WESTERN EUROPEAN

ELECTRONIC INFORMATION SERVICES

1990 - 1995

INPUT

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Abstract

Electronic information services (EI) has emerged as an area of increasing focus and interest for many organisations. This report is INPUT's latest evaluation of this important and complex market sector in Western Europe.

The report provides an assessment of the current size of this market and a forecast of its growth through 1995.

The overall market is analysed by country market size and by cross-industry sector. Also included are commentaries on the competitive environment, including identification of the leading vendors in the market and the major development forces that are driving market growth.

A technology perspective is included showing the impact of the emerging mobile radio technology on the development of the electronic information services sector.

The report is 111 pages long and includes 42 exhibits.

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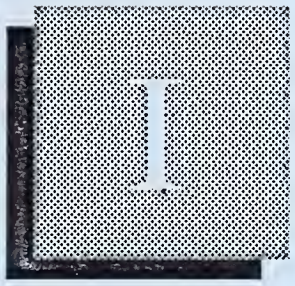
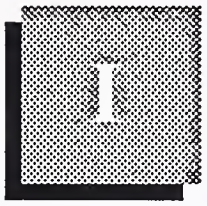
Exhibits (Continued)



Introduction



Introduction

A Objectives

This report, part of INPUT's Network Services Programme for the computer software and services industry, examines the Western European market for electronic information services from 1990 to 1995.

The electronic information services (EI) market is a key growth area in Western Europe, as the need for faster, more accurate information is required by companies seeking to compete in the evolving single European market.

The electronic information services industry has been constantly growing over the past five years, with many sectors of the industry experiencing growth rates in excess of 20% per year. In addition to this, new technologies such as optical media, artificial intelligence, and broadcast, mobile and satellite technologies will impact the electronic information services market dramatically over the forecast period.

Intensification of competitive forces within the industry and the strategic changes taking place in the financial services segments are causing vendors

- To reassess their strategies with regard to pricing, distribution and promotion of their products.
- To develop joint ventures and alliances.

The primary objectives of this report are to:

- Provide a quantitative assessment of present and future electronic information services markets based on estimates and forecasts of end-user revenues.

- Provide a qualitative assessment of the underlying forces shaping these markets and the surrounding competitive environment.

- Identify the technological and strategic issues that will impact the electronic information services market between 1990 and 1995.

The scope of this report covers the electronic information services markets in the U.K., France, Germany, Italy, Benelux, Scandinavia, Spain and the rest of Western Europe. INPUT's forecasts include purchases in Western Europe of data from international on-line vendors. Revenue to domestic vendors from sales abroad of electronic information services is excluded. Forecasts are derived from the corporate end-user expenditures on electronic information services.

B

Methodology

This report has been compiled through a series of interviews with selected Western European vendors, industry experts and users, as well as reviews of vendor-produced literature.

Interviews were conducted either in person or by telephone with leading vendors active in the electronic information services (EI) market. Leading EI vendors appear in Appendix A.

Revenue forecasts are based on end-user expenditures on electronic information services by industrial companies and financial institutions. These services consist of:

- Leasing and royalty payments to electronic information service providers

- Expenditures on access to electronic information services and related services, as paid to electronic information services vendors

C

Report Structure

This report examines the electronic information services industry in the following sections:

Chapter II is an Executive Overview that provides a summary of the essential points of the entire report.

Chapter III sets out INPUT's definitions, and general background material on the industry.

Chapter IV provides INPUT's estimates and forecasts of user expenditures on electronic information services, broken down by country market and by cross-industry sector, examining the industry structure and reviewing key market developments in Western Europe.

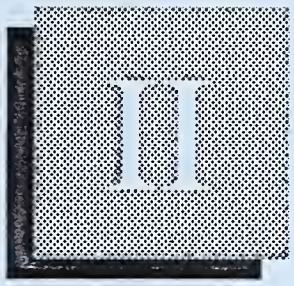
Chapter V examines the key economic and market-related issues affecting the electronic information services sector.

Chapter VI considers the communications background and regulatory environments associated with recent developments in the mobile communications area, which could have long-term impact on the EI sector.

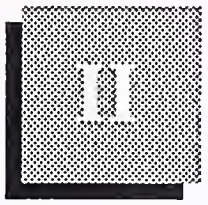
Appendix A includes INPUT's definitions.

Appendix B contains the exchange rates and inflation assumptions used in the market sizing and forecasting for this report.

Appendix C includes listings of the major Western European database hosts and producers.



