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INTEGRATED SERVICES  
DIGITAL NETWORKS

STRATEGIC IMPLICATIONS  
FOR MANAGEMENT



Published by  
INPUT  
1280 Villa Street  
Mountain View, CA 94041-1194  
U.S.A.

**Information Systems Program (ISP)**

***Integrated Services Digital Networks  
Strategic Implications for Management***

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ISDN • 301 • 1988



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the 1990s, the number of people in the world who are undernourished has increased from 600 million to 800 million. The number of people who are malnourished has increased from 1.2 billion to 1.5 billion. The number of people who are obese has increased from 100 million to 300 million.

There are a number of reasons for this. One is that the world population has increased from 5 billion to 6 billion. Another is that the world population is becoming more urban. A third is that the world population is becoming more affluent. A fourth is that the world population is becoming more educated. A fifth is that the world population is becoming more mobile.

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## Introduction



the 1990s, the number of people in the UK who are aged 65 and over has increased from 10.5 million to 13.5 million, and the number of people aged 75 and over has increased from 4.5 million to 6.5 million (Office for National Statistics 2000).

There is a growing awareness of the need to address the needs of older people, and the need to ensure that the health care system is able to meet the needs of older people. The Department of Health (2000) has published a strategy for older people, which sets out the government's commitment to older people and the need to ensure that the health care system is able to meet the needs of older people.

The strategy for older people is based on the following principles: (1) older people should be able to live independently in their own homes; (2) older people should be able to participate in the community; (3) older people should be able to access the services they need; (4) older people should be able to live in a safe and secure environment; (5) older people should be able to access the services they need; (6) older people should be able to live in a safe and secure environment.

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# Introduction

## A

### Purpose and Scope

Integrated Services Digital Network (ISDN) is a term now familiar to systems and telecommunications executives throughout the world. For the past several years, numerous articles have discussed the conceptual, technical, and regulatory aspects and have profiled numerous ways in which ISDN can be implemented in the corporate environment. Likewise, equipment suppliers—from the largest PABX vendors to the smallest modem vendors—have declared ISDN compatibility.

Despite the extensive amount of information available, information services and telecommunications executives continue to voice concerns about what ISDN is and what it will contribute to the organization.

The purpose of this report is to provide an assessment of what ISDN is, assess management's understanding about ISDN, assess how ISDN development should be considered in relationship to an organization's strategic technology plans, and recommend when, if ever, senior executives should be concerned about ISDN.

In addition, INPUT has sought to identify significant ISDN-related issues that could affect management plans for the next several years. The issues are ones that management may need to consider prior to finalizing strategic technology plans.

## B

### Report Organization

The report is divided into a number of sections that address the definition of ISDN; whether ISDN is important, and, if so, why; who should have an interest in ISDN; and when information services managers should consider ISDN as part of their planning process.

The report concludes with a summary of conclusions and recommendations for information services and telecommunications management.

the 1990s, the number of people in the UK who are aged 65 and over has increased from 10.5 million to 13.5 million, and the number of people aged 75 and over has increased from 4.5 million to 6.5 million (Office for National Statistics 2000).

There is a growing awareness of the need to address the needs of older people, and the need to ensure that the health care system is able to meet the needs of older people. The Department of Health (2000) has set out a strategy for the health care system to meet the needs of older people. The strategy is based on the following principles:

- To ensure that older people have access to the same range of health care services as younger people.
- To ensure that older people are able to live independently for as long as possible.
- To ensure that older people are able to participate in decisions about their care.
- To ensure that older people are able to live in their own homes for as long as possible.

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**C****Methodology**

To prepare the report, INPUT staff conducted a review of industry and product literature and discussed management perceptions, needs, and requirements with a number of large organizations.

Information obtained was then considered in light of other major trends to identify areas where ISDN plans could have an effect on other plans or other plans could affect ISDN planning.

**D****Related INPUT  
Reports**

*Integrated Voice/Data Communications, 1985*

*Network Services Directions, 1986*

*Network Integration, 1987*





## ISDN: Strategic Business Considerations









## ISDN: Strategic Business Considerations

### A

#### Background and Development

To develop an understanding of ISDN and its place in an organization, one must have an understanding of the background and original intent for the development of ISDN.

#### 1. ISDN Evolution

Until the early to mid 1970s, communications requirements were generally for voice and written text. The means of communications were generally through the telephone and the telex.

To meet the needs of telephone and telex, the technological infrastructure of metallic wires (twisted pairs) and analog transmission were generally satisfactory. However, several developments created a need for improved methods to provide faster, higher quality transmission.

- Dramatic increases in computer-to-computer connections created a need for higher speed, higher quality, and reduced costs.
- Increases in the development and use of graphic transmission (FAX) created a demand for both higher speed and quality.
- Shifts and growth in the population created demands for new services in new areas of the country.
- The high costs associated with developing new electromechanical switching centers and replacing others created an increasing strain on telephone company services.

During the early development of networks, each was highly tailored, standalone, and individualized. These networks had several characteristics that would not meet the needs of a growing number of users.

Table 1. Mean values of the dependent variables for the three groups of subjects. The values are given in the order in which they are presented in the text

Group	Age (years)	Height (cm)	Weight (kg)	VO <sub>2</sub> max (l min <sup>-1</sup> )	VO <sub>2</sub> max (ml kg <sup>-1</sup> min <sup>-1</sup> )	VO <sub>2</sub> max (ml min <sup>-1</sup> m <sup>-2</sup> )	VO <sub>2</sub> max (ml min <sup>-1</sup> m <sup>-2</sup> 100 kg <sup>-1</sup> )	VO <sub>2</sub> max (ml min <sup>-1</sup> m <sup>-2</sup> 100 kg <sup>-1</sup> 100 cm <sup>-1</sup> )
1	20.1	175.2	72.8	3.7	21.1	20.7	21.1	20.7
2	20.1	175.2	72.8	3.7	21.1	20.7	21.1	20.7
3	20.1	175.2	72.8	3.7	21.1	20.7	21.1	20.7

VO<sub>2</sub>max (ml min<sup>-1</sup> m<sup>-2</sup> 100 kg<sup>-1</sup> 100 cm<sup>-1</sup>) = 20.7 (1.0) for the three groups. The values are given in the order in which they are presented in the text.

