS
- EXPECTED DEGREE OF ACCEPTANCE

SPECIFIC APPLICATIONS FOR OCS

- ON-LINE DOCUMENT PREPARATION, REVIEW, AND DISTRIBUTION
 - WITHIN LOCATIONS
 - BETWEEN LOCATIONS
- REPORT AND LETTER PRODUCTION
 - FASTER TURN AROUND
 - ON-LINE CHANGES
- MULTI-PARTY CONSULTATION ON LETTERS
- PERSONAL FILING OF ROUGH DRAFTS
- ACCESS TO DATABASE
- INDICATION OF CALLS WAITING
- DIRECTORY CALLING TO FREQUENT NUMBERS
- MESSAGING TO FIELD STAFF
- STAFF PLANNING
- APPOINTMENT AND DEADLINE REMINDERS

MEASURES

- WORK ACTIVITIES
- COMMUNICATION NETWORKS
- PERCEIVED NEED
- ATTITUDE AND ACCEPTANCE

CONCEPTS

- CRITICAL MASS
- CRITICAL FUNCTIONALITY
- HIGH NEED
- POSITIVE ATTITUDES

USER NEEDS ANALYSIS OUTCOMES

• FOCUS ON SPECIFIC GROUPS AND INDIVIDUALS FOR BASIC SERVICES

- FED INTO DECISIONS ON MOST APPROPRIATE OCS BASIC SERVICES
- SPECIFIC EXCISE BRANCH APPLIC-ATIONS
- PROVISION OCS TERMINALS AND SERVICES TO INDIVIDUALS

OTHER OUTCOMES OF USER NEEDS

- EXPANSION POSSIBILITIES FOR OCS IN EXCISE
- OTHER OPPORTUNITIES COMPLEMENTARY TO OCS
- PRELIMINARY DEFINITION OF MEASURE-MENT AND EVALUATION CRITERIA
- ISSUES IN IMPLEMENTATION AND USER ACCEPTANCE

NEXT STEPS IN FIELD TRIAL

- MEASUREMENT
- IMPLEMENTATION

MEASUREMENT AND EVALUATION

- MEASUREMENT FOR
 - COST/BENEFIT ANALYSIS
 - DESIGN MODIFICATIONS
- AREAS OF MEASUREMENT
 - SYSTEM USAGE
 - USER BEHAVIOUR
 - ATTITUDE
 - MEASURES SPECIFIC TO
 EXCISE ''PRODUCTS''
- MEASUREMENT TECHNIQUES
 - TIME-SERIES TRACKING
 - PARTICIPANTS ACT AS OWN CONTROL GROUPS
 - MEASURES BEGIN WELL BEFORE BASIC SERVICES IMPLEMENTATION

IMPLEMENTATION

"A SIGNIFICANTLY LARGE PORTION OF COM-PLETED SYSTEMS DEVELOPMENT - ALMOST 40% -RESULT IN LESS THAN FULL SATISFACTION OF THEIR USERS."

"OF THESE SYSTEMS HAVING UNHAPPY USERS, THE DISSATISFACTION IN OVER 80% OF THEM STEMS FROM REASONS OTHER THAN FUNCTIONAL CAPABILITY."

DIEBOLD AUTOMATED OFFICE PROGRAM



WHY THE DISSATISFACTION AND USER REJECTION?

- PERSONAL & ORGANIZATIONAL CONCERNS
 - FEAR OF NEW TECHNOLOGY
 - FEAR OF LOOKING INCOM-PETENT WITH NEW SYSTEM
 - FEAR OF LOSS OF POWER
 WITH SHARED DATA BASES
 & FILES
 - NO PERCEIVED PERSONAL
 GAIN FROM NEW SYSTEM
 - RESISTANCE TO "OUTSIDERS" SAYING HOW JOB SHOULD BE DONE
- SOCIAL & ECONOMIC IMPACTS
 - JOB SECURITY & UNEMPLOY-MENT
 - LOSS OF PRIVACY
 - LOSS OF CONTROL

USER ACCEPTANCE

- WORK DESIGN AND QWL
- JOB ATTITUDES
- ATTITUDES TO TECHNOLOGY

PRODUCTIVITY AND INFORMATION: HIGH EXPECTATIONS

90%: REDUCE TIME SPENT ON MENIAL CHORES96%: INFORMATION MORE AVAILABLE90%: IMPROVE PRODUCTIVITY

WORK PROCESS: EXPECTED IMPACTS

57%: MORE OPPORTUNITY FOR PERSONAL ACHIEVEMENT
76%: GREATER ACCESSABILITY TO PEOPLE
47%: GREATER CREATIVITY
50%: RAISE JOB SATISFACTION
67%: BETTER MANAGEMENT DECISIONS

PERSONAL, SOCIAL, AND ECOMOMIC IMPACTS

.....

62%: THREATEN PERSONAL PRIVACY
40%: LIFE MORE COMPLICATED
48%: INCREASE UNEMPLOYMENT
30%: WORSEN EMPLOYEE HEALTH

USER NEEDS ANALYSIS: BNR-OCS FIELD TRIAL

- GUIDE DESIGN OF TECHNOLOGY
- IDENTIFY OPPORTUNITIES IN ORGAN-ISATION
- DEVELOP EVALUATION AND MEASURE-MENT TOOLS
- IDENTIFY AND ACT ON ISSUES IN IMPLEMENTATION

"IF ONLY IT WEREN'T FOR THE PEOPLE, THE GODDAMMED PEOPLE," SAID FINNERTY, "ALWAYS GETTING TANGLED UP IN THE MACHINERY. IF IT WEREN'T FOR THEM, EARTH WOULD BE AN ENGINEER'S PARADISE."

FROM PLAYER PIANO BY KURT VONNEGUT, JR.

ENVIRONMENTAL ISSUES IN PLANNING

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THE OFFICE COMMUNICATION SYSTEM

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OVERVIEW

9.