Executive Overview



Executive Overview

A

Electronic Information Services Market

The electronic information services (EI) market is highly specialised, with computer and communications technology becoming less critical as the information and associated added-value services become more dominant through specialisation, joint ventures and new media.

There are around one million users of electronic information services in Western Europe, with a wide cross-section of user types and activities. The financial, business, professional and industry-specific sectors are the most widely used. The news and economic sectors are the least used. EI users typically access the vendor of choice via ordinary telephone lines through a modem attached to a microcomputer or ASCII terminal.

The number of electronic information services has been growing at over 20% per annum in the past five years; there are now approximately 1,000 databases produced in Western Europe alone. This number continues to increase, although, given the small number of subscribers to particular services, the newer services tend to be industry-specific and tend towards narrow market segments. New electronic information services are still viable business opportunities, since they can be offered at premium prices. Services combining the use of proprietary analytical software with access to one or more databases, are particularly interesting as opportunities. There are around 100 on-line vendors reselling the data of over 1,000 publishers.

The leading electronic information services publishers—Dialog, Dow Jones, Reuters, and Mead Data Corporation—are still only tapping into a small market in proportion to the number of personal computer users in Western Europe. There are close to 30 million personal computers in use. The Western European electronic information services market is worth well over $2 billion but has considerable potential for growth, implicit in this large, and still growing, installed base of end-users.

In addition, the advent of CD ROM and optical technology disks, attached directly to PCs and able to store thousands of pages of text and data, is likely to supplement the current base and attract new subscribers in the non-real-time sector of the market.

Exhibit II-1 summarises the key statistics of the electronic information services market.

EXHIBIT II-1

Electronic Information Services Industry, 1990 Western Europe

- 1 million users
- 1,000 databases
- 100 on-line vendors
- Over 1,000 publishers
- $2.7 billion market
- 19% growth forecast

B

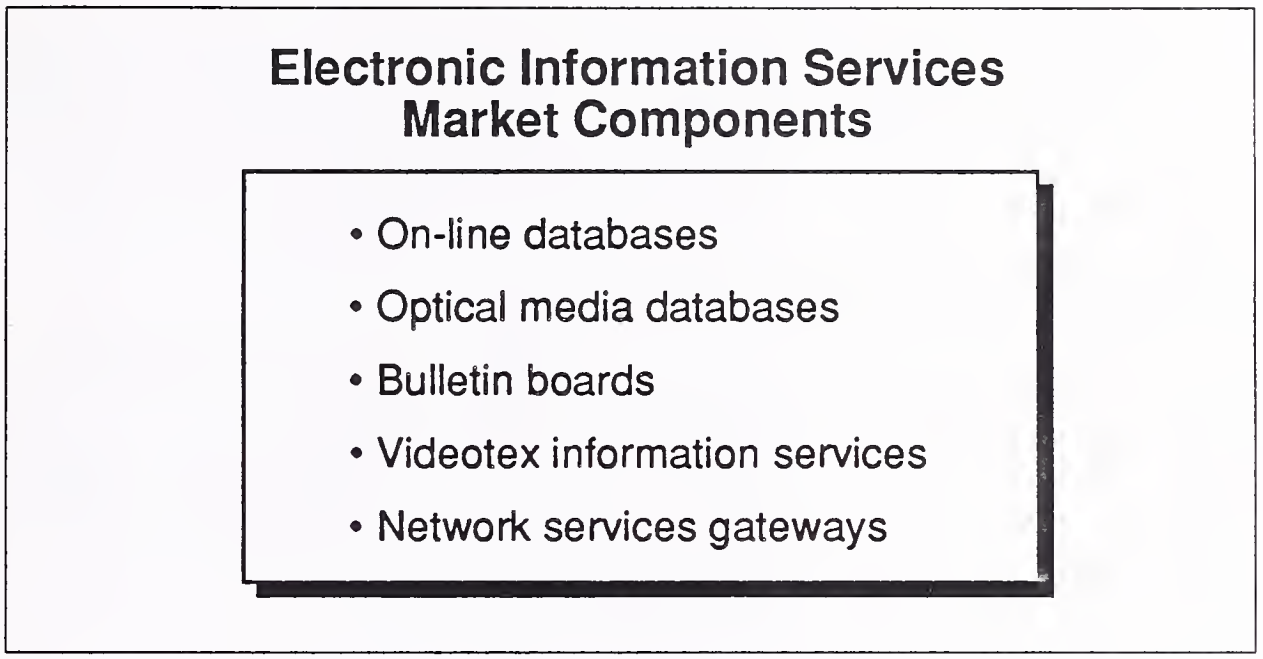
Market Components

Electronic information services is the term INPUT uses to describe the full range of user-accessible computer-based information services. These are listed in Exhibit II-2.