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- *High Cost:* Each network required specific, individual connections for the application, and often for each type of terminal connected to the network. This created high costs and generally placed a network capability beyond the means of most smaller users.
- *Inefficient:* Each network was for a single purpose, and interconnection of networks was generally not possible. Error rates were high and significant resources were needed to maintain network operation.
- *Difficult to Use:* Access and use procedures were developed for each specialized network. Users attempting to use more than one network were faced with different procedures and requirements, causing frustration.

The increasing use of networks and a growing need to be able to connect different networks for the transmission of 'data' demanded that telecommunications authorities look for ways to improve utilization of existing facilities.

Concurrent with the development in need was the emergence of integrated circuits. The economics of "intelligence on a chip" provided a means for telecommunications authorities to achieve greater use of existing facilities. Integrated circuits created several opportunities that had not previously existed.

- The cost performance of switching systems would be improved dramatically.
- Integrated circuits would permit use of digital transmission technology rather than analog technology.
- With integrated circuits, greater diagnostic and control capabilities could be built into the network.
- Standards could be developed that would further increase the cost-effectiveness of new equipment.

Concurrent with the emergence of new technologies, the increasing globalization of business began to exert pressure. Business had an increasing need to transmit data between plants and offices around the world.

From the numerous considerations and opportunities, three factors began to dominate planning efforts. The first was digitization. The second was globalization of business. The third was standards.

- With digitization, methods could be developed to significantly increase speed and quality. This could be done using the same physical wiring structures that had been in place for years.

the 1990s, the number of people in the world who are under 15 years of age has increased from 1.1 billion to 1.5 billion. This increase is due to the fact that the number of children under 15 years of age has increased in every country in the world, and the increase is particularly rapid in the developing countries.

The increase in the number of children under 15 years of age has led to a corresponding increase in the number of children who are in need of education. In 1990, there were 1.1 billion children under 15 years of age in the world, and of these, 1.1 billion were in need of education. In 2000, there were 1.5 billion children under 15 years of age in the world, and of these, 1.5 billion were in need of education.

The increase in the number of children in need of education has led to a corresponding increase in the number of children who are out of school. In 1990, there were 1.1 billion children in need of education in the world, and of these, 1.1 billion were out of school. In 2000, there were 1.5 billion children in need of education in the world, and of these, 1.5 billion were out of school.

The increase in the number of children out of school has led to a corresponding increase in the number of children who are illiterate. In 1990, there were 1.1 billion children out of school in the world, and of these, 1.1 billion were illiterate. In 2000, there were 1.5 billion children out of school in the world, and of these, 1.5 billion were illiterate.

The increase in the number of children who are illiterate has led to a corresponding increase in the number of children who are unable to read and write. In 1990, there were 1.1 billion children who were illiterate in the world, and of these, 1.1 billion were unable to read and write. In 2000, there were 1.5 billion children who were illiterate in the world, and of these, 1.5 billion were unable to read and write.

The increase in the number of children who are unable to read and write has led to a corresponding increase in the number of children who are unable to find and use information. In 1990, there were 1.1 billion children who were unable to read and write in the world, and of these, 1.1 billion were unable to find and use information. In 2000, there were 1.5 billion children who were unable to read and write in the world, and of these, 1.5 billion were unable to find and use information.

The increase in the number of children who are unable to find and use information has led to a corresponding increase in the number of children who are unable to participate in the global economy. In 1990, there were 1.1 billion children who were unable to find and use information in the world, and of these, 1.1 billion were unable to participate in the global economy. In 2000, there were 1.5 billion children who were unable to find and use information in the world, and of these, 1.5 billion were unable to participate in the global economy.

The increase in the number of children who are unable to participate in the global economy has led to a corresponding increase in the number of children who are unable to improve their living standards. In 1990, there were 1.1 billion children who were unable to participate in the global economy in the world, and of these, 1.1 billion were unable to improve their living standards. In 2000, there were 1.5 billion children who were unable to participate in the global economy in the world, and of these, 1.5 billion were unable to improve their living standards.

The increase in the number of children who are unable to improve their living standards has led to a corresponding increase in the number of children who are unable to reach their full potential. In 1990, there were 1.1 billion children who were unable to improve their living standards in the world, and of these, 1.1 billion were unable to reach their full potential. In 2000, there were 1.5 billion children who were unable to improve their living standards in the world, and of these, 1.5 billion were unable to reach their full potential.

- Globalization of business added a complexity that had not previously been a major requirement. Telecommunications authorities recognized that any major new development would need to be usable throughout the world.
- These considerations led to a fundamental conclusion that, to make digital transmission an economic reality, all equipment vendors, all service providers, and all domestic and international telecommunications authorities worldwide would need to use the same standards.

## 2. Driving Forces

With these considerations in mind, there are a number of driving forces behind ISDN. Some of the forces existed at the time ISDN was conceived; some have become prominent during the development process.

- Deregulation—Deregulation is causing RBOCs, OCCs, and foreign PTTs to find more cost-effective ways to make better use of existing facilities.
- Needs and Requirements—Users are placing increasingly greater pressure on suppliers to provide greater functionality and flexibility.
- Greater Bandwidth—Users are increasingly in need of bigger electronic highways to transmit increasing amounts of data between company locations and between the company and external contacts.
- Fiber Optics—Compared to the costs of producing, installing, and maintaining copper or metallic wires, fiber optic cables are considerably more cost-effective and provide greater capacity and reliability. Suppliers are searching for ways to put the technology to use.
- Business Globalization—The increasing globalization of business is placing increasing pressure on developed and developing countries to provide standardized, cost-effective methods for communicating data.
- System Integration—The increasing focus on integrating systems is pressuring information service executives to tie previously fragmented systems together. Executives must also find ways to make better use of the ever-increasing amounts of data.

## 3. Standards Development

Development of international standards is the responsibility of the CCITT (International Telephone and Telegraph Consultative Committee). Composed of representatives of countries throughout the world, the CCITT has the responsibility for developing standards acceptable to all countries. Through the work of a number of working groups, the CCITT has developed a number of standards related to hardware, software, and networks.



Considering that ISDN can be viewed differently by different people, a description of the basic elements as identified by the CCITT may, in fact, be of greater value than a specific definition.