ENVIRONMENTAL SCALE

IMPACT OF OCS ON THE ENVIRONMENT

ISSUES, PROBLEMS AND SOLUTIONS

PROBLEM SOURCES

TOWARD PRIMARY PREVENTION OF PROBLEMS

ENVIRONMENTAL SCALE

MICRO ENVIRONMENT - INDIVIDUAL DESK - OFFICE AREA

- MEZO ENVIRONMENT GENERAL OFFICE
 - THE BUILDING
 - COMMUNITY OF BUILDINGS
 - INTRA CITY LOCATIONS

MACRO ENVIRONMENT - INTER CITY OFFICES - NATION WIDE

- INTERNATIONAL

IMPACT OF OCS ON THE ENVIRONMENT

FROM MANY PHYSICAL ENVIRONMENTS TO ONE COMMUNICATION ENVIRONMENT

MICRO	
MEZO	ocs
MACRO	

FLEXIBILITY, EFFICIENCY

IMPACT OF OCS ON THE EVIRONMENT

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MACRO - CONSIDERABLY LESS TRAVEL

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- DIVERSIFIED INTRA-URBAN OFFICE LOCATIONS

IMPACT OF OCS ON THE ENVIRONMENT

MEZO - LESS INTRA-BUILDING TRAVEL

- MORE EFFICIENT USE OF BUILDING/FLOOR SPACE
- MORE FLEXIBLE EXPANSION/CONTRACTION

IMPACT OF OCS ON THE ENVIRONMENT

MICRO - GREATER DESIGN FLEXIBILITY

- FEWER RESTRICTIONS ON DESK TO DESK PROXIMITY

- REDUCES AMBIENT NOISE LEVEL

- REDUCES OFFICE TRAFFIC

- ----

- MORE EFFICIENT USE OF OFFICE SPACE
IMPACT OF OCS ON THE ENVIRONMENT

SUMMARY - FEWER ENVIRONMENTS

- FOCUS ON MICRO ENVIRONMENT

- FOCUS ON INDIVIDUAL

- FLEXIBILITY

- EFFICIENCY

ISSUES, PROBLEMS AND SOLUCTIONS TO VDU PROBLEMS

THE ISSUES	THE ''PROBLEMS''	SOLUTIONS
RADIATION	PREGNANCY CONCERNS LONG TERM HEALTH WORRIES FEAR OF CATARACTS	RESEARCH
GLARE	DISCOMFORT GLARE DISABILITY GLARE	ENVIRONMENTAL TREATMENT
WORKSTATION DESIGN	ACHES AND PAINS	INTERFACE ERGONOMICS

ISSUES, PROBLEMS AND SOLUCTIONS TO VDU PROBLEMS

THE ISSUES	THE ''PROBLEMS''	SOLUTIONS
RADIATION	PREGNANCY CONCERNS LONG TERM HEALTH WORRIES FEAR OF CATARACTS	RESEARCH
GLARE	DISCOMFORT GLARE DISABILITY GLARE	ENVIRONMENTAL TREATMENT
WORKSTATION DESIGN	ACHES AND PAINS	INTERFACE ERGONOMICS

ERGONOMICS

MULTIDISCIPLINARY STUDY: ANTHROPOMETRICS ENGINEERING BEHAVIOURAL SCIENCES

HARDWARE ERGONOMICS FITTING THE MACHINE TO THE USER EFFICIENCY OF USER/MACHINE INTERACTION

SOFTWARE ERGONOMICS USER FRIENDLY TECHNOLOGY TO MEET THE HUMAN SPIRIT

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SOURCES OF PROBLEMS

TECHNOLOGY IS NOT THE ONLY SOURCE OF PROBLEMS

SOURCES OF PROBLEMS

- MASS MEDIA
- USER KNOWLEDGE
- USER/MACHINE INTERFACE
- TASK TYPE
- USER PERFORMANCE PREDISPOSITION
- ENVIRONMENTAL CONDITIONS



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By Graham Hughes Armed with a mountain of stu-Citizen staff writer dy results, a spokesman for Canada's multi-billion-dollar office equipment industry told a federal task force video display terminals pose no radiation risks to users.

Conrad Maheux told a Montreal session of the task force on micro-electronics and employment that while further study is needed on the human factors in the use of VDTs, all studies to

date have found no radiation risk to the ever-increasing number of Maheux, chairman of the workers using VDTs. standards committee of the 76member Canadian Business

Little risk seen in VDTs The algebra of trade.

WASHINGTON

Ward and the the the

hesting the fort and

Dun renter

Video terminals no peril, says makers' spokesman tions, "in fact, beyond five centimetres from any point on the terminal, the needle of the measurement gauge simply doesn't

ONTARIO

VDTs safe,

report states

TORONTO (CP)

Video.display (Cr) are no more terminals Dan black and white teles are ave a semantials

Allan Diaca and Mine Mark Nision Sets Savs a mine Mark And Canadian a report in Assantasian Kannal (California)

his

his "However, each individual most working distance individual signed biocals or reading the terminal know sult in the asses inch (adding Blasser and as body posture as they adopting fitted distance sult in the sit before at unnature body posture as they sit before the displat.

Sult in the operators adopting an unadural thus resulting in severe muscular fatigue.

"However, each individual must know to the terminal as

Association Lournal

Association Journal Strector of the cournel Streeteral health department Carry no radiation heatand Lectourneau said bis

The formation the second secon

MD says video displavinits are not a radiation problem

Renections on the Blare can be on the changing the corrected by: so and the light from of the screen and windows from of the screen matter to and the applied of wis screen matter

SCIENTIFIC CONSENSUS isplas: terminals CONSENSUS says an occupational to CONSENSUS Chher oroblems (VDTS) do that video ther oroblems to those using the such as eve sumniams

esteroau Dr. Stopps is acting director of the occu: ational and environmental health unit at Dr. Stopps is acting director of the occu. the Linixersitiv of Joronto.

the Conversity of Joronto At none of the scientific ports he's seen, has anyone ever measured

attended: and in hone of the research research reading frequency: emissiony that Ports he's seen, has anyone exceed existing frequency: ever measured machines have been deliberately lam.

the University of Toronto.

exceed existing standards, he said when the study of the

But other problem

burning, dr. ing double. Deck;

While denying there is any ramove," he said. diation danger, Maheux conceded

further research is needed to increase the comfort and convenience of those using VDTs. Research has already resulted

in the production of VDTs with features such as anti-glare and tiltable screens, contrast control and detachable keyboards, all designed to improve operator com-

