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ISDN as the Key to Increased User Benefits in the Office

Whenever a new system is to be introduced, people's immediate concern is with its application potential and the benefits it will bring to those who work with it directly and the company or authority which operates it. This is especially true of the new ISDN Communication Systems: as practical experience with these systems is still very limited, their performance characteristics and features must, for the time being at least, be judged from a technical rather than a business management viewpoint.

The term "user benefit" is here taken to mean both the direct and indirect benefit for the office user and the system operator.

First, there are two important factors to be considered:

o Statements about user benefit must be made individually for each specific situation since the following points are variables which differ greatly from one case to the next:
o the type of organization,
o the personnel level and degree of system sophistication,
o the internal and external communication requirements,
o the kind of work processes involved and their distribution.
For this reason, specific user benefits need to be determined separately for each organization.

o User benefits are not limited to the ISDN Communication System operator, but are particularly apparent at the individual's workstation and in the organization of work processes:
o easier handling,
o greater accessibility,
o improved information acquisition and
o faster availability of information
have a streamlining effect. They increase throughput rates within the "office" work unit and enhance reliability and flexibility.

So far, the application *of* technology has only brought fragmented success

If we consider today's office and administrative aids (central computers, PABXs, workstation systems, terminals) and the communication paths they employ, we can make the following statements about them:

o Most of the devices and media used for communicating and for processing information in its various forms (voice, data, text and images) are monofunctional. Technical incompatibility and the lack of integration means that information has to undergo a great deal of unnecessary conversion from one form to another, referred to as "media clashes".

o The communication paths are specially tailored to the different types of information.

o Gains in efficiency through the use of special support facilities have only been possible in specific task areas. Examples include DP programs for the flexible structuring of work procedures, and the use of word processors in offices and typing pools.

● Adhering to an excessive division-of-labor approach instead of paying due regard to the integrity of certain work processes gives rise to needless friction and wastes time.

An analysis of the situation shows that some significant improvements can be achieved if the following conditions are met either fully or nearly :

● integration of the information sets for data, text, voice and images,

● integration of the information paths, networks, services and switching systems,

● integration of the communication activities associated with the handling of various tasks.

The introduction of an ISDN Communication System and of the public ISDN network will have a forceful impact on these very necessary integration measures.

Features of the ISDN Communication Systems

The main features of the ISDN are set out below (Fig. 1) to illustrate the significance of ISDN and the ISDN Communication Systems to the users and operators.

Technology

ISDN Communication Systems offer:

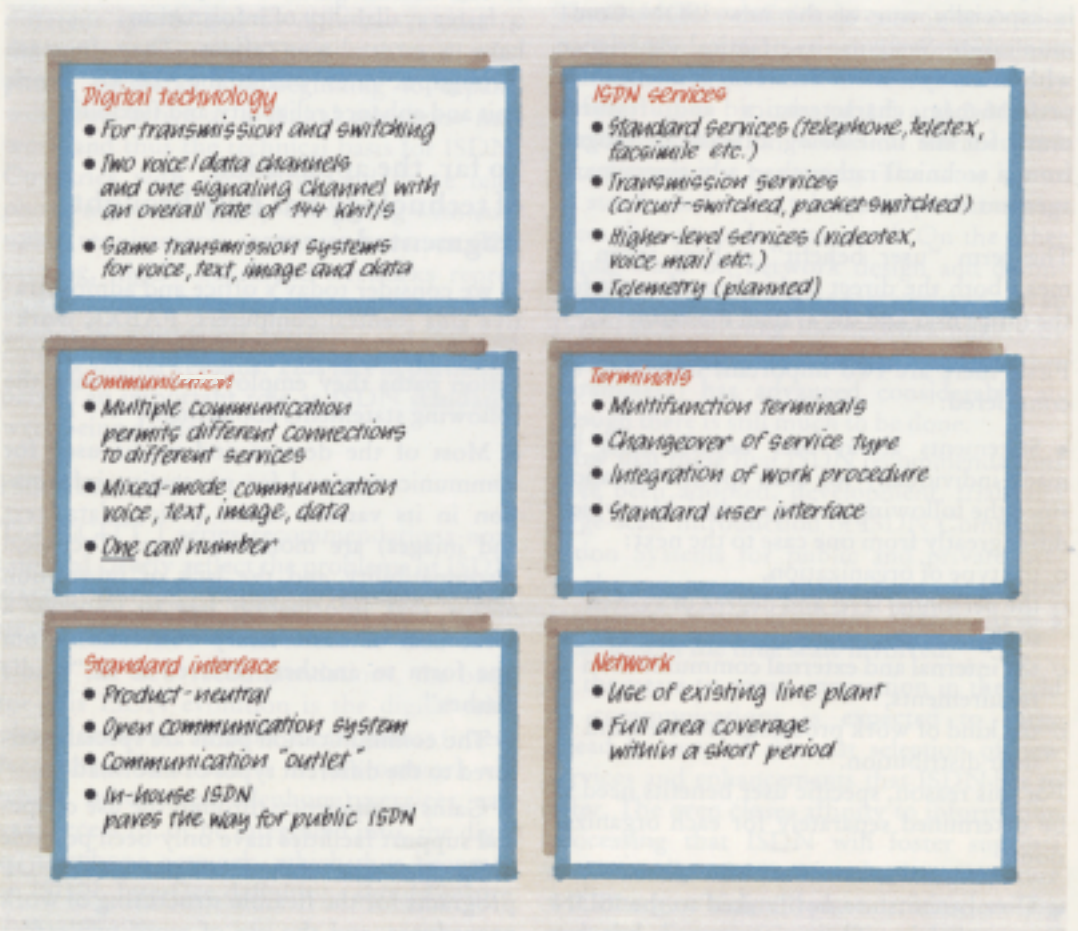● terminal-to-terminal digital technology, for both transmission and switching,