- **Digital Connectivity**—All components of a network—whether telephone, FAX machine, or computer—will all talk the same language: digital.
- **Multipurpose Network Interfaces**—The means of connection within a user's premises and between the user's premises and external networks is standardized to permit shared use of the same transport facilities.
- **Common-Channel Signalling**—The structure of signals will be the same from provider to provider. Using this method, AT&T's computers will provide and expect to see the same message structure as will Sprint, MCI, British Telecom, and KDD in Japan.

#### 4. ISDN Identified

Identifying what ISDN is requires an understanding of what ISDN is not. ISDN is not a technology. It is not hardware. It is not software. It is not a chip and it is not a standard. ISDN is a telecommunications platform that encompasses hardware, software, and standards.

From an executive standpoint, the only truly relevant portions of the term are the first two letters (*IS*). As compared to analog, digital is important only to the designers and engineers who have an interest in developing more-efficient means of transporting data. The term *network* is an encompassing term that must be interpreted in light of what an organization is trying to accomplish.

The letters *IS* (Integrated Services) are significant. They convey the essence of the meaning and will mean different things to different people. They reflect an ability of Information Services Executives to develop strategic plans to make maximum use of the vast amounts of data that are created and transmitted each day.

The letters *IS* are also the root of problems that managers and planners will need to address over the next ten years: how to maximize the strategic value of information.

## B

### Current Status

#### 1. Vendor Offerings

Numerous vendors are preparing products to meet the needs of ISDN functionality. In every segment of the industry, products are either available or being developed. However, an area of great attention has been PABXs for two reasons:

the 1990s, the number of people in the world who are under 15 years of age has increased from 1.1 billion to 1.3 billion. This increase is due to the fact that the number of children under 15 years of age has increased in every country in the world, and the increase is particularly large in the developing countries.

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- Voice telecommunications have traditionally been analog. Service integration necessitates that PABXs and central-office switches be converted to digital technology for both compatibility and economic reasons.
- A single method to interface between a user's premises and external networks and services has generally been viewed as desirable by all users.

Currently, some 15 companies provide more than 25 digital PABXs. Exhibit II-1 highlights the equipment, line capacity, type of host interface, types of LANs that they support, and the maximum transfer rate for three major vendors: AT&T, IBM, and Northern Telecom.

EXHIBIT II-1

## DIGITAL PRIVATE BRANCH EXCHANGES

Vendor	Model	Min/Max Lines	Host Interface	LAN Interface	Transfer Rate*
AT&T	SYS 75	40/800	DMI	Starlan, ISN	19.2/64
	SYS 85	800/32,000	DMI	Starlan, ISN	19.2/64
IBM (Roim)	9751 CBX	100/20,000	NA	NA	19.2/64
Northern	SL-1	32/5,000 Voice 2,000 Data	Any Host	Ethernet, Lanstar, Appletalk, RS-232-C	19.2/56 2.56M-Twisted Pair
	SL-100	5,000/30,000	Any Host	Ethernet RS-232-C	19.2/64

DMI=Digital Multiplexed Interface  
ISN=Information Systems Network

\*19.2=19.2K Asynchronous; 64=64K Synchronous

When considering the use of a PABX as a means to establish an ISDN operating environment, a number of questions arise.

- For data networks, will a PABX be able to replace all (or nearly all) modems and multiplexers, or will the PABX be another piece of equipment that can fail?
- With regard to data networks, does a PABX, which is traditionally oriented to casual use, provide necessary functionality for applications typically requiring high capacity, continuous availability, or both?

the 1990s, the number of people in the world who are under 15 years of age has increased from 1.1 billion to 1.5 billion, and the number of people aged 65 and over has increased from 0.5 billion to 0.7 billion (United Nations 2002).

As a result of the increase in the number of people aged 65 and over, the number of people aged 65 and over as a percentage of the total population has increased from 7% in 1990 to 10% in 2000. This increase is expected to continue, with the number of people aged 65 and over as a percentage of the total population expected to increase to 15% by 2020 (United Nations 2002).

As a result of the increase in the number of people aged 65 and over, the number of people aged 65 and over as a percentage of the total population has increased from 7% in 1990 to 10% in 2000. This increase is expected to continue, with the number of people aged 65 and over as a percentage of the total population expected to increase to 15% by 2020 (United Nations 2002).

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- With the exception of the largest organizations, do companies need a PABX that can expand to 10,000 or 20,000 lines? Will smaller machines be able to provide the needed functionality?
- Is a 64-Kbps transfer rate high enough to meet the needs of future ISDN applications, or would a company be faced with a replacement or upgrade decision before the useful life of the PABX has expired? Any PABX decision needs to consider a number of key timing factors.
  - A PABX typically has an operational life (mechanical soundness) of 10-12 years.
  - The functional life (meets functional objectives) is 5-7 years.
  - The realistic life of a PABX is 4-5 years when considering company growth, acquisitions, etc.
- Is there a need to connect dissimilar LANs, and is a PABX the logical method?
- Will dynamic bandwidth allocation through a PABX be viable? Will it be a cost-saving reality or a function having limited practical value for dedicated applications?

## 2. Market Tests

Despite questions and skepticism on the part of managers and planners or perhaps to demonstrate progress, operating companies and suppliers are progressing with field trials that are characterized as 'customer rollouts' and represent introduction of the first set of services that organizations can expect to see over the next several years. Tests conducted during 1987 and planned for 1988 include the following.

- USWest—has planned at least six different tests to be conducted in Oregon, Arizona, Colorado, and Minnesota. These tests range from providing 200 basic-rate (2B+D) ISDN lines to a bank, to replacing 200 analog lines connecting a host and remote minis transmitting at 19.6 Kbps over B channels. A variety of other combinations are being tested.
- Southwestern Bell—Southwestern Bell is involved in a number of tests in Texas and Missouri that involve providing more than 10,000 ISDN lines for a number of companies that will combine voice and data between their plant and office locations.
- Ameritech—Ameritech is actively involved in a test that will involve hardware and software to provide high-speed facsimile, digital Centrex, and asynchronous word processing between locations of a major food chain.