As electronic information is highly fluid, it is not restricted to a single distribution system, and may be transmitted across any number of networks in electronic form. Single sources of distribution offer little economic advantage over multiple sources to the electronic publisher.

This will change with the continuing penetration of CD ROM and the continuing trend to "pay as you view" pricing, while the advent of new technologies such as satellite transmission and mobile data adds to the potential within the electronic information services market. Furthermore, high-volume users are demanding increasingly sophisticated services and are prepared to pay premium prices.

EXHIBIT II-2



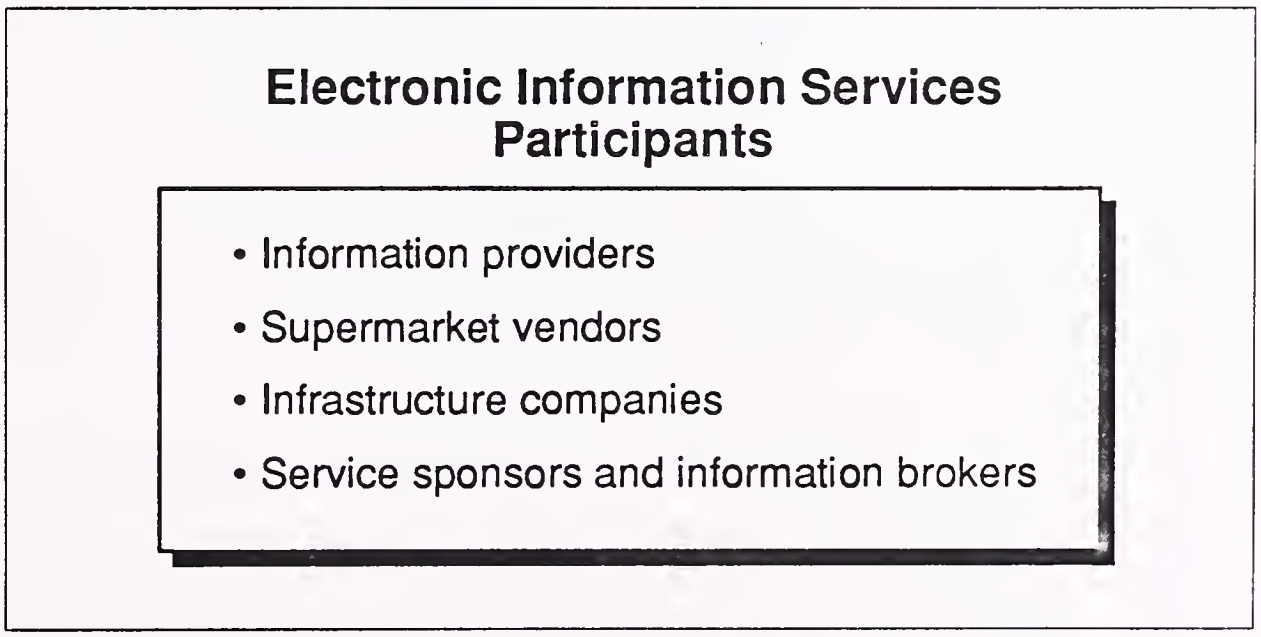
C

Market Participants

There are four major types of EI market participants. These participants are listed in Exhibit II-3. Each has a different set of strategic objectives:

- Integrated information providers, such as Dun & Bradstreet and Reuters, and database producers such as Derwent Traditional Publishers, have a potential problem in that electronic information services will affect print revenues. With the decline in distribution costs, publishers are obtaining more independence from systems vendors. In order to combat this threat, these companies are continuing to develop their own electronic services.

EXHIBIT II-3



- Supermarket systems vendors, such as Dialog, Data-Star and Pergamon, are finding their revenues being squeezed from three directions: firstly, by the publishers who are increasingly able to bypass vendors and sell directly to users; by competing vendors with similar or the same products; and by infrastructure companies and service sponsors who are entering the electronic information services market.

- Infrastructure companies, such as the PTTs, are looking for new ways to stimulate demand for their core services. These companies face competition from other infrastructure companies, and problems with the hitherto uncertain regulatory environment in Western Europe. They also know very little about the EI market but can obtain market share through acquisition.

- Service sponsors and information brokers seek to use electronic information services to add value to vertical market businesses. These service sponsors and brokers in effect constitute a "second tier" of information providers with more freedom to innovate than traditional publishers.