Digital technology
- For transmission and switching
- Two voice / data channels and one signaling channel with an overall rate of 144 kbit/s
- Same transmission systems for voice, text, image and data

ISDN services
- Standard services (telephone, teletex, facsimile etc.)
- Transmission services (circuit-switched, packet-switched)
- Higher-level services (videotex, voice mail etc.)
- Telemetry (planned)

Communication
- Multiple communication permits different connections to different services
- Mixed-mode communication voice, text, image, data
- One call number

Terminals
- Multifunction terminals
- Changeover of service type
- Integration of work procedure
- Standard user interface

Standard interface
- Product-neutral
- Open communication system
- Communication "outlet"
- In-house ISDN paves the way for public ISDN

Network
- Use of existing line plant
- Full area coverage within a short period

Fig. 1   Technical aspects of the ISDN

o two 64-kbit/s voice and data channels and a powerful 16-kbit/s signaling channel,

o the same transmission path for voice, data, text and images.

Communication

o Multiple communication allows connections to be set up simultaneously via different services to different users.

o Mixed-mode communication allows data, texts or images to be transmitted to the same user alongside simultaneous voice transmission.

o *One* call number for each user for *all* forms of communication.

Standard interface

● The ISDN standard interface is totally neutral as regards product manufacture.

o ISDN systems are "open" communication systems.

o The "communication outlet" will become a reality.

o In-house communication systems and public systems will coalesce to form a single, unified network.

Services

The ISDN service spectrum includes:

o the *standard services* "telephony", "telegraphy" (teletex means texts of correspondence quality) and "telefax" (facsimile transmission),

o *data transmission services* with access to circuit-switched and packet-switched data networks,

o *higher-level services* such as "videotex" (Vtx) and "electronic mail" for voice and text messages,

o *alarm and monitoring services* are scheduled to be introduced at a later date.

Terminals

o It will become possible to develop and produce new types of multifunction terminals in large quantities, and hence at acceptable prices.

o Users will be able to employ these termi-

nals for handling work procedures involving communication *and* data, text, image and voice handling.

o The multiplicity of user interfaces that has always existed among the various terminals will be standardized.

Network

o The existing network of telephone lines will continue to be used.

o The two-wire telephone line will continue to be used for single-mode or multiple communication via the "communication outlet".

o It will be possible for all digital workstation terminals to be combined via this network.