- Bell Atlantic—Among a number of tests, Bell Atlantic plans to provide ISDN service involving 19 central offices in the state of Virginia.
- Nynex—Included in a number of tests planned by Nynex is an internal test between four of Nynex's offices in Boston. The test will include voice and data integration, local-area networking, and PC-to-PC communications.
- Pacific Telesis—Among the tests being conducted by Pacific Telesis is a test involving a major electronics firm that will include 37 lines to be used for developing CAD applications, engineering and business computing, an integrated local-area network, video, and telemetry. The test, which is expected to last up to eighteen months, will eliminate coaxial cable currently being used.
- BellSouth—BellSouth is currently planning to provide ISDN services to a number of customers in the local market area.
- GTE—In addition to the Regional Operating Companies, GTE has announced that it will be conducting tests in a number of areas.

### 3. The Centrex Connection

Centrex, once thought to be an over-the-hill technology, has begun to make a resurgence, riding on the coattails of digital technology and ISDN.

Traditionally an analog technology, Centrex service has frequently been targeted at the organization that did not want or was too small to have a large PABX on its premises.

Included in the 'new' Centrex are services and features that appeal to many companies and provide services that were traditionally not available.

- Pacific Bell—As part of its Project Victoria, Pacific Bell provides two digital voice channels and five data channels over a single circuit between the central office and the customer's premises.
- Bell Atlantic—Bell Atlantic has introduced a central-office-based Local-Area Network service for its customers.
- Nynex—Nynex has developed a digital service that permits the transmission of voice, data, and image on a single high-speed digital line.
- Ameritech—Ameritech has developed a central-office-based public switched digital service and packet-switching techniques.

the 1990s, the number of people in the world who are under 15 years of age has increased from 1.1 billion to 1.3 billion. The number of people aged 65 and over has increased from 200 million to 300 million. The number of people aged 15–64 years has increased from 2.5 billion to 3.5 billion.

There are a number of reasons for the increase in the number of people in the world. One of the main reasons is the increase in life expectancy. People are living longer and longer, and this is leading to an increase in the number of people in the world. Another reason is the increase in the number of people who are having children. This is leading to an increase in the number of people in the world.

The increase in the number of people in the world is leading to a number of problems. One of the main problems is the increase in the number of people who are poor. This is leading to a number of social and economic problems. Another problem is the increase in the number of people who are unemployed. This is leading to a number of social and economic problems.

The increase in the number of people in the world is also leading to a number of environmental problems. One of the main problems is the increase in the number of people who are using natural resources. This is leading to a number of environmental problems. Another problem is the increase in the number of people who are polluting the environment. This is leading to a number of environmental problems.

The increase in the number of people in the world is also leading to a number of health problems. One of the main problems is the increase in the number of people who are suffering from chronic diseases. This is leading to a number of health problems. Another problem is the increase in the number of people who are suffering from mental health problems. This is leading to a number of health problems.

The increase in the number of people in the world is also leading to a number of social problems. One of the main problems is the increase in the number of people who are living in poverty. This is leading to a number of social problems. Another problem is the increase in the number of people who are living in slums. This is leading to a number of social problems.

The increase in the number of people in the world is also leading to a number of economic problems. One of the main problems is the increase in the number of people who are unemployed. This is leading to a number of economic problems. Another problem is the increase in the number of people who are living in poverty. This is leading to a number of economic problems.

The increase in the number of people in the world is also leading to a number of political problems. One of the main problems is the increase in the number of people who are living in poverty. This is leading to a number of political problems. Another problem is the increase in the number of people who are living in slums. This is leading to a number of political problems.

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Although developments to date may be somewhat limited, a widely available central-office-based centrex service that can offer a wide range of features and connect a customer's voice and data equipment to world-wide networks could find wide acceptance.

## C

### Features and Services

Taken at face value, the tests would suggest an aggressive introduction of ISDN into mainstream corporate America. However, such is not the case. Those involved in the tests and closely monitoring developments indicate that implementation of ISDN will occur in three distinct phases.

- The first phase is generally regarded as a testing phase. This phase will be closely followed by the availability of true ISDN in the form of Centrex services.
- The second phase, characterized as 'digital islands,' is expected to occur over the next two years. The 'islands' will be made up of large corporate customers who will use ISDN to augment or replace portions of their private networks.
- The third phase will begin in the early-to-mid 1990s. During this phase, the islands will be linked across central offices nationwide. During this phase, ISDN services may become available to the residential customer.

Exhibits II-2 and II-3 provide a summary of the general timing of services that can be expected. Although there is a general trend toward viewing the PABX as the key platform for integrating an organization's networks, several questions need to be resolved.

- Industry data indicates that 50% of the local exchanges will be digital by early 1991/92. Will 50% penetration provide sufficient digital infrastructure for organizations to be able to make use of ISDN between headquarters and remote locations?
- The trials to date have generally been able to provide a maximum bandwidth of 64 Kbps. Users have indicated that broadband ISDN (1.5-2.0 Mbps) is necessary for maximum functionality. Generally this will require fiber cables in local loops. Will the 50% digital offices be able to provide fiber local loops? Can this be accomplished in the next 3-4 years?
- Will organizations be able to develop network management procedures and policies that can effectively make use of dynamic allocation and other features?





EXHIBIT II-2

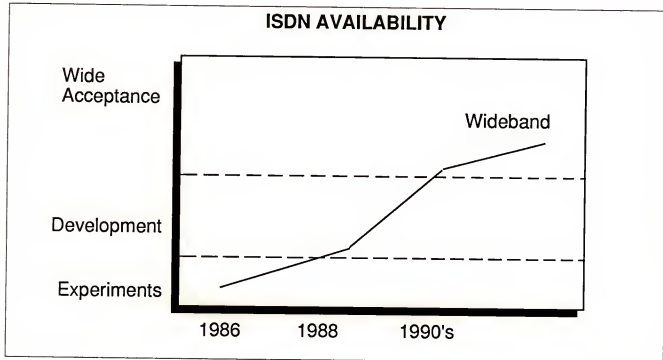


EXHIBIT II-3

**ISDN AVAILABILITY**

Introduction of Full Service	1987-1988
Basic Rate Access 50% Available	1988-1989
Primary Rate Access 50% Available	1989-1990
Local Exchanges 50% Digital	1991-1992

- INPUT research indicates that at least 15-20 percent of data networks will need to remain dedicated and will not be controlled by an ISPABX (Integrated Services—PABX). How does this affect the cost-effectiveness of new PABXs?
- Can casual-use services such as telephone, TELEX, and FAX be successfully integrated with bulk-transfer services found on large data networks?

the 1990s, the number of people with a doctor's diagnosis of depression has increased in the United States (Robinson and Franks 1995).