2410

The five-member task force fort, he said. created by Labor Canada is investigating the growth of microelectronics in industries under the jurisdiction of the Canada Labor Code, ways of dealing with techpological change in the code and tions of the technological s on the workforce, partiumong women who ar to be disproportional the changes. says an occupational health expert other problems. Such as ever james Stopps can arise how symptoms sesterday. as on radiation at Mic.Madical

Continues

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marine

SOURCES OF PROBLEMS

USER/MACHINE INTERFACE - POOR ERGONOMICS

- INAPPROPRIATE IMPLEMENTATION

TASK TYPE - SINGLE FUNCTION TASK

MISMATCH BETWEEN TASK AND MACHINES

- MULTIFUNCTION TASK

SOURCES OF PROBLEMS

USER PERFORMANCE PREDISPOSITION

ENVIRONMENTAL CONDITIONS

- PER
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- - •

- WORK SATISFACTION
- JOB MOTIVATION
- INAPPROPRIATE WORK PLACE
 - APPROPRIATE WORK PLACE

ENVIRONMENTAL CONDITIONS AGGRAVATE PERFORMANCE PREDISPOSITIONS

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INTERACTION OF PERFORMANCE PREDISPOSITION

AND

ENVIRONMENTAL CONDITIONS ON USER COMPLAINTS

	ENVIRONMENTAL CONDITIONS		
PERFORMANCE PREDISPOSITIONS	INAPPROPRIATE	APPROPRIATE	
LOW MOTIVATION LOW SATISFACTION	HIGHEST	MODERATE	
HIGH MOTIVATION HIGH SATISFACTION	MODERATE	LOWEST	

ENVIRONMENT IS NECESSARY BUT NOT SUFFICIENT CONDITION

PREDICTING PROBLEMS IN OCS

FACTORS: INTERFACE DESIGN TASK TYPE USER PERFORMANCE PREDISPOSITION ENVIRONMENTAL CONDITIONS USER KNOWLEDGE

PREDICTING PROBLEMS IN OCS

KNOWLEDGE BASE

FACTORS: INTERFACE DESIGN BASED ON USER NEEDS

TASK TYPE MULTIFUNCTIONAL

USER PERFORMANCE	HIGH MOTIVATION
PREDISPOSITION	HIGH SATISFACTION
ENVIRONMENTAL	STANDARD OFFICE
CONDITIONS	(PAPER BASED)

USER KNOWLEDGE USUAL CONCERNS

INTERACTION OF PERFORMANCE PREDISPOSITION

AND

ENVIRONMENTAL CONDITIONS ON USER COMPLAINTS

	ENVIRONMENTAL CONDITIONS	
PERFORMANCE PREDISPOSITIONS	INAPPROPRIATE	APPROPRIATE
LOW MOTIVATION LOW SATISFACTION	HIGHEST	MODERATE
HIGH MOTIVATION HIGH SATISFACTION	MODERATE	LOWEST

ENVIRONMENT IS NECESSARY BUT NOT SUFFICIENT CONDITION

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PRIMARY PREVENTION OF PROBLEMS

ENVIRONMENTAL CONDITIONS - TREAT ENVIRONMENT

USER KNOWLEDGE -

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- USER EDUCATION

PRIMARY PREVENTION OF PROBLEMS

ENVIRONMENTAL CONDITIONS

MICRO - WORKSTATION - CHAIRS

MEZO - ILLUMINATION - LAYOUT

MACRO - VENDOR CONCERN

PRIMARY PREVENTION OF PROBLEMS

USER KNOWLEDGE

· · · ·

- EDUCATION

- EXPLAIN ISSUES
- ''HOW TO'' AVOID PROBLEMS

- FOCUS ON INDIVIDUAL RESOURCES

LIMITATIONS TO AN "ENVIRONMENTAL FIX"

GOOD R & D PRODUCES BETTER TECHNOLOGY GOOD ERGONOMICS PRODUCES BETTER INTERFACE DESIGN GOOD ENVIRONMENTS MAKE BETTER WORK PLACES

THE ENVIRONMENT CANNOT SOLVE ALL PROBLEMS

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ENVIRONMENTAL ISSUES IN PLANNING

THE

OFFICE COMMUNICATION SYSTEM

SUMMARY

ENVIRONMENTAL SCALE

ISSUES, PROBLEMS AND SOLUTIONS

SOURCE OF PROBLEMS

MICRO, MEZO, MACRO

FOCUS ON MICRO/INDIVIDUAL

RESEARCH, ENVIRONMENT, ERGONOMICS

MEDIA, USER KNOWLEDGE INTERFACE DESIGN, TASK TYPE PERFORMANCE PREDISPOSITION, ENVIRONMENT

PRIMARY PREVENTION

ENVIRONMENTAL TREATMENT USER EDUCATION OPSP

8/12/82

DETERMINING COST

BENEFITS OF IOS

James H. Bair Manager Office Systems Research

Bell Northern Research Mountain View, California

USA

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BNR



OSR



Mountain View

opsp

o OSR 🛲

LEVELS OF PRODUCTIVITY CHANGE:

ELEMENTS OF COST BENEFIT DETERMINATION FOR IOS



= OPSP			OSR =
			•
		COSTS	
MACHINE	Man-Machine	work unit	organization
Cost: (Purchase	Cost - Added Labor	Cost + Added Labor	Cost +
or Lease)	Added Labor =	Added Labor =	Added Labor =
,	+ transition	$+ \cos t$ of	+ management
	+ training	change	+ administration
	+ machine operating	+ start up	
	overhead	inefficiencies	
	+ errors	+ office redesign	
		-+ duplicate system	,

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BNR () Mountain View opsp

BENEFITS

Increased Output +

+ Faster results

WORK UNIT

MAN-MACHINE

Reduced Labor +

Faster Throughput ==

+ increased capability
+ increased control
+ fewer delays

* Acceleration Control NA

PERFORMANCE

CREATIVITY

Increased Responsiveness =

ORGANIZATION

Reduced Costs +

OSR

Increased Revenues *

(Enhanced profitability)

Timing e.g. reduced cost of inventory, competitive response to orders, product & pricing strategies.