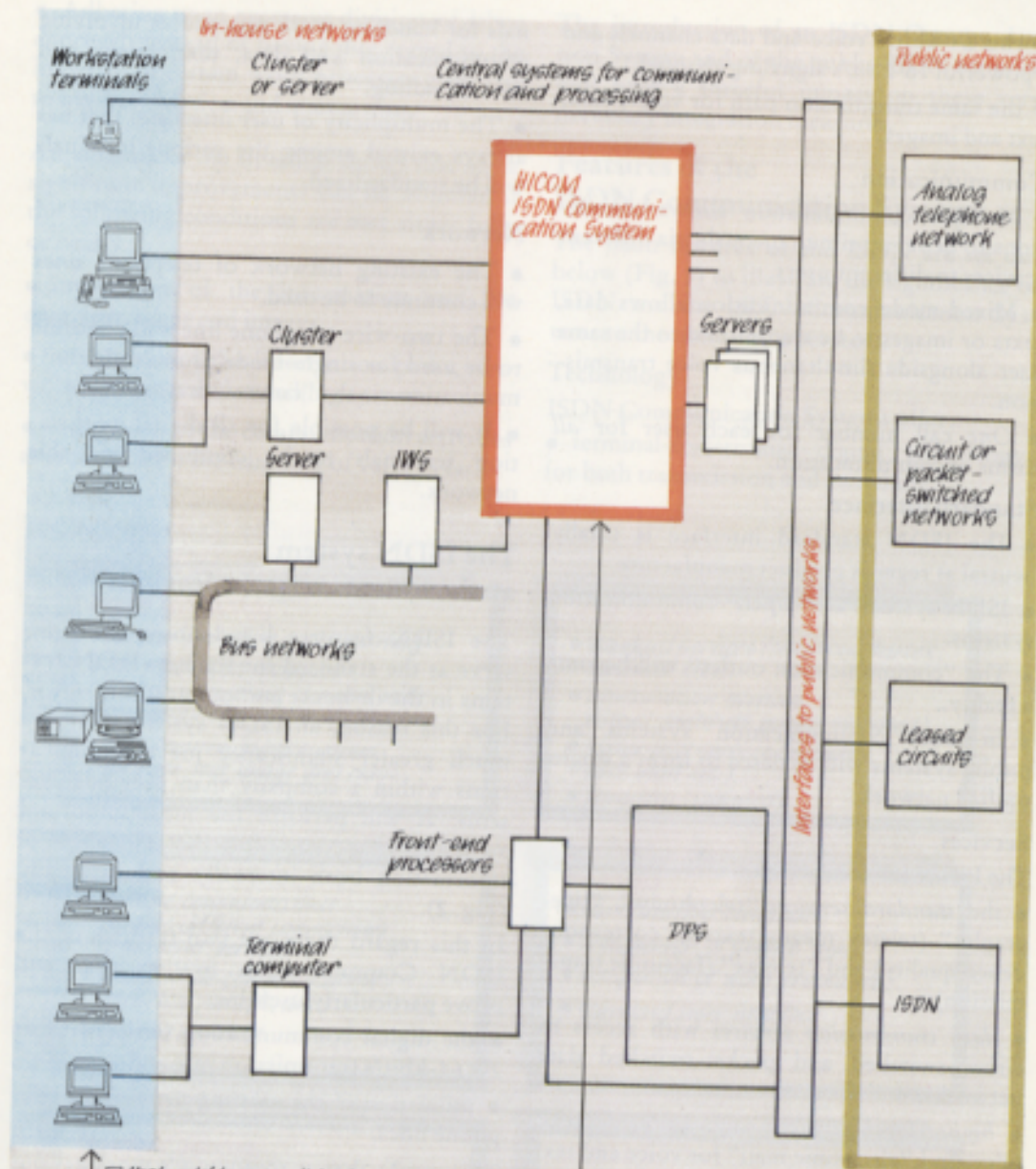## The ISDN system at the hub of communications

The ISDN features listed above will also serve as the standard for the new ISDN systems in the in-house communications sector. For this reason, an ISDN system will have much greater significance for communications within a company than previous systems. It will perform the most important switching functions for the exchange of information both internally and externally **(Fig. 2).**

In this regard there are two features of the ISDN Communication System that will prove particularly useful:

o the digital communication outlet with its $2\times$ 64-kbit/s transmission rate and

o utilization of the existing network of telephone lines.

This means that at tomorrow's workstations it will be possible to use the existing telephone network to connect not just telephone terminals, as is the case at present, but to link terminals of any kind to the ISDN Communication System: personal computers, word processors, videotex terminals, data terminals and workstation systems.

As a result, the need for separate telephone, data and text networks at the same worksta-

Public networks

Workstation terminals

Cluster or server

Central systems for communication and processing

HICOM
ISDN Communication System

Servers

Cluster

Server

IWS

Bus networks

Analog telephone network

Circuit or packet-switched networks

Leased circuits

Front-end processors

DPG

Terminal computer

Interfaces to public networks

ISDN

□ It should be possible for workstation terminals to communicate
- with each other
- with outside parties
- with ISDN services
- with central computers and servers

□ Different communication relations and forms of communication (mixed-mode communication) should be possible
- simultaneously
- alternatively

via the "communication outlet"

□ ISDN Communication System
- links up terminals, clusters, servers
- transmits information at high speed
- permits mixed-mode communication
- links up to public communication networks and connects computers, LANs, clusters and servers

tion will largely be eliminated, as the connection and transport requirements can all be taken care of by the ISDN Communication System.

This is not to imply that in the future all terminals will have to be connected up via the ISDN Communication System. There will continue to be data networks and local area networks (LANs), and it will still be sensible for users who work mainly with VDUs or specialist workstation systems to be connected directly to the DP system or LAN.

But in cases where only occasional database interrogation or videotex dialog is required, users will in future be able to choose whether or not to specially install an additional line network, since the telephone line will be there anyway.

Those responsible for organizing communications will have a more challenging task, because in future they will not only have to establish which particular device is best suited to each workstation's needs, but also which is the best and most cost-effective communication link.