There are several reasons for the increase in depression. First, the prevalence of depression has increased in the general population (Robinson and Franks 1995). Second, the number of people who seek help for depression has increased (Robinson and Franks 1995). Third, the number of people who are diagnosed with depression has increased (Robinson and Franks 1995). Fourth, the number of people who are prescribed antidepressants has increased (Robinson and Franks 1995). Fifth, the number of people who are hospitalized for depression has increased (Robinson and Franks 1995).

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- Can timing-sensitive transactions such as credit authorization be successfully integrated with non-timing-sensitive transactions in a demand allocation scheme?

Included in the services to be available are a number that have been identified for Centrex-based services. To date, BellCore has identified 118 specific services that can be made available. However, user demand for many of the services has not been identified.

## D

### Impact of Other Technologies

#### 1. Local-Area Networks

Corporate users are increasingly demanding the ability to interconnect their computing products. The proliferation of PCs has resulted in significant demand for local networks to connect PCs to printers and to each other. Under the control of user departments, these networks are frequently selected and implemented without regard to an overall technology plan.

Concurrent with the demand for local-area networks, there is increasing demand for connectivity between PCs and a corporate host. Exhibit II-4 shows a typical office configuration today. Several characteristics of this configuration can be noted.

- Local-area data networks are separate from traditional voice and data networks.
- PABXs are used for dial-up connections to a host.
- Data terminals (3270s) are hard-wired to the host, either directly or through a remote controller.
- A front-end processor (FEP) is used to provide access to multiple hosts.
- PCs are networked to share peripheral resources and provide access to a host.

the 1990s, the number of people who have been employed in the public sector has increased in all countries. The increase has been particularly large in the United States, where the public sector has grown from 15.5% of the total workforce in 1970 to 22.5% in 1995 (see Figure 1).

There are a number of reasons for the increase in public sector employment. One reason is that the public sector has become a more attractive place to work. This is due to a number of factors, including the fact that public sector jobs are often more secure and offer better benefits than private sector jobs. Another reason is that the public sector has become a more important part of the economy, particularly in the areas of health care and education.

There are also a number of reasons why the public sector has become a more important part of the economy. One reason is that the public sector has become a more important provider of social services. This is due to the fact that the public sector has become a more important provider of health care, education, and other social services. Another reason is that the public sector has become a more important provider of infrastructure services, such as transportation and utilities.

There are also a number of reasons why the public sector has become a more important provider of social services. One reason is that the public sector has become a more important provider of health care. This is due to the fact that the public sector has become a more important provider of health care services, particularly in the areas of hospital care and long-term care. Another reason is that the public sector has become a more important provider of education services, particularly in the areas of primary and secondary education.

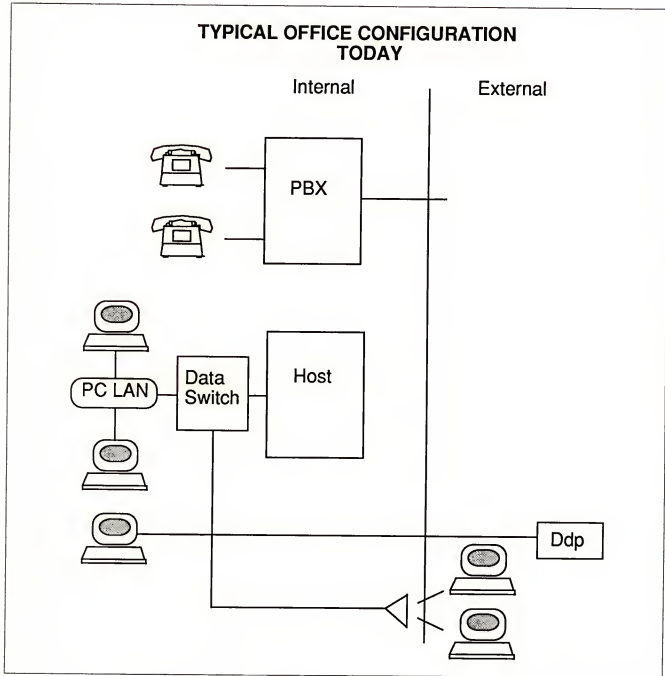
There are also a number of reasons why the public sector has become a more important provider of infrastructure services. One reason is that the public sector has become a more important provider of transportation services, particularly in the areas of public transit and highways. Another reason is that the public sector has become a more important provider of utility services, particularly in the areas of water supply and electricity.

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EXHIBIT II-4



the 1990s, the number of people in the world who are under 15 years of age has increased from 1.1 billion to 1.3 billion. This increase is due to the fact that the number of people who are under 15 years of age has increased in every country in the world.

The number of people who are under 15 years of age in the world is expected to increase further in the 2000s. This is because the number of people who are under 15 years of age is expected to increase in every country in the world.

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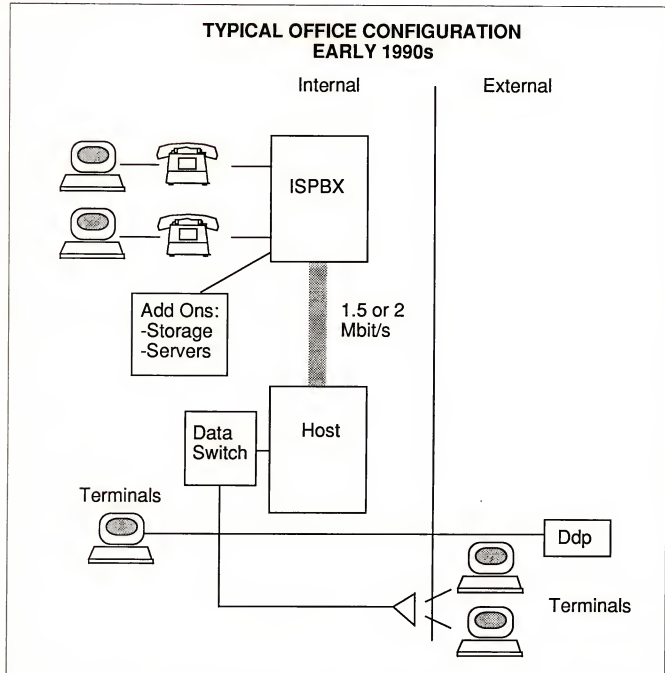
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Research suggests that, by the early to mid 1990s, this configuration will change to a configuration illustrated in Exhibit II-5. General characteristics include:

EXHIBIT II-5







- An ISPABX will have been installed at the majority of large sites.
- The ISPABX will become the dominant local-area network methodology for several reasons.
  - The costs of connecting PCs thru an ISPABX will drop to less than \$100.
  - Connections through an ISPABX will make it possible to make use of existing twisted pairs.
  - Use of an ISPABX permits voice and data applications to take place simultaneously.
  - Use of an ISPABX will permit access to external (wide-area) services without extra hardware or software.