D

Market Factors

The EI market in Western Europe is a buyer's market, in that supply exceeds demand. As a consequence, vendors are keen to expand their market beyond the small core of heavy users. Vendors are attempting to attract more customers with features that make access and use more attractive. These include network gateways, thematic bundling of databases, new and innovative price structures software and training courses. These factors are listed in Exhibit II-4.

The consumer market success of Minitel in France, and professional videotex in certain niche areas throughout Western Europe, are indications that electronic information services have latent mass appeal and that the market structure will develop further.

The real-time financial sector, whilst still a lucrative and expanding market, has experienced price erosion and lower profitability due to intense competition in niche markets. Survival in these markets will belong to the lowest-cost producers, and advertising or commercial sponsorship is inevitable.

The movement towards the single European market and the proposed deregulation of telecommunications prior to 1992 will further open the European market to information providers and database producers via the European Commission (EC) ONP initiatives. The successful extension of the EI market rests with the EC, national governments and the PTTs, focusing on issues such as regulation, monopoly, cost-based charges and transborder issues.

The advent of optical storage media, such as CD ROM, will alter the user's economic relationship with databases, enabling users to avoid the "pay per view" pricing associated with remote on-line databases. In addition, there are other technologies that hold promise for the on-line industry. For example:

- Massively parallel front-end processing combined with AI templates to supplement keyword searching.
- The emergence of image-based databases using photovideotex and ISDN technologies.
- The introduction of "hypermedia"-like non-sequential text-organising capability.
- Satellite transmission technology.

EXHIBIT II-4

Market Factors

- Market structure deepening
- Commercial sponsorship
- New pricing methods
- Single European market
- Optical storage media
- "Value added" bundling with software and training

E

EI Market, 1990-1995

The electronic information services industry, although essentially a somewhat traditional sector, is facing a period of rapid change, due primarily to

- Mergers and acquisitions,
- New entrants,
- The challenge from the network service providers,
- The maturing of a number of new technologies.

Exhibits II-5 and II-6 show INPUT's five-year forecasts for the European EI market by country market and by application sector respectively.