User benefits at the workstation

The main features of workstations that will be affected by the introduction of the ISDN are

o communication,

o procedure handling and

o document filing and retrieval.

The ISDN Communication System will have a very significant impact on all of these activities.

Communication

o *Mixed-mode communication* will permit simultaneous use of voice and non-voice services.

It will be possible, for instance, for facsimile transmission to take place while a telephone

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◄ **Fig.2   The ISDN Communication System at the hub of in-house communications**

call is in progress, or for the contents of a screen to be sent to the other party (display copy). In this way, telephone calls can be supported by the transmission of additional information in the form of data, text or facsimile. This is an enormous improvement on the way procedures of this sort are handled today.

o *Multiple communication* will allow simultaneous connections to be set up to different users or services.

For example, it will be possible during a telephone call to access a database or a private or public videotex center and call up information that may be important for the call.

o *Interworking* will permit interfacing between important services to increase the availability of communication partners.

Thus a letter arriving by teletex is converted into a facsimile and printed out on the recipient's facsimile terminal if that is all he has.

o *Mailbox and addressing services* will store text and facsimile information and ensure fast distribution.

o *Voice mail services* will allow voice messages to be produced and distributed quickly and increase user availability.

o The *standardized user interfaces* not only will reduce the initial orientation period but will also result in fewer operating errors and make it easier for users to

o set up connections,

o change between different forms of communication and

o implement features such as:
   automatic callback, speed calling, call pickup, call forwarding etc.

o There will be an improvement in the *transmission quality* of the switched information.

o Screen-support functions will reduce the *search time* for call numbers and the connection setup time.

o Higher *transmission rates* will reduce the waiting times. For example, at a rate of 64 kbit/s it will only take about **1 s** to transmit a page of A4.

Procedure handling and information filing or retrieval

● Because of faster and improved access to information stored in the communication system or host computer, task-handling procedures that can be supported by workstations with ISDN capability will also be greatly speeded up.

As well as faster connection setup times and higher transmission rates, coupled with faster screen generation times, support from mixed-mode and multiple communication will be of decisive importance in this regard.

In addition, "filing and retrieval" procedures will be considerably shortened due to standardized document structuring and document exchange (see "User benefits resulting from the incorporation of the HICOM ISDN Communication Systems in the Siemens office architecture").

Use can be made of all these advantages of ISDN Communication Systems from workstation to workstation within a company or authority even *before* the public ISDN is introduced.

User benefits for the company

User benefits at the workstation are not the only advantages to be gained from employing an ISDN Communication System. If we view the company as a whole, there are numerous other benefits:

● *One switching system*
In contrast to today's specialized switching systems for voice, text and data, a *single,* common switching system for data, text, voice and image is usually all that is required for the ISDN Communication Systems.

Apart from the reduced space requirements, the advantage of a single system is that the cost of administration and maintenance is less than in the case of conventional approaches.

● *One network*
All the various forms of communication can take place via one and the same network.

And it should be emphasized that there is no need to install new line plants as the existing telephone network can continue to be used. Added to this, there is the possibility of gradually substituting present-day "special-purpose networks" (data and telex networks and also, to a degree, the bus network).

● *Communication outlet*
The "communication outlets" that will be provided at numerous points throughout the in-house network area will put an end to the tight locality constraints imposed on terminals at present. If, for example, terminals need to be rearranged because of changes in the volume of information or in work procedures, it will be just as easy to relocate ISDN terminals from one communication outlet to another as it is to move a desk lamp or daylight projector to another room.

● *Multifunction terminals*
Integrating the various forms of communication in a single network will allow new types of multifunction terminals to be developed (**Fig. 3**). As these terminals bring together processing and communication functions that used to be separate, the shared use made of their components (memory, screen, processor etc.) will make them cheaper than the several monofunctional terminals previously required. Moreover, this downward price trend is sure to be encouraged by the anticipated reduction in per-unit costs resulting from higher production.

● *Flexibility and future-proof design*

Since organizations are becoming increasingly more dependent on electronic switching and transmission capabilities, it is extremely important to meet all the requirements placed on the system as regards availability, traffic-handling capacity and transmission reliability. Another decisive factor is the certainty of being able to adapt to new tasks and changes in the volume of communication activity.