## 2. Wide-Area Networks

In large, multisite organizations, wideband (T1) wide-area networks have increased in importance as a means to optimize the cost of transmission of voice and data. Tariff reductions for short-distance T1 capacity circuits have resulted in numerous organizations implementing T1 (and higher) circuits through multiplexing equipment.

ISDN is expected to further stimulate the use of wide-area networks. In addition, there will be a need for building greater intelligence to provide increased flexibility and functionality. Exhibit II-6 provides a perspective of how wide-area networks of the 1990s might be configured.

From this configuration and considering Exhibits II-4 and II-5, a number of trends can be identified.

- While ISDN standards will be incorporated into front-end processors (FEPs), this unit will continue its traditional role.
- The ISPABX will not provide a direct interface to public networks, but may be integrated with the use of intelligent multiplexors that provide the primary method of connecting to external networks and applications.
- Large users will continue to implement high-capacity (T1) links between their sites and will look for increasing intelligence in their multiplexing equipment.
- True ISDN will not become a reality in the corporate environment until such time as PABXs are capable of supporting the data rates in excess of 64 Kbps that are generally available today.

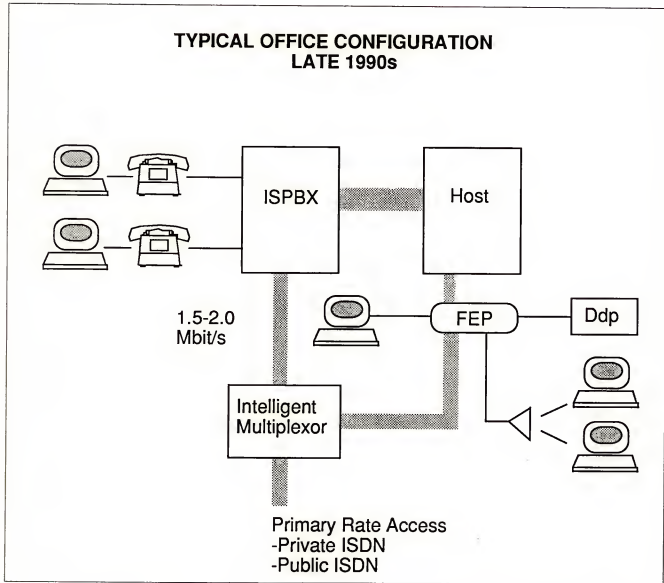
The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that every entry, no matter how small, should be recorded to ensure the integrity of the financial data. This includes not only sales and purchases but also expenses and income. The document provides a detailed list of items that should be tracked, such as inventory levels, accounts payable, and accounts receivable.

In the second section, the author outlines the various methods used to collect and analyze financial data. This includes the use of spreadsheets, databases, and specialized software. The document explains how these tools can be used to identify trends, forecast future performance, and make informed decisions. It also discusses the importance of regular audits and reconciliations to ensure that the data is accurate and up-to-date.

The third part of the document focuses on the role of management in overseeing the financial operations of the organization. It highlights the need for clear communication and collaboration between different departments to ensure that financial goals are met. The document provides a framework for setting financial targets and monitoring progress, as well as strategies for addressing any issues that arise.

Finally, the document concludes with a summary of the key points discussed and offers some final thoughts on the importance of financial management. It encourages readers to take a proactive approach to their financial affairs and to seek professional advice when needed. The document is intended to serve as a practical guide for anyone involved in the financial management of a business or organization.

EXHIBIT II-6

**E****Management  
Considerations****1. Management Understanding**

Recent studies regarding the importance of ISDN to an organization serve to illustrate the extent to which there is either a lack of understanding or a general lack of concern about its importance, application, and use.

In a survey conducted by INPUT, managers were asked a number of questions regarding their understanding of ISDN, its importance to their current and future plans, and the extent to which they believe ISDN is a solution to accomplishing network integration.

the 1990s, the number of people with a diagnosis of schizophrenia has increased in many countries, including the United Kingdom (Murray & Lewis, 1998). The prevalence of schizophrenia is estimated to be 1% of the population (Murray & Lewis, 1998).

There is a growing awareness of the need to improve the lives of people with schizophrenia. The World Health Organization (WHO) has developed a strategy for the care of people with schizophrenia, which emphasizes the need for a comprehensive approach to care, including social, psychological, and medical interventions (WHO, 1993).

One of the key components of this approach is the need to provide a supportive environment for people with schizophrenia. This includes the need to provide a safe and secure environment, as well as the need to provide a range of services and support, including housing, education, and employment (WHO, 1993).

One of the ways in which this can be achieved is through the use of self-help groups. Self-help groups are groups of people who share a common experience or condition, and who meet regularly to provide mutual support and information. They can be a valuable resource for people with schizophrenia, as they can provide a sense of community and belonging, as well as the opportunity to share experiences and learn from others (Murray & Lewis, 1998).

There is a growing body of research that suggests that self-help groups can be an effective way of providing support and information to people with schizophrenia. For example, a study by Murray and Lewis (1998) found that people who participated in a self-help group for people with schizophrenia had significantly better outcomes than those who did not participate. This was true for a range of outcomes, including social functioning, self-esteem, and the use of services (Murray & Lewis, 1998).