EXHIBIT II-5

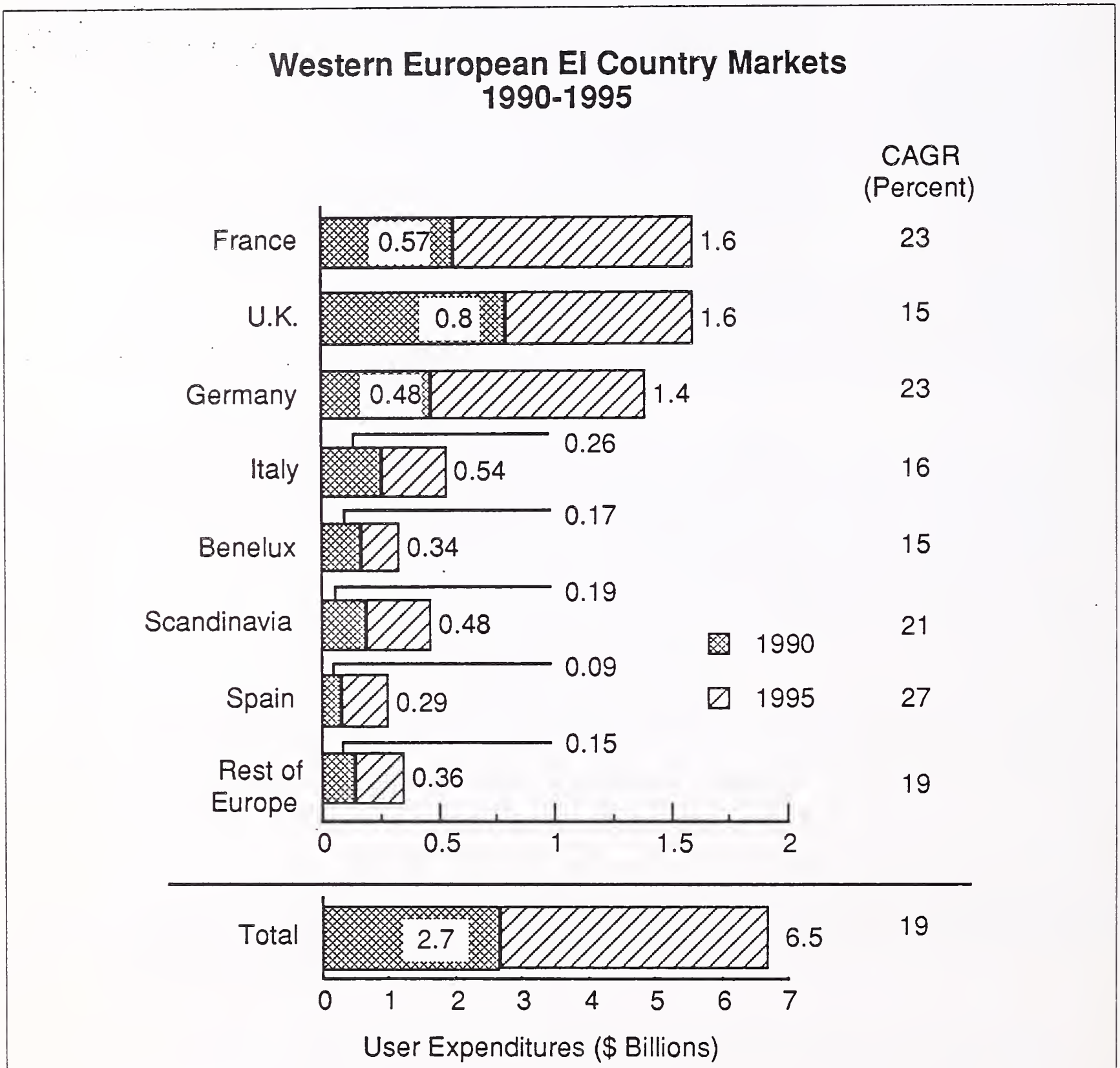
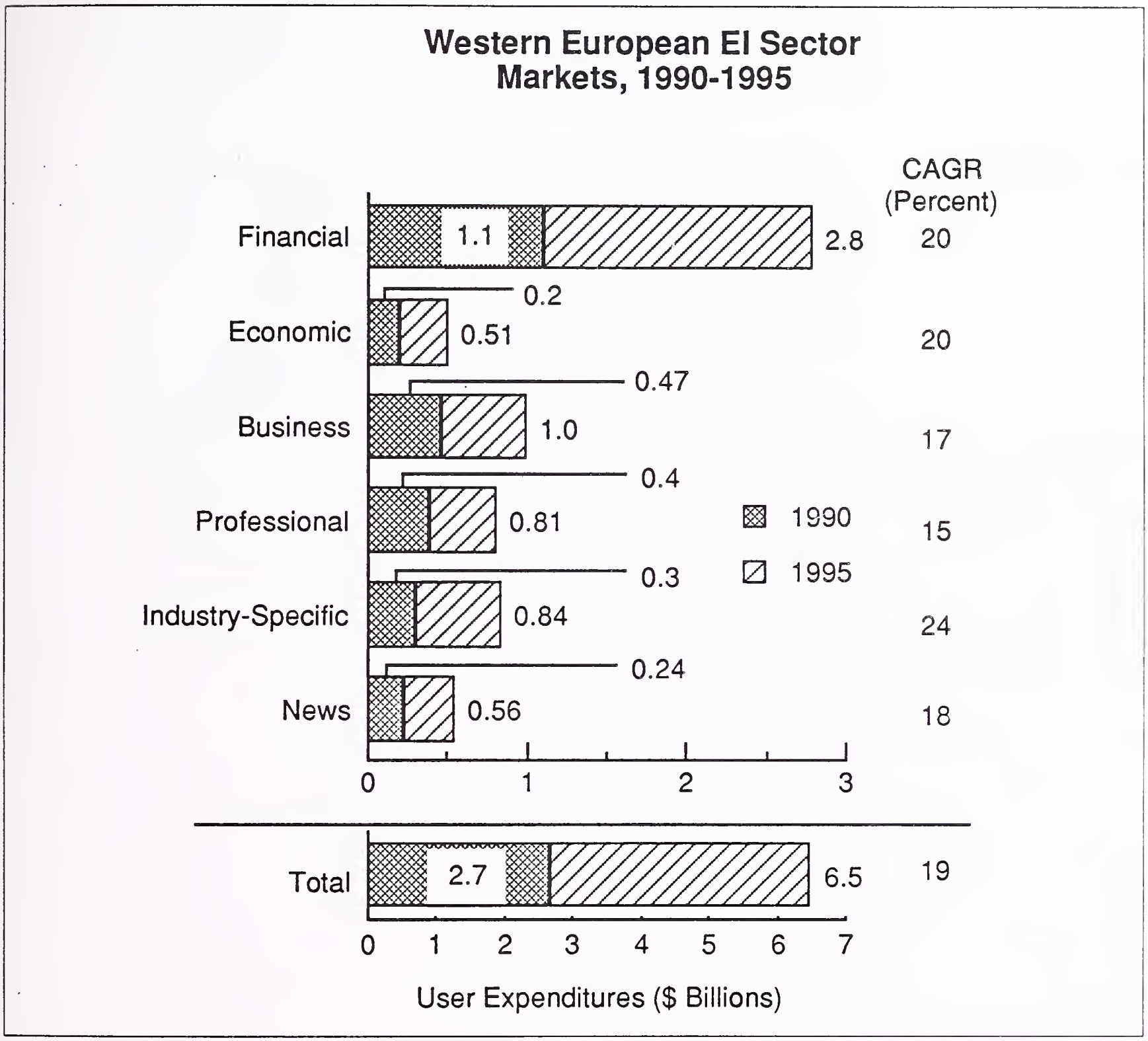