In this connection, the modular system architecture of the HICOM ISDN Com-
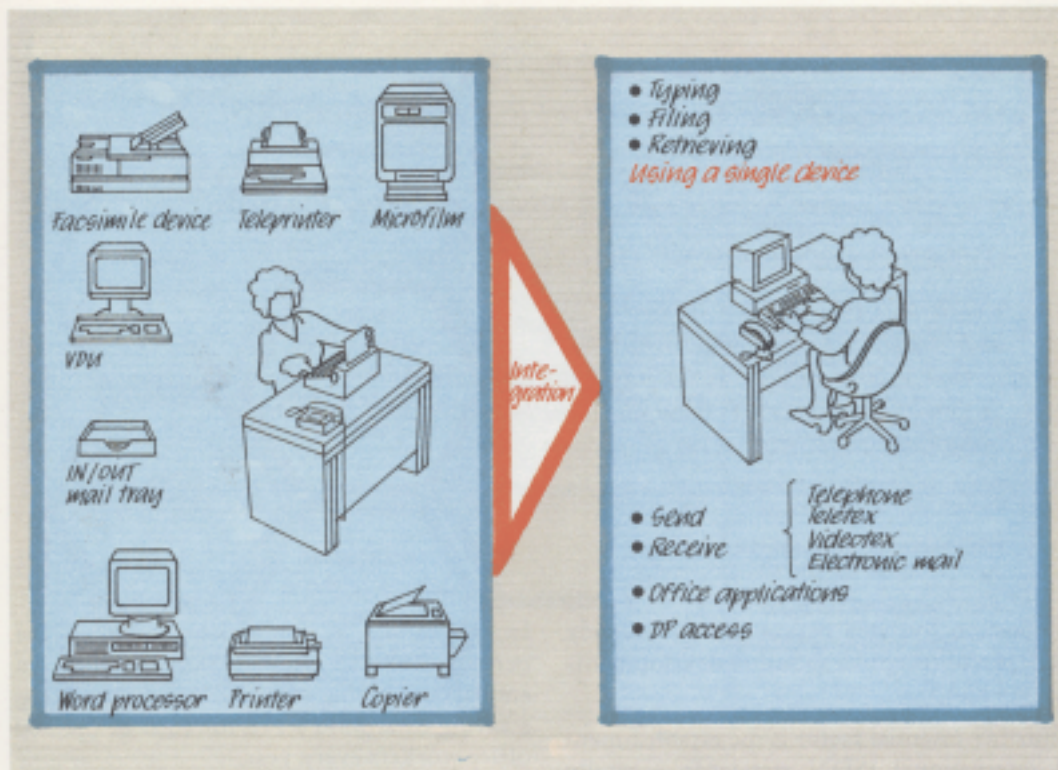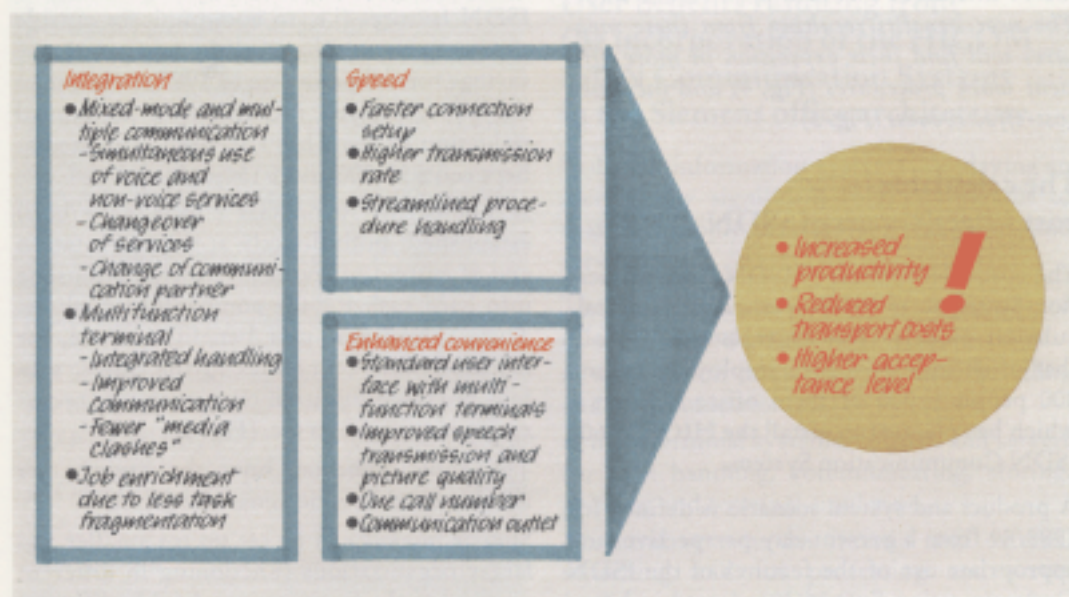
Fig. 3   Multifunction workstation system

Fig 4   HICOM for **enhanced** work procedure

- One system for voice, text, image and data
- Multifunction terminals for different forms of communication
- Standardized user interface
- One call number, one line and one network for different services
- One network administration, one service
- Increased productivity through
  - integrated processing facilities
  - faster and higher-quality communication
  - smooth changeover from/to communication and processing
  - higher acceptance level

Fig. 5   **HICOM** for greater cost-effectiveness

munication Systems makes them extremely flexible and receptive to future developments (Figs. **4** and **5).**

A further essential factor is the establishment of international ISDN standards − vitally important for communication on a global scale − and the definitive, product-neutral ISDN interfaces that will ensue from these. *The user benefits resulting from these measures will find their expression in more efficient work procedures (Fig.4) and increased cost-effectiveness (Fig.5).*

The calculable cost-effectiveness of ISDN

The cost-effectiveness of ISDN Communication Systems can be demonstrated using calculation models. The example used here is that of an industrial firm employing around 800 people − 300 of them office workers − which has planned to install the HICOM 600 ISDN Communication System.