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- Fifty percent said they were somewhat familiar with ISDN. Forty percent said that they were familiar with ISDN. Only twenty percent were very familiar.
- Twenty percent said that ISDN is important to their planning considerations. Forty percent said that it is somewhat important. Forty percent said that it is of low importance.
- Nearly 70% said that ISDN is a significant consideration for the future.
- Regarding when ISDN would be important, 30% said that it would be important in 1-3 years. Forty percent said that it would be important in 5-7 years. Of the remainder, one said that ISDN would never be an important consideration. His reason was that foreign countries would never be able to come to agreement on the standards.
- Of the total surveyed, 50% have reviewed vendor offerings. Of these, 67% believed that the offerings do not provide a solution to implementing ISDN. Asked why they did not provide a solution, managers generally indicated:
  - Standards have not been sufficiently well developed, and
  - Costs have not been identified
- Considering ISDN as an alternative to accomplish network integration, nearly 70% said that there is no single solution to accomplishing network integration.
- Considering the rapid growth of LAN networks within organizations, managers were asked whether ISDN could replace LANs as a way to achieve network integration. Forty percent indicated that ISDN would not provide an alternative to LANs. Thirty percent indicated that ISDN could be used as an alternative to LANs. The remainder did not know.
- Managers were also asked whether they viewed ISDN as a means to achieve *inter-* or *intracompany* connectivity. Although 50% indicated that ISDN addresses both, 40% viewed ISDN as a means to address only *intercompany* connectivity.
- While the costs for ISDN have not been specifically identified to date, over 50% of those surveyed believed that operating costs will be higher than they are currently. A number noted, however, that this cost increase would be acceptable if there were significant added functionality.
- When asked about significant considerations related to ISDN, respondents said that regulations are generally considered to be the most



significant problem. Costs, hardware, and software were considered to be of nearly equal, but slightly lesser concern. Concerns were also expressed about applications development, development of ISDN in foreign countries, and whether network management would be more or less complex.

- As part of the same survey, managers were also asked to describe ISDN in their own words. Responses included the following:
  - Integrated transport for all applications under packet layer control.
  - Integrated voice and data over twisted pair.
  - A method to integrate various services, providing dynamic allocation.
  - Affords improved digital capability, integrated telecommunications, and information signalling that will lead to superior business applications.
  - Communications method to connect fiber links to boxes.
  - A 'T-Span,' channelized pipe that I can stuff anything on.
  - A telecommunications environment to integrate voice and data.
  - A set of interfaces/accesses that provide basic and primary rate service. Represent lower three layers of ISO model.
  - Single set of wires, transmitting all data, meeting CCITT standards worldwide.

## 2. Costs—A Major Consideration

The subject of ISDN tariffs has emerged and is likely to remain a significant consideration for a while longer. Users, trying to assess the cost benefits of ISDN, have not been able to identify specific charges that they could analyze and compare. There are two primary reasons:

- First, ISDN is not sufficiently far along in its development for providers to be able to either assign value or fully identify the advantages of ISDN over other methods of accomplishing the same processes.
- Second, there has been no specific market identified for ISDN. The key word is *specific*. In the early stages, ISDN may be able to provide greater throughput, but no significant functionality has been added to be able to clearly identify added value.





### 3. Development/Implementation Costs

While operating costs have been a primary focus, the costs to develop and implement ISDN can be a significant consideration. Management consideration must be given to technical requirements such as internal wiring and organizational issues such as commonality of data requirements.

Implementation of ISDN will permit greater integration of data and a greater flow of information among business units within an organization. However, if real benefits are to be realized, management must give consideration to the structure, flow, and integration of data.

### 4. Operating Costs

When considering operating costs, two general schools of thought have emerged.

The first is that providers should tariff ISDN so that it commands a price premium over telephony tariffs. Generally, this would mean:

- Charging for ISDN basic access at a tariff related to current data tariffs. For example, the tariff might be calculated as the same as that for two 64-Kbps circuit-switched data network access lines and one 4.8-Kbps packet-switched access line.
- Charging for ISDN primary-rate access at a tariff above that for a comparable number of analog exchange lines.
- ISDN calls should command a price premium to reflect the enhanced functionality or the use of higher-value services.

The second is that existing telephone tariffs should provide the basis for setting ISDN tariffs. Generally, this would mean:

- Charging for ISDN basic access at the same tariff as for two exchange lines.
- Charging the same or less for ISDN primary-rate access than for an equivalent number of analog exchange lines.
- That ISDN call charges should be the same as telephone call charges and independent of the service used.

The two approaches would result in very different ISDN costs. The first could result in charges that could be five times those of the second. Although the issue has not and will not be resolved for some time, the second approach seems to be the more likely possibility, certainly in the long term. There are several reasons:

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- Carriers' revenues will rise with aggressive ISDN tariffing. In general, improved quality and a reduction in complexity can be expected to increase usage for a wide variety of purposes. This assumes competitive pricing.
- By the early to mid 1990s, the cost of ISDN service will be comparable to that for analog telephone service. The 'cards' required in central offices and the cost of interface boards in user equipment can be expected to fall significantly.
- Telephone and ISDN tariffs will have to be the same in the longer term. With digital technology becoming the mainstay of the communications industry, political and economic pressures will drive the costs down.

## F

### Strategic Planning Considerations

#### 1. ISDN and Technology Planning

Responses to INPUT's survey indicate that there are a number of areas that IS managers will need to address before ISDN can be considered a reality.

- Although the descriptions of ISDN indicate a general awareness of the technical aspects, there is little to suggest an understanding of benefits to the organization. This is of particular interest since over 50% indicated they expected the costs to be higher.
- If nearly 70% of those who have reviewed vendor offerings consider the offering to be inadequate, what changes need to be made to provide economically viable products?
- If 70% of those surveyed believe there is no single solution to network integration, and if nearly 70% did not consider ISDN to be an alternative to accomplish integration or did not know, is intracompany network integration an important planning consideration?
- An important planning question results from a comment about ISDN considerations. Can network integration be considered in isolation from systems integration? If ISDN is viewed as more than an improved electronic highway (more functionality), will applications be able to make productive use of the resulting increase in data?

Perhaps the most significant question that IS managers must address is the value (to the organization) of an ISDN-based, integrated network.