EXHIBIT II-6



The U.K. is the largest single country market, primarily due to the influence of London as a world financial centre. France and Germany will experience high rates of growth as will Italy, which is currently the largest market for CD ROM.

Whilst the financial sector remains the most dominant, there will be rapid growth in industry-specific sectors, as applications such as EDI are applied as information drivers. However, it will be new applications and new media which will be prime generators of this growth, as will the availability of on-line consumer and commercial information through services such as Teletel in France and Bildschirmtext in Germany.

The Western European electronic information services market is expected to grow at a compound annual growth rate of 19% over the next five years. The real-time financial sector remains dominant, whilst in the textual information field, the established vendors are being challenged by the CD ROM publishers and providers of digests and historical information.

F

Strategic Perspectives

The central strategic issue for information providers is to lose their defensive fear of the erosion of their print media by electronic information services. A fresher, more assertive approach can be achieved by adopting the following strategies:

- Avoid exclusive deals with systems vendors.
- Develop new distribution channels either independently or through alliances
- Publish on a variety of electronic media.
- Sell electronic services directly to corporate networks.

For systems vendors, the issues are

- Differentiation of service.
- Maintenance of market share.

There are several approaches which would be relevant to systems vendors to differing degrees, depending on their targeted markets. Such strategies would include:

- Eliminating services with low market penetration.
- Bundling services to vertical market sectors.
- Improving and simplifying billing procedures.
- Adding value to products, (analysis, interactive databases).
- Entering into alliances with information publishers and infrastructure companies.

The key issue for infrastructure companies is simple:

- Stimulate demand for core services.

This can be achieved in several ways:

- Encourage the growth of private networks.
- Make acquisitions in order to extend market reach.

For service sponsors and information brokers, the key issues are:

- To maintain presence in their niche markets.
- To add value to vertical market businesses.

INPUT believes this can be achieved by any of the following:

- Underwrite new electronic information services.
- Develop alliances.
- Provide specialised services.

The financial information services market is such a specialised sector that there are strategic issues unique to it. As a highly profitable, specialised niche market, it has become intensely competitive. INPUT makes the following recommendations to vendors of financial information services:

- Exploit opportunities for new adaptive technologies.

- Dominate selected niches via comprehensive service and strategic alliances.

- Develop relationships with software companies.

- Develop customised services.

- Differentiate via service and customer support.

These strategies are all listed in Exhibit II-7.

EXHIBIT II-7

Strategic Perspectives

Information Providers

- Avoid exclusive deals with systems vendors
- Develop new distribution channels
- Publish on a variety of electronic media
- Sell electronic services directly to corporate networks

Systems Vendors

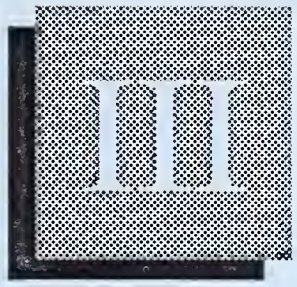
- Eliminate services with low market penetration
- Bundle services to vertical market sectors
- Improve and simplify billing procedures
- Add value to products
- Develop alliances

Infrastructure Companies

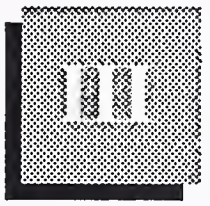
- Stimulate demand for core services
- Encourage private vendors
- Make acquisitions

Service Sponsors/Brokers

- Develop niches
- Underwrite new electronic information services
- Develop alliances
- Provide specialised services



Electronic Information Services



Electronic Information Services

A Market Definitions

The term electronic information services (EI) is INPUT's label to denote the provision of user-accessible computer-based information. Services that now proliferate throughout Western Europe include examples of EI that go beyond the more traditional on-line database services, e.g. videotex services and computer bulletin boards.