A product and system scenario is defined for 1988/89 from a present-day perspective, and appropriate use of the features of the ISDN Communication System is assumed in keeping with the task and personnel structure.

In the model, a comparison between the periods 1984185 and 1988189 shows an annual cost saving of $230,000, representing a saving of around $770 for each of the 300 office workers every year.

As the public ISDN is not expected to be introduced until *1987188,* before which time it will not be possible to make full use of the ISDN features (i.e. to communicate outside the company and beyond the local area), the savings for the period up to 1987 are less than the above figures. Nevertheless, the annual reduction in costs has still been estimated at between $95,000 and $150,000.

A number of beneficial effects have been established, both directly at the workstation and at system operator level, which translate into hard cash for the company as a whole. These measurable user benefits include, for instance, time economies in the office, savings in communication charges, lower recurring operating costs etc. (Fig. 6).

The **table** indicates how the savings are achieved and in which cost categories.

Similar models can be set up for smaller and larger organizations functioning in different sectors of the economy and with different structures.
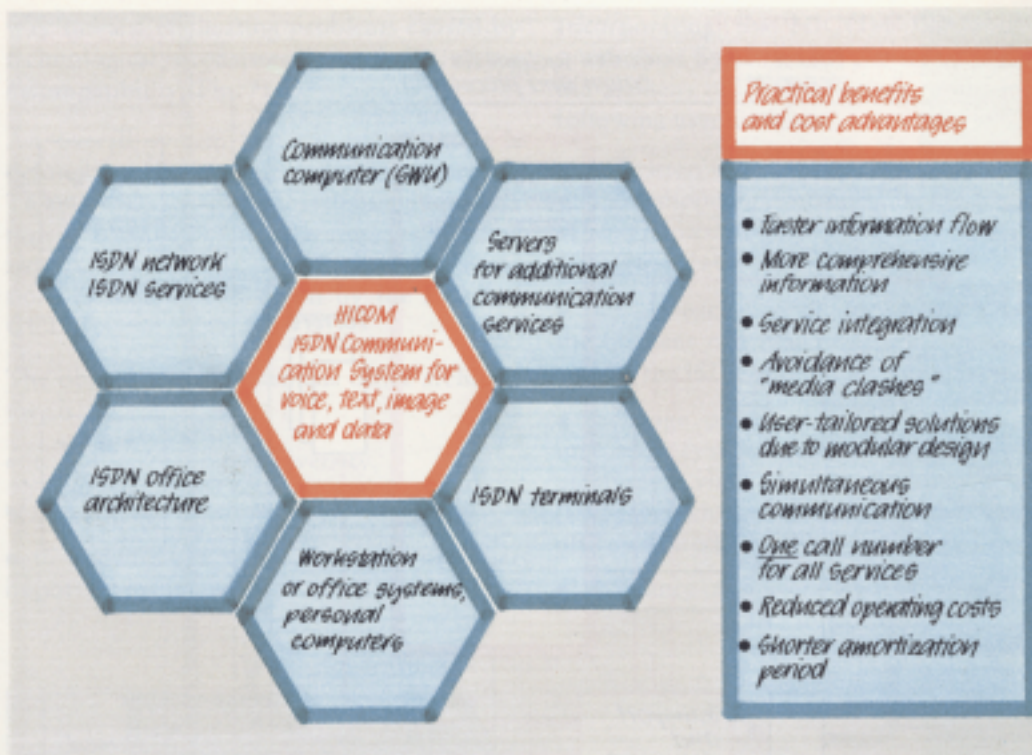
Fig. 6   Practical benefits and cost advantages of HICOM

• handling of all communication procedures at the ISDN multifunction terminal	$ 58,000	(25%)
• Mixed-mode and multiple communication	$ 48,000	(21%)
• Communication service for voice mail (voice mail server)	$ 18,000	(8%)
• Communication service for text and facsimile (text/fax server)	$ 46,000	(20%)
• Operating costs	$ 30,000	(13%)
• Charges	$ 30,000	(13%)
	$ 230,000	(100%)

User benefits resulting from the incorporation of the HICOM ISDN Communication Systems in the Siemens office architecture

In-house information systems are playing an increasingly significant role, comparable to that of a supply network for vital goods and services.