#### 2. Network and Data Integration

Industry data suggests that fully integrated networks (voice, data, image) will be a dominant factor within the next ten years. Industry data also

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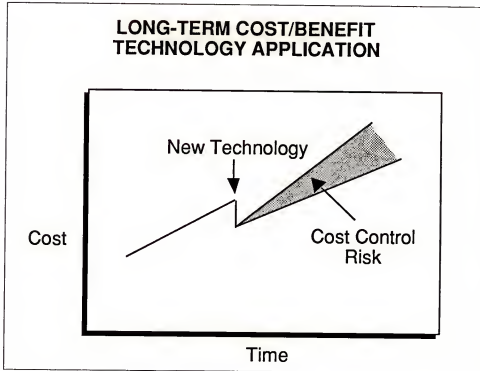
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indicates that greater efficiency combined with lower costs and a greater number of services will increase the amount of data transmitted.

A key question to be addressed by IS management is how to make use of the significantly increased data. To be of value, data must be synthesized, analyzed, and stored for subsequent retrieval and analysis. To be of value it must be incorporated into integrated systems that provide decision opportunities.

Exhibit II-7 illustrates a traditional effect of applying technology to reduce operating costs. At the time technology is introduced, a reduction in costs is experienced. When the solution provides additional capacity, the increased capacity is frequently consumed by data not related to specific business uses. The cost effect of implementing ISDN services raises several questions for management.

EXHIBIT II-7



- Are controls needed to ensure that the added resources are effectively used? Without a method to plan for the use of the added capacity, the capacity can be quickly consumed.
- What is the nature of the additional data being transmitted? Using additional capacity to coordinate and integrate business activities can be of high value. Other uses can be of low value.



- How will the increased data be incorporated into the organization's information data base, and how will it be used to improve business revenues and profits?

IS managers who view ISDN simply as a means to reduce costs may, in fact, end up incurring higher operating costs and will be missing the value that ISDN can offer.

### 3. Global Implications

Globally, ISDN will have a dramatic impact. The overall effect should be positive. However, there are areas that require careful consideration.

Development of global standards should remove many problems experienced by telecommunications managers over the years. Equipment will be more standardized, providing greater compatibility and a greater number of options to meet corporate requirements.

Significant benefit could be realized from new services such as those brought by Electronic Data Interchange (EDI). Direct connections to vendors and suppliers can result in more timely and accurate information—permitting strategic, competitive analysis and reductions in costs.

However, at least in the short term, international operating costs could be higher. Experience in Europe suggests that national authorities might use ISDN as a means to move multinational organizations from leased networks (low unit cost) to digital networks that are higher cost. Likewise, digital networks and standardized message structures could result in a greater monitoring capability in countries that require data base registration and that have restrictions on the transmission of name-linked data.

### 4. ISDN Implementation Scenarios

ISDN implementation can be expected in a variety of forms. The exact form will depend, to a great extent, on the size of the organization and objectives to be accomplished.

- Large organizations can be expected to place great emphasis on ISDN functionality, but will be reluctant to convert their large private networks to public, ISDN-based, networks. Large organizations are expected to continue to develop private networks, providing ISDN functionality at key points of interface between networks and public services.
- Many small organizations do not have the need for many of the features and services offered by ISDN. Likewise, many organizations do not have a requirement for a large ISPABX. Many small organizations can be expected to rely on Centrex-based ISDN-type services and functions provided by private or public carriers.





- Since Centrex-based ISDN services may be available early in the implementation cycle, many small users will have ISDN services available before large and small organizations. Likewise, small organizations may be unaware that they are using ISDN, since features and services may be packaged in ways that do not indicate ISDN functionality.
- For medium-size organizations, ISDN may prove to be a blessing or a curse during the early years. Faced with a multitude of choices and not having the staff or financial base to make use of many of the services, they will need to give careful consideration to services selected.
- Medium-size organizations should be expected to make use of available public facilities (Centrex, Packet Nets) in combination with existing facilities, and should require interfaces that will be phased out over time.





the 1990s, the number of people in the UK who are aged 65 and over has increased from 10.5 million to 13.5 million, and the number of people aged 75 and over has increased from 4.5 million to 6.5 million (Office for National Statistics 2000).

There is a growing awareness of the need to address the needs of older people, and the need to ensure that the health care system is able to meet the needs of older people. The Department of Health (2000) has published a strategy for older people, which sets out the government's commitment to older people and the need to ensure that the health care system is able to meet the needs of older people.

The strategy for older people is based on the following principles: (1) older people should be able to live independently in their own homes; (2) older people should be able to participate in the community; (3) older people should be able to access the services they need; and (4) older people should be able to live in a safe and secure environment. The strategy for older people is based on the following principles: (1) older people should be able to live independently in their own homes; (2) older people should be able to participate in the community; (3) older people should be able to access the services they need; and (4) older people should be able to live in a safe and secure environment.

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## Conclusions and Recommendations





## III

## Conclusions and Recommendations

## A

### Conclusions

- ISDN is not an answer. It is a series of alternatives based on a standardized platform from which specific solutions can be identified and implemented.
- ISDN services are generally not sufficiently well identified for most organizations to be concerned with short-term operating requirements.
- ISDN is a sufficiently well developed concept for organizations to be able to incorporate it into strategic technical plans.
- ISDN will be of greatest benefit to organizations that are prepared to make strategic use of the increased amount of information available.
- The availability of ISDN could have a significant impact on other technologies such as storage and retrieval systems.
- Narrowband ISDN will yield minimal benefit relative to the costs of planning, etc.
- Multinational companies will need to place greater emphasis on ISDN plans than on purely domestic ones.
- ISDN will be adopted slowly. Services originally predicted to be available by the early 1990s may not be significantly used until the late 1990s.
- Many organizations will use ISDN services without knowing they are doing so. Services will be identified and packaged as services without reference to ISDN.
- Many ISDN costs will not be uniquely identifiable. Costs will relate to specific services or packages of services.

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**B****Recommendations**

- The time is right to build ISDN into plans that determine strategic direction.
- Initial planning efforts should be directed at identifying technology objectives and their alignment with corporate objectives.
- Organizations should address and make plans for the use of the increased amount of data that will be available. This should include the use of complimentary technologies.
- It is safe to buy LANs and PABXs if:
  - Payout time is in the next five years
  - Products conform to major international standards such as X.25, RS-232-C, etc.
- Rather than listening to the vendors,
  - Identify what you need
  - Ask vendors whether they can meet the specific need
  - If they can't, they will. Equipment and service providers need to understand what the user needs and requirements are.
- For maximum benefit, begin planning now.