Mountain View

opsp

DETERMINATION OF COST BENEFITS

ORGANIZATION LEVEL

Profitability = Revenues - Costs

Revenues

Profits
Costs

BNR



OSR

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ORGANIZATION COST (cont'd)

Return

opsp

Investments

Profits Overhead Marketing Direct Costs* Purchases

Controllable

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Limited Control

Not controlled by Org. Information Value Added

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Goods Value Added

OSR =

* Labor heavily capitalized



OPSP

CONTROLLABLE ORGANIZATIONAL COSTS (cont'd)



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Mountain View

OSR

OPSP

PRODUCTIVITY IMPROVEMENT =

Reducing overhead = per capita reduction } efficiency I

Increasing sales = sales per capita increase } effectiveness Π

G

OSR

BN Mountain View



TWO ALTERNATIVES REQUIRE DIFFERENT APPROACHES:

REDUCING OVERHEAD

gizgo

- o Output does not need to be defined
- o Output assumed necessary
- o Input = human resource measurable as labor
- o Measurable at work-unit and individual levels

- **INCREASING SALES**
- o Output = sales (return)

OSR.

- Output not specific enough for cause —> effect (probabalistic)
- o Input = human performance measurable only as cost
- o Measurable at organizational level in dollars

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IMPACT OF PRODUCTIVITY CHANGE ORGANIZATION LEVEL

- Higher contact value strategic & logistic
- o Faster response
- o Better sales information

Improved Work Unit Productivity

OPSE

o Better information for decisions

- o More contacts
- o Faster control (communication)



Increased Sales/

Revenues

OSR

IDENTIFYING POTENTIAL PRODUCTIVITY CHANGES: ALL LEVELS OF AN ORGANIZATION MUST BE CONSIDERED

opsp

	HERARCHY	Example		N. Contraction of the second sec
	Mission	Banking		•
Reportable	Purpose & Goals	Financial service	&	products with profit
	Functions	Financial Planning	&	Analysis
Observable	Processes	Communication		Modeling
	Activities	meeting telephoning		spreadsheet
	Actions	scheduling relocating callin	ē	calculations



OSR

OPSP

TRANSLATING IMPROVEMENTS INTO COST BENEFITS



Competitive position Increased Revenues

Revenue functions expand (marketing) Maintenance functions contract (purchasing) Time released for effectiveness

Shift effort from *maintenance* to *results* (e.g., communication & info gathering to analysis & decision-making)

Reduce lower value activities, substitute more efficient activities

Reduce time, number & wasted actions



OSR



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SOURCE OF COST BENEFITS: I TIME SAVINGS

OSR

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Shadow Functions = wasted time (e.g., 30 min/day)

o Incompleted phone calls

o Queueing at the copier or other equipment

o Relocating to meetings (traffic, etc.)

o Searching for information (phone number

Media Transformations = avoidable time (e.g., 60 min/day)

o Dictation to typewriter

o Computer output to standard copy

o Paper to computer form

o Mailing

Jbdl

o Computer to computer

COST BENEFITS I.TIME SAVINGS (cont'd)

Reduction in tasks per job

o Retyping

OPSP

- o Copying
- o Refiling
- o Scheduling

Reduction in tasks per "procedure"

- o Tickler
- o Distribution
- o Form to data base check



OSR
OPSP

SOURCE OF COST BENEFITS

IL Meets User Needs

Using IOS for Messaging

User Needs (691 persons)

OSR

- 1 Does not require ______ reduce interruptions real-time contact
- 2 Does not require ______ reduce phone call nonclosures scheduling/interrupting
- 3 Does not require _____ relocation and/or travel
- 4 Minimizes time required for non-task oriented communication
- 5 Minimizes social dynamics, that disrupt, extend, or confuse
- 6 Efficient for administrative or routine communication

increase flexibility of contact

reduce unnecessary contacts

reduce delays in written communication

reduce travel

reduce misunderstandings



OSR

SIMILAR TO PAPER, TELEX, & FAX

OPSP

Permanent storable record

Efficient reading

Can be copied to many

Continuously serves as resource/reference

Can clarify understanding

Portable

Can be used for notes, edits, etc.

ADDITIONAL ADVANTAGES:

Minimal delays in communication

Easy for communicator to prepare and send himself

Digitally stored for space saving

Computer power for search and retrieval

Immediate feedback if desired





OFFICE COMMUNICATIONS SYSTEMS

82 11

TECHNOLOGY, PRODUCTS, AND PLANNING

AGENDA

PERSONAL COMPUTERS:

- INTRODUCTION
- A LOOK INSIDE A PERSONAL COMPUTER
- MAJOR APPLICATION AREAS FOR PERSONAL COMPUTERS
- NEXT GENERATION AND FUTURE PERSONAL COMPUTERS

LOCAL AREA NETWORKS:

- INTRODUCTION
- POPULAR NETWORK TOPOLOGIES
- METHODS OF DATA TRANSMISSION
- NETWORK PRODUCTS
- KEY ISSUES IN SELECTING A LOCAL NETWORK

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PERSONAL COMPUTER TECHNOLOGY

WHAT IS A PERSONAL COMPUTER?