As a consequence, the terminology describing participants in the on-line database industry is in a state of flux. Databases that are on-line generally contain machine-readable records available for retrieval via interactive (two-way) telecommunication channels, special software and a computer terminal or personal computer.

With the evolution of information processing technologies, personal computers and powerful workstations are replacing dumb terminals on database users' desktops, whilst large databases can now be delivered to the user's desktop PC without the "pay as you view" on-line charges—via optical storage media such as CD ROMs.

Distinctions between remote databases that are available on-line in the traditional way, and local databases that are available on media that run directly on the user's machinery, are likely to blur over the forecast period as vendors exploit the obvious synergy between frequently updated remote databases and less frequently updated local database media. Service and product mix will become the key differentiators in a future characterised by Europe-wide telecommunications liberalisation.

On-line retrieval of information is the process of accessing a remote computer through a telephone line from a terminal. Hosts are systems vendor organisations which mount databases on a computer and offer them to users on behalf of the database producer. Producers receive a royalty or licence fee, and users are normally charged a combined host and royalty fee per connect hour, plus print charges. The same database is often offered by a number of different hosts. Dialog is currently the host with the largest number of databases mounted, around 500.

The single European market will offer companies the opportunity to reach wider markets. It will also bring all the difficulties attached to trading in foreign territories (e.g., basic unfamiliarity with the commercial practice and the culture). The most successful businesses will be those who start off well-informed. Electronic information services will have a key role in this development process.

There is no shortage of available information; in fact the burgeoning number of electronic information services has led to confusion. Services offered in association with on-line databases can be essentially split into two categories:

- Services for the specialist/professional (e.g., those from Dialog, BRS, Mead).

- General purpose services (e.g., Minitel, Telecom Gold) which include database retrieval as one aspect of the business.

A further segmentation of the specialist market takes place on the basis of user need:

- Specialist/Professional:

  - Information essential to decision making, i.e., real-time financial information systems such as Reuters, Telerate, and Topic.

  - Information valuable to decision making, i.e., industry- or profession-specific databases such as legal (Mead), medical (Elsevier), credit control (Dunsdata), and advertising (MAID).

- General Purpose:

Information useful but peripheral to decision making, i.e., full text or bibliographic, textual databases.

This structure is illustrated in Exhibit III-1.

The most profitable and expanding services within the electronic information services market are those that address the first two areas of need. In terms of subjects, commercial information seems to be more important than scientific and technical information. In terms of customers, it is end users, for example, stockbrokers, and not information intermediaries such as librarians, who have most need for commercial information. Information about money is almost as valuable as money itself.

EXHIBIT III-1

The EI Market by Information Quality

Information Quality	Specialist	Professional	General Purpose
Essential	Real-time financial information		
Valuable		Legal, medical, industry-specific, credit control	
Useful			Full-text, bibliographic

B

Sector Definitions

Electronic information services can be classified in other ways. In terms of data, EI can be split into three categories:

- Word-based (e.g., bibliographic, full-text files).
- Number-based (e.g., statistics, time-series, econometric data).
- Picture-based (e.g., patents, maps).
- Combinations of the above.

Separated by subject matter or by the function of the information, there are further categories:

- Single subject (e.g., legal).
- Multidisciplinary (e.g., chemical and biological data).
- Problem-orientated (e.g., medical research).
- Transaction-orientated (e.g., financial trading).

When classified in terms of delivery modes, there are the following categories:

- Pay-as-you-view on-line databases (e.g., Dialog, Dun & Bradstreet).
- CD ROM (e.g., European Kompass, CIFAR), essentially an off-line delivery mode.
- Information brokers (e.g., Financial Times Business Information Service).

- Public videotex (e.g., Teletel services in France or Prestel in the UK).
- Private videotex or viewdata (e.g., Topic).
- Teletext (e.g., Ceefax).

The types of database can be defined in terms of their sources:

- Corporate databases (usually only for in-house retrieval).
- Government databases (increasingly charged for but still mainly made available free of charge).
- Academic.
- Consumer.
- Commercial/Professional.

INPUT's forecasts of electronic information services revenues are classified into the following sectors. These are:

- Financial (i.e., real-time financial information and historical data concerning money markets).
- Economic (i.e., econometric databases, stocks, bonds, commodities and future databases).
- Business (i.e., business abstracts, demographic, credit checking, market research).
- Professional (i.e., scientific, technical, medical, legal, patents, etc.).
- Industry-specific (i.e., chemicals, pharmaceuticals, petrochemicals, manufacturing).
- News (i.e., abstracts or full texts of newspapers, news services, etc.).