The individual components of an optimized information supply system are:

• workstation terminals for task handling and communication,

• multiterminal systems, clusters and servers for task handling, communicating, storing, printing and terminal emulation,

• central systems for internal and external switching and for processing and server facilities, namely ISDN Communication Systems and DP systems,
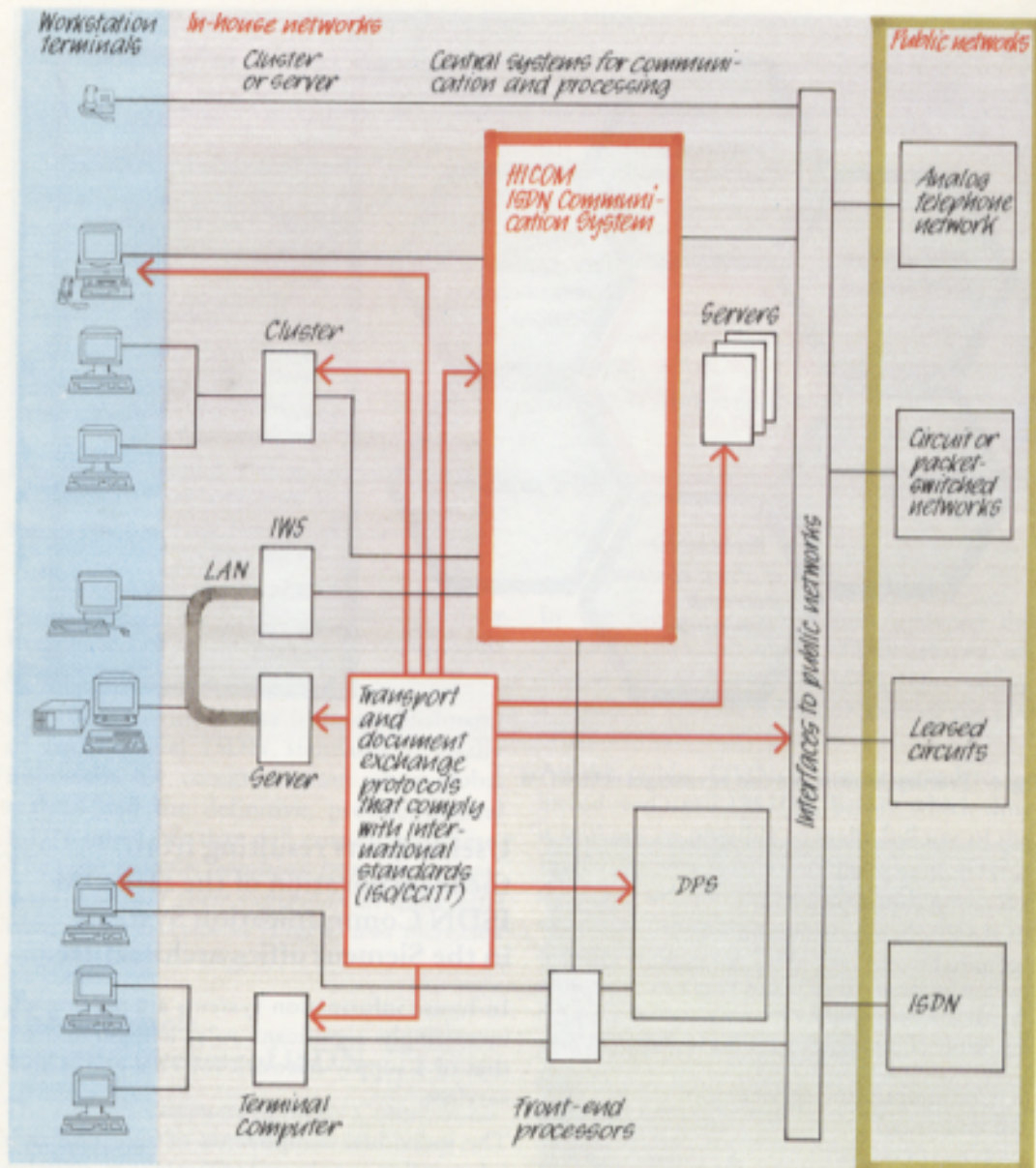
Fig. 7 Product and system scenario of the Siemens office architecture

LAN   Local area network

• in-house communication networks, local area networks (LANs) etc.

The benefits to users and organizations outlined above will be increased still further once the ISDN Communication System and

the components that operate with it have been integrated into a

• definitive and
• internationally standardized

overall system concept. This will go a long

way toward eradicating problems caused by technological inconsistencies and eliminating incompatibility (**Fig. 7**).