- A DEVICE THAT PROVIDES STAND-ALONE PROCESSING, STORAGE, AND INPUT/OUTPUT IN A COMPACT DESK-TOP OR SMALLER PACKAGE
- PRIMARILY DESIGNED FOR SINGLE USER SYSTEMS
- DIFFER FROM HOME COMPUTERS IN THAT EVEN THE BASIC MODELS SUPPORT A WIDE SELECTION OF COMMERCIAL, SCEINTIFIC, AND OFFICE ORIENTED SOFTWARE
- MAY BE PORTABLE, BUT DO NOT SACRIFICE SIGNIFICANT FUNCTIONALITY FOR PORTABILITY

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PERSONAL COMPUTER TECHNOLOGY

FOUR MAIN FUNCTIONAL COMPONENTS:

- 1) PROCESSOR WITH SIGNIFICANT MEMORY
 - 64K BYTES STANDARD CONFIGURATION
 - USUALLY EXPANDABLE TO 256K MAXIMUM MEMORY
 - VARIETY OF 8 AND 16 BIT PROCESSORS IN USE, EXAMPLE:

8 BIT

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16 BIT

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IAPX88	- IBM PC DYNALOGIC	IAPX86	CONVERGENT TECH-
	40		NOLOGIES, WANG
			PERSONAL COMPUTER,
			NEC ADVANCED
			LPERSONAL COMPUTER
6502	- APPLE II AND III	68000	STRS80 MODEL 16
			LFORTUNE 32:16
Z8 0	TRS80		
	OSBORNE		
	L ZX81		
			PNP

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PERSONAL COMPUTER TECHNOLOGY CONTINUED

2) MULTI-LINE DISPLAY

- USUALLY 24 LINES X 80 COLUMNS
- OPTIONAL GRAPHICS AND COLOUR CAPABILITY

APPLE III IBM PC TRS80 II ALL SUPPORT 24 LINES X 80 COL. DISPLAYS ALSO SUPPORT GRAPHICS

- 3) INTEGRAL STORAGE DEVICES
 - 5%" FLOPPY DISKETTE IS THE PREFERRED STORAGE MEDIUM.
 - FORMATTED CAPACITIES 80K BYTES TO 500K BYTES
 - 320K AND 160K ARE STANDARD SIZES
 - 8" FLOPPIES WITH 1 MBYTE STANDARD FORMAT ARE REGAINING POPULARITY

4) ALPHANUMERIC KEYBOARD





SOFTWARE STRUCTURE OF A PERSONAL COMPUTER



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MAJOR APPLICATION AREAS FOR PERSONAL COMPUTERS

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HOME USE:

- HOME & PERSONAL FINANCIAL PLANNING
- VIDEO GAMES
- EDUCATION
 - COMPUTER SCIENCE
 - LANGUAGES
 - MATH SKILLS
 - SPELLING
- SECUPITY & ENERGY MANAGEMENT*
- REMOTE DATABASE ACCESS

PROFESSIONAL/EUSINESS USE:

- WORD PROCESSING
- ELECTRONIC MAIL
- DECISION SUPPORT
- FINANCIAL PLANNING
- EDUCATION & TRAINING
- PROJECT PLANNING
- INVENTORY CONTROL
- DENOTES NEW APPLICATIONS AREAS

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MAJOR APPLICATION AREAS FOR PERSONAL COMPUTERS CONTINUED

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- BUSINESS GRAPHICS
- SLIDE PRESENTATION*
- FINANCIAL ACCOUNTING
- DATABASE APPLICATIONS
- INTEGRATED OFFICE COMMUNICATIONS SYSTEMS*
- COMPUTER AIDED DESIGN

DENOTES NEW APPLICATIONS AREAS

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Microcomputer developments in the 1980s will refect economic competitive and recinic ogical pressures according to Granve Site gre International a San Jose, Calif, market research firm, CS is recent study identified a U.S. market potential for under \$15,000 microcomputer in excess of 25 million units, and predicted that between 1981 and 1985, microcomputer performance levels will guadruple. Over the samperiod, prices will fall 20 percent per year.

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MINI MICRO SYSTEMS AUgust 1982

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THE FACTOR INC.

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MIN MICRO SYSTEMS AUguer 1982

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MARKET DISTRIBUTION FOR LEADING MICROCOMPUTER VENDORS



Microcomputer market shares for the large business market segment will refeat the growing involvement of corporate DF managers in the microlacouls for process. International Resource Development a forwalk Conninesearch firm recently found that BC percent of the DF managers if surveyed expected to develop section orders and buying policies for their companies personal computer purchases. The DF managers preference for direct sales organizations families and quantity discounts should please established verdors such as BMIDEC and Xerck, but may threaten independent computer dealers and refailers.

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GRAPH SHOWING GROWTH IN LOW END COMPUTER MARKET



Shift in computer market from 1980 to 1981 favored row-end microcomputers selling for less than \$15 DW. The \$15 DWC to \$20 DWC range in which minipumputers compete with multi-user micros experienced the least growth

MIN MICRO SYSTEMS ALOUS ISET

Contraction of the local division of the loc

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NEXT GENERATION PERSONAL COMPUTERS

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- MIGRATION FROM 8 TO 16 BIT ARCHITECTURES
- GREATER PERFORMANCE AND MEMORY PER UNIT PRICE
- MORE DETAILED MONOCHROME & COLOUR GRAPHICS
- WIDER SOFTWARE BASE
- MOVE TOWARDS INTEGRATED SCFTWARE APPLICATIONS
- LOCAL AREA NETWORK SUPPORT
- FILE SERVER SUPPORT
- VENDOR TREND TOWARD SERVING MARKET NICHES:
 - PORTABLE
 - HIGH PERFORMANCE
 - LOW COST
 - ETC.

FUTURE TRENDS

- FULL 32 BIT CAPABILITY
- HIGH RESOLUTION BIT MAPPED GRAPHICS
- ADVANCED COMMUNICATION SUPPORT
- FULLY INTEGRATED SOFTWARE

bn. 565a 8011



LOCAL AREA NETWORKS

LANS

ROBERT HUDYMA

BELL-NORTHERN RESEARCH

TORONTO

WHAT IS A LOCAL AREA NETWORK?