An overall system concept of this type is defined by the Siemens office architecture. This is a set of rules for defining product types, terminal configurations, user interfaces and protocols, based on the international standards laid down by the ISO and CCITT.

The objective of the Siemens office architecture is:

• to minimize product diversity,

• to maximize networking capability and

• to accommodate the interfaces of other important manufacturers.

Incorporating the HICOM ISDN Communication Systems into the set of rules for the Siemens office architecture results in the following user benefits:

• utilization of the ISDN features for all the other components included in the Siemens office architecture, such as DP system, servers, terminals etc.,

• flexible exchange of documents between the Siemens office architecture components and via the ISDN Communication System,

• exchange of information with the most important systems produced by other manufacturers via the interworking services (IWS), which are provided in the Siemens office architecture,

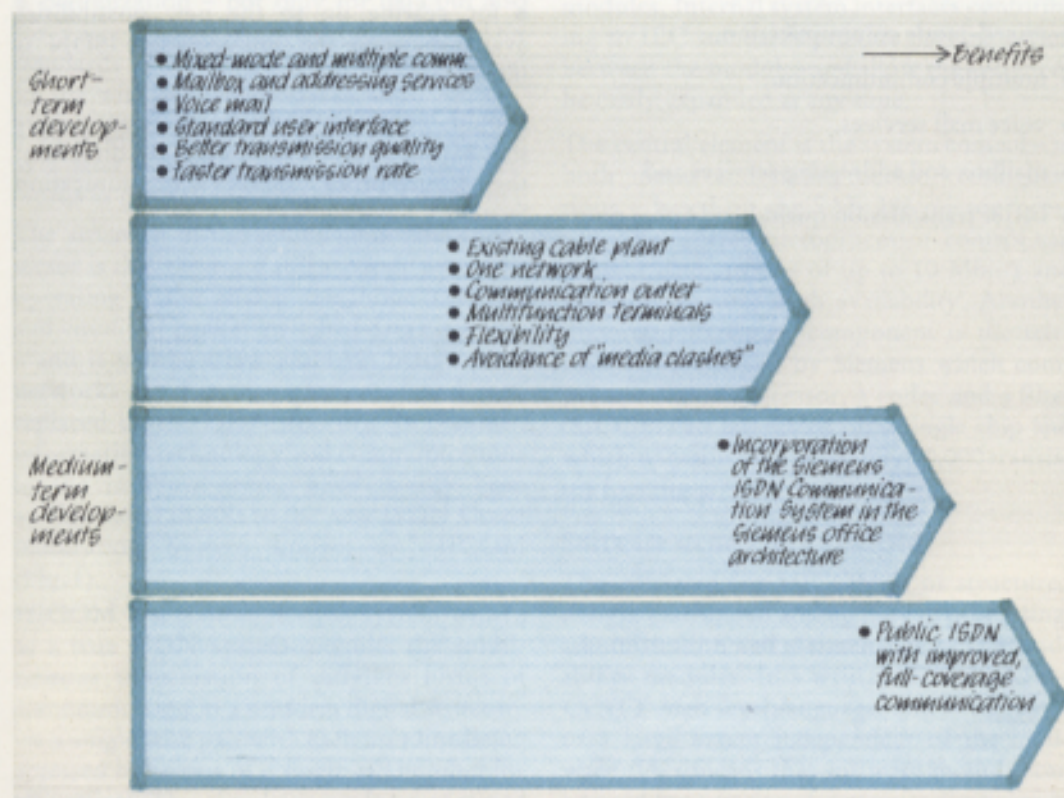• avoidance of unnecessary incompatibility.

Fig. 8   User benefits of the HICOM ISDN Communication System

Other benefits
from the public ISDN network

So far no mention has been made of the user benefits that will arise once the public network with its transmission rate of 144 kbit/s is available on a full-coverage basis. When that time comes, all the components required for communication procedures between ISDN system users in, for example, New York and Munich, namely

o terminals,

o in-house ISDN Communication Systems and

o public switching facilities

will operate using the same standard digital technology and with standard interfaces.

This means that the benefits of improved in-house communication, such as

o mixed-mode communication,

o multiple communication,

o voice mail services,

o mailbox and addressing services and

o better transmission quality and faster rates,

can then be extended to communication with partners outside the organization.

Furthermore, these features and advantages will then also be available to ''small'' companies and branch offices that do not operate their own in-house ISDN network but communicate via the public ISDN network directly from their main station.

Now is the time to secure
the future of telecommunications

Fig. 8 sets out the advantages of the Siemens HICOM ISDN Communication System. These advantages

o for communication and task-handling activities at the workstation,

o for the operating company's organization,

o for the evolutionary development of the in-house communication scenario and

o for gearing up to the new possibilities available when the full-coverage ISDN is introduced

should convince today's decision-makers that HICOM is a step in the right direction: the future-proof ISDN Communication System.