- DATA COMMUNICATIONS SYSTEM
- SINGLE ORGANIZATION OWNER
- ALLOWS SIMILAR OR DISSIMILAR DEVICES TO TALK TO EACH OTHER OVER A COMMON TRANSMISSION MEDIUM

TYPICAL EQUIPMENT SUPPORTED:

COMPUTERS

MICROCOMPUTERS, MINICOMPUTERS, MAINFRAMES WORD PROCESSORS WORKSTATIONS: TELEPHONES, TERMINALS, ETC. PERIPHERALS: PRINTERS, DISK DRIVES, AND FILE SERVERS

GENERAL CHARACTERISTICS:

LIMITED GEOGRAPHIC DISTANCE

- CAN VARY FROM A FEW HUNDRED FEET TO SEVERAL MILES TYPICAL INSTALLATION

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- FLOOR
- SECTION OF BUILDING
- ENTIRE BUILDING

- CLUSTER OF BUILDINGS VARIED DATA CAPACITY (BANDWIDTH) 300BPS TO IN EXCESS OF 50MBPS

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ADVANTAGES OF LOCAL AREA NETWORK

- POTENTIAL FOR INCREASED RELIABILITY BY SUPPORTING REDUNDANCY
- GOOD VEHICLE FOR INCREMENTAL GROWTH
- REDUCED COSTS THROUGH RESOURCE SHARING
- FAST, EFFICIENT ACCESS TO MACHINE READABLE DATA
- POTENTIAL TO PROVIDE INTERFACE TO VARIETY OF VENDORS

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MAJOR APPLICATIONS & BENEFITS OF A LOCAL AREA NETWORK

BENEFITS

- LOW COST, HIGH PERFORMANCE COMMUNICATIONS MEDIUM
- BETTER COMPUTER ACCESSIBILITY AND AVAILABILITY
- HIGHER WORKER PRODUCTIVITY THROUGH BETTER ACCESS TO INFORMATION

MAJOR APPLICATION AREAS

OFFICE AUTOMATION

- DOCUMENT TRANSFER
- ELECTRONIC MAIL
- ACCESS TO REMOTE COMPUTING
- RESOURCE SHARING

RETAIL AND FINANCIAL SYSTEMS

- COMMUNICATIONS FOR POINT OF SALE TERMINALS

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- INVENTORY CONTROL

MANJFACTURING

- PLANT MONITORING AND CONTROL
- ENERGY MANAGEMENT
- FACTORY DATA COLLECTION
- MACHINE AND PROCESS CONTROL

OTHER APPLICATIONS

- PHOTOTYPESETTING
- CAD/CAM
- SCIENTIFIC LARCEATORY

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DEFINITIONS FOR LANS

NETWORK TOPOLOGY:

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TOPOLOGY:

THE SPATIAL PATTERN OR LAYOUT EMBODIED IN THE NETWORKS NODES LOCATIONS AND INTERCONNECTING LINKS.

MEDIA:

THE ACTUAL VEHICLE CHOSEN TO TRANSPORT DATA WITHIN THE NETWORK.

TYPICALLY ONE OF THE FOLLOWING:

- COPPER WIRES - TWISTED PAIR

- COAXIAL CABLE

- FIBRE OPTRICS

- ELECTROMAGNETIC RADIATION (RADIO AND LIGHTWAVES)

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POPULAR NETWORK TOPOLOGIES

BUS

- LENGTH OF OPEN-LOOP, PASSIVELY TERMINATED COAXIAL OR TWISTED PAIR CABLE
- USE TAPS TRANSCEIVERS TO CONNECT USER NODES TO THE BUS
- ACHIEVE NETWORK ACCESS THROUGH A COMMON MULTIPLE ACCESS LINK
- COMPETE FOR NETWORK RESOURCES ON A FIRST COME, FIRST SERVED BASIS

TREE

- VARIATION OF BUS TOPOLOGY THAT PERMITS SPLITS TO BE MADE IN THE BUS

RING

- CLOSED LOOP SYSTEM; NO ENDPOINTS
- NODES ARE CONNECTED TO THE CABLE VIA AN ACTIVE REPEATER
- MESSAGES TRAVEL IN ONE DIRECTION
- REPEATERS SELECT MESSAGES THAT IT OWNS, PASSES THE REST

STAR

- CENTRALIZED CONTROL THROUGH MESSAGE SWITCHING MECHANISM
- EVOLUTION FROM TRADITIONAL PBX VENDORS



CENTRAL SWITCH TOPOLOGY



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COMMON TECHNIQUES TO ACCESS NETWORK MEDIA

TWO GENERAL ACCESS TECHNIQUES:

CONTENTION

- STATISTICAL MULTIPLEXING
- CSMA/CD
- TOKEN PASSING

NON CONTENTION

- ASSIGN TIME SLOTS OR FREQUENCIES WHERE A BANDWIDTH IS PRE-ALLOCATED AND RESERVED

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NETWORK ACCESS TECHNIQUES DESCRIPTION

MULTIPLEXING:

- USED MAINLY FOR LONG HAUL PACKET SWITCHED NETWORKS
- QUEUE PACKETS AT EACH NODE IN THE NETWORK UNTIL OUTGOING CHANNEL IS FREE
- EACH NODE MUST PROVIDE SUFFICIENT BUFFERING AND BANDWIDTHS TO PREVENT LOSS OF DATA DURING PEAK DATA PERIODS
- USE FLOW CONTROL AND DYNAMIC ROUTING TO MANAGE THE DATA
- STRATEGY IS NOT EASILY ADAFTABLE TO LANS

CSMA/CD:

- CARRIER SENSE MULTIPLE ACCESS WITH COLLISION DETECT
- PIONEERED BY XERCX
- A PROPOSED STANDARD FOR IEEE802
- TWO BASIC RULES:
 - 1) DEFER TRANSMISSION UNTIL MEDIUM IS QUIET.
 - 2) WHEN TWO OR MORE STATIONS TRANSMIT SIMULTANEOUSLY, EVERYONE BACKS OFF AND TRIES TO RETRY AT DIFFERENT TIMES.
- GOOD TECHNIQUE FOR SHORT BURSTY TRAFFIC
- DELAYS DUE TO RETRANSMISSION CAN VARY SIGNIFICANTLY DEPENDING ON NETWORK LOADING
- NOT SUITED FOR APPLICATIONS THAT REQUIRE GUARANTEED DELIVERY IN A SPECIFIED TIME
- FOR TECHNIQUE TO WORK, PACKET SIZE MUST BE GREATER THAN ROUND TRIF TRANSIT TIME BNR

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NETWORK ACCESS TECHNIQUES DESCRIPTION CONTINUED

TOKEN PASSING:

- USUAL TECHNIQUE FOR RING TYPE NETWORKS; CAN BE APPLIED TO BUS NETWORKS TOO
- SPECIAL PACKET, CALLED A TOKEN IS CIRCULATED NODE TO NODE
- NODE THAT HOLDS THE TOKEN HAS NETWORK CONTROL
- APPROPRIATE METHOD TO CONTROL SUSTAINED TRAFFIC AND TRAFFIC WITH FREQUENT BURSTS
- NO RESTRICTION ON PACKET SIZE
- SLIGHT OVERHEAD IF NODE HAS NOTHING TO SEND
- DIFFICULTIES IN RECOVERY FROM FAILURES AND GETTING NETWORK STARTED
- ALSO PROPOSED AS IEEE301 STANDARD

TIME DIVISION MULTIPLE ACCESS TDMA (WITH RESERVATIONS):

- PRIMARY USE IN RADIO AND SATELLITE SYSTEMS
- DIVIDE THE UPLINK CHANNEL INTO FIXED SIZED SLOTS AND ORGANIZE INTO TIME FRAMES

(FRAME DURATION > ROUND TRIP PROPAGATION TIME)

- SLOTS MAY BE EITHER FREE OR RESERVED

FREE SLOTS

- CAN EITHER SEND ONE PACKET OF INFO OR
- REGUEST RESERVED SLOTS FOR STREAM OR * MULTI-PACKET MESSAGES
- EMPLOY A VARIETY OF TECHNIQUES TO DETECT COLLISIONS IN THREE-SLCT TRANSMISSIONS AND RESERVATION OF SLCTS

NETWORK ACCESS TECHNIQUES DESCRIPTION CONTINUED

- SATELLITE ALSO USES TDMA TO BROADCAST ON DOWN-LINK TOO
- NO_NEED FOR ORDERING OF SLOTS SINCE ALL STATIONS HEAR EVERYTHING AND IDENTIFY PACKETS BY DESTINATION CODES

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NETWORK PRODUCT EXAMPLES

BUS AND TREE NETWORKS

ETHERNET	BASEBAND	CSMA/CD
WANGNET	BROADBAND	FDM

RING NETWORKS

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PRIMEWET

TCKEN PASSING

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STAR NETWORKS

NORTHERN TELECOM	sll	PBX
MITEL	sx2000	PBX

NETWORK EXAMPLE

BUS TOPOLOGY BASEBAND COAXIAL LAN CSMA/CD

PRODUCT NAME: ETHERNET

DEVELOPER; XEROX PARC

- DESIGNED TO CONNECT COMPUTERS AND RELATED EQUIPMENT
- BASEBAND COAX CABLE
- 10 MEPS CABLE TRANSMISSION RATE
- ADOPTED BY DEC, INTEL, AND XEROX AS A STANDARD
- PROVIDES SUPPORT FOR XEROX STAR AND XERCX 860 INFORMATION PROCESSING SYSTEM

MAJOR ETHERNET COMPONENTS:

- ETHERNET 50 OHM COAXIAL CABLE
- ETHERNET TRASCEIVERS

MAJOR XEROX SYSTEM 8000 COMPONENTS:

- 8000 NETWORK SYSTEM PROCESSORS MODEL 8011 AND 8012

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- NETWORK FILE SERVER 10-50MB
- NETWORK PRINT SERVER

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· General

NETWORK EXAMPLE

TR	REE TOPOLOGY BROADBAND COAXIAL LAN
PR	RODUCT NAME: WANGNET
VE	NDOR: WANG LABORATORIES
-	SUPPORT FOR WANG AND NON-WANG EQUIPMENT
-	USES FREQUENCY DIVISION MULTIPLEXING (FDM) TO PROVIDE A NUMBER OF CHANNELS ON A SINGLE CABLE
-	CURRENT WANG PRODUCTS USE 40% OF THE AVAILABLE CAPACITY ALLOWING FOR CONSIDERABLE FUTURE GROWTH
-	DIVIDE THE FREQUENCY SFECTRUM FROM 10MHZ TO 350 MHZ INTO DIFFERENT AREAS SERVING DIFFERENT FUNCTIONS
-	UTILITY BAND
	- VIDEO AVAILABLE BY TUNING IN CHANNEL 7 TO 13 ON A REGULAR TV
-	INTERCONNECT BAND
	- FOR NON-WANG EQUIPMENT; INTENDED FOR RS232 OR 449

IT; INTENDED FOR RS232 OR 449 EQUIPMENT THROUGH THE USE OF RF MODEMS

- WANGBAND
 - FOR WANG CPU'S, DATA AND WORD PROCESSING EQUIPMENT

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WANG PRODUCTS ARE INTERFACED THROUGH A CABLE INTERFACE UNIT (CIU) WHICH OFERATES AT 12MBPS



Same Creek

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NETWORK EXAMPLE

RING TOPOLOGY COAXIAL CABLE TOKEN PASSING NETWORK ACCESS PRODUCT NAME: PRIMENET

DEVELOPER: PRIME COMPUTER

- CONFIGURE COAX INTO A RING
- TAP THE RING AT CONVENIENT POINTS WITH INTERFACE UNITS
- 8MEIT/SEC DATA RATE
- < 1 SEC TOTAL NETWORK ROUND TRIP DELAY
- SUFPORT FOR UF TO 15 PROCESSORS
- ACHIEVE NETWORK CONTROL WITH A CIRCULATING TOKEN
- NETWORK CONTAINS SINGLE TOKEN AND OBEYS THESE RULES:
 - A NODE MAY PLACE A MESSAGE ON THE NETWORK IF IT CURRENTLY HOLDS A TOKEN.
 - 2) ONLY THE NODE THAT PUT THE MESSAGE ON THE NETWORK MAY REMOVE IT.

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BASIC COMPONENTS

- PRIMENET NODE CONTROLLER (PNC)

PERIPHERAL BOARD FOR FRIME COMPUTER.

- JUNCTION BOX

CONNECTOR TO THE RINGNET CAPLE ALLOWS THE NODE TO BE SWITCHED IN OR OUT OF THE NETWORK.

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MAJOR PEX VENDORS

NORTHERN TELECOM

- SLI DIGITAL SWITCH 6000 LINE CAPACITY
- SL100 DIGITAL SWITCH 30,000 LINE CAPACITY

MITEL

- SX2000 SUPERSWITCH
- 150 TO 10,000 LINES
- ELECTRONIC MAIL, DIAPY, DIRECTORY
- PRODUCTS FOR HOME AND SMALL BUSINESS AS WELL

ROLM

- CENTRAL BRANCH EXCHANGES (CBX)
- 5 MODELS FROM 100 TO 4000 LINE CAPACITY
- PROVIDE AN ELECTRONIC MAIL FACILITY ON LARGER MODELS

INTECOM

- INTEGRATED BUSINESS EXCHANGE (IBX) SERIES 40
- 4000 LINE CAPACITY

IEM

- 3750, 1750 ANALOG PBX
- EUROPEAN MARKET ONLY

DATAPOINT

- INTEGRATED BUSINESS EXCHANGE (IBX)
- WORKS WITH ATTACHED RESOURCE COMPUTER (ARC) LOCAL NET

NETWORK EXAMPLE

STAR TOPOLOGY DIGITAL FCM TDM SWITCHED

PRODUCT NAME: SL1

ENDOR. NORTHERN TELECOM

- DIGITAL PEX SYSTEM

- FOUR MODELS AVAILABLE SERVING UP TO 6000 LINES

- FEATURES:

- BASIC AND ADVANCED TELEPHONY
- INTEGRATED VOICE AND DATA THROUGH ADD-ON DATA MODULE (ADM)
- ADM SUPPORTS RS232 LINK UP TO 9600 BAUD

: -: 5653 8211

A SELECTION OF SL-1 FEATURES

- CALL WAITING
- TOLL RESTRICTION
- DIRECT INWARD DIALLING
- CODE RESTRICTION
- REMOTE ADMINISTRATION & MAINTENANCE
- LINE LOCKOUT
- AUTODIAL
- CALL FORWARDING
- SPEED CALLING
- RING AGAIN
- EXECUTIVE OVERRIDE
- CALL PICKUP
- VOICE CALLING
- CONFERENCE



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TORONTO

OPEN WORLD

TODAY

-SL1 AND SL100 SUPPORT FOR VOICE AND DATA TERMINALS -DATA SUPPORT: 19.2KBPS ASYNC; 56KBPS SYNC. -Nominal licence fee for async interface specs. -Commitment to support IBM SNA, X.25 and other protocols -Commitment to support outside vendor equipment

1984

-OPEN WORLD FAMILY OF TERMINALS

-ENHANCEMENTS TO SL FAMILY TO SUPPORT E4KBPS

1985

-ENHANCED TWISTED PAIR BANDWIDTH -GATEWAY TO COMMERCIAL LANS

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LOCAL-AREA NETWORKS: SOME KEY ISSUES

- RECOGNIZE THE MARKET IS NOT YET MATURE STILL THREE TYPES OF VENDORS:

- COMPUTER SYSTEMS

- COMMUNICATION SYSTEMS

- COMPONENT VENDORS

- QUESTIONS FOR A POTENTIAL LAN USER:

- WHAT DEVICES WILL IT SUPPORT?
- WHAT FEATURES DOES IT SUPPORT, I.E., DIRECTORIES, SUPPORT FOR VIRTUAL CIRCUITS?
- WHAT NETWORK ADMINISTRATION TOOLS ARE PROVIDED FOR NETWORK MONITORING AND MAINTENANCE?
- WHAT PROGRAMMING TOOLS ARE PROVIDED THAT ALLOW SPECIALIZED PROTOCOLS OR CUSTOMIZED SERVICES?
- WHAT SUPPORT IS PROVIDED TO CAPTURE SYSTEM-PERFORMANCE STATISTICS SUCH AS: END-END THROUGHPUT AND AVERAGE MESSAGE DELIVERY TIME?
- WHAT MIGRATION PATHS ARE PROVIDED FOR FUTURE PRODUCTS?
- WHAT IS THE RELIABILITY OF THE PROPOSED CONFIGURATION?
- WHAT ARE THE HIDDEN COSTS IN CABLES, REAL ESTATE, AND POWER CONSUMPTION?

FUTURE OF LOCAL AREA NETWORKS

- INCREASED BANDWIDTH AT LOWER COST
- DEVELOPMENT OF STANDARD PROTOCOLS
- STRONG GROWTH BOTH FOR PBX AND CAELE VENDORS
- DEVELOPMENT OF FIBRE OPTICS TO REPLACE COPPER WIRE

TRUCK THE LOCAL TRUCK CARLES AND

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BNR OCS FIELD TRIAL

AGENDA

INTRODUCTION	- R. HUDYMA
OFFICE STUDY	- M. DALLAS
TECHNICAL DEVELOPMENT	- R. HUDYMA
LATER PHASES	- R. HUDYMA

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BNR TORONTO

OCS PROGRAM

EACKGROUND:

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- PROJECT FUNDED BY THE DEPARTMENT OF COMMUNICATIONS, CTTAWA

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- CNE OF SEVERAL FIELD TRIALS SPONSCRED BY THE DOC
- FIELD TRIAL IS WITH EXCISE BRANCH OF CUSTOMS & EXCISE

HARDWARE CONFIGURATION



TECHNICAL DEVELOPMENT

POTENTIAL BASIC SERVICES

ADVANCED TELEPHONY FEATURES 'ELECTRONIC MESSAGING (TEXT) ELECTRONIC FILING TEXT EDITING FORMS MANAGEMENT POINT TO POINT SHARED WORKSPACE HELP FEATURES PERSONAL SUPPORT TOOLS

REFERENCE MATERIAL ON LAN'S

1.	The Wired Office - Output - May 1981
2.	An Introduction to Local Networks - Telematics - May 1981
3.	The Many Faces of Local Networking - Data Communications - Dec. 1981
4.	Implementing Ethernet from Soup to Nuts-Data Communications - Dec. 1981
5.	Inside Wang's Local Net Architecture -Data Communications - Jan. 1982
6.	Ring Nets: Passing the Token - Data Communications - Dec. 1981
7.	Local Area Networks - Part 1 - Technology - EDN - Feb. 1982
8.	Local Network Access Trade offs - Computer Design - October 1981



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- F QUEEN HF 5548.2 .B5 1982
- P Office Communications System^{S'} M BNR/OCS information sharing T



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