INPUT's forecasts refer to these six key application sectors throughout the report.

C

Marketing Dynamics

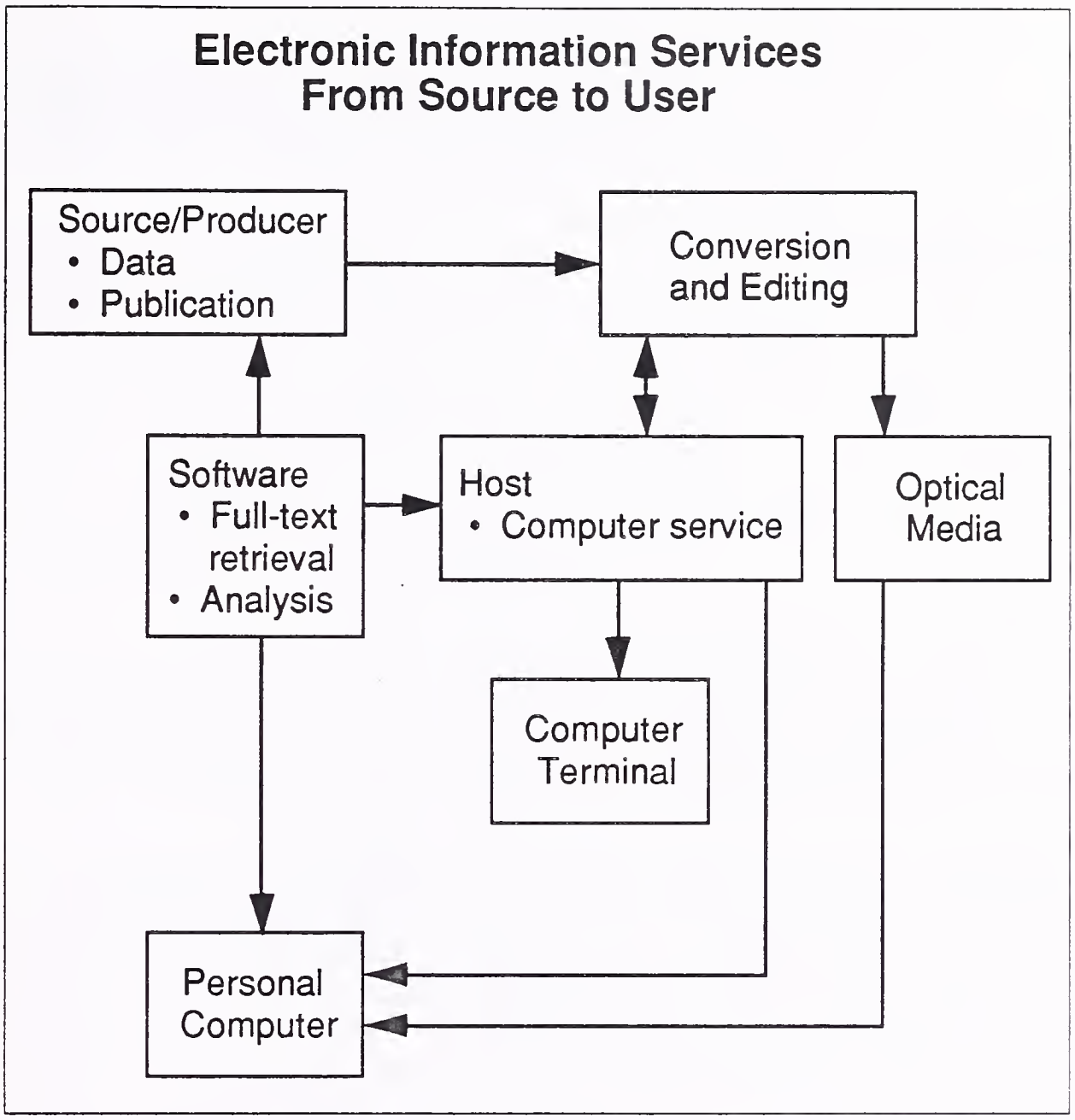
Exhibit III-2 illustrates relationships within the EI market, and the path from source to user. For the user, however there are several factors to take into account before making a decision to use an electronic information service.

For example, whilst all host organisations offer demonstrations, some of the larger ones offer an allowance of free on-line time as part of a standard starter package permitting the user to test the service before signing up. Users will need to do extensive research before host selection. This will include looking at the following items:

- Information content evaluation.

- Cost comparisons between competing services.

EXHIBIT III-2



• Evaluation of the training, helplines, and other support services on offer.

• Ease of searching using the language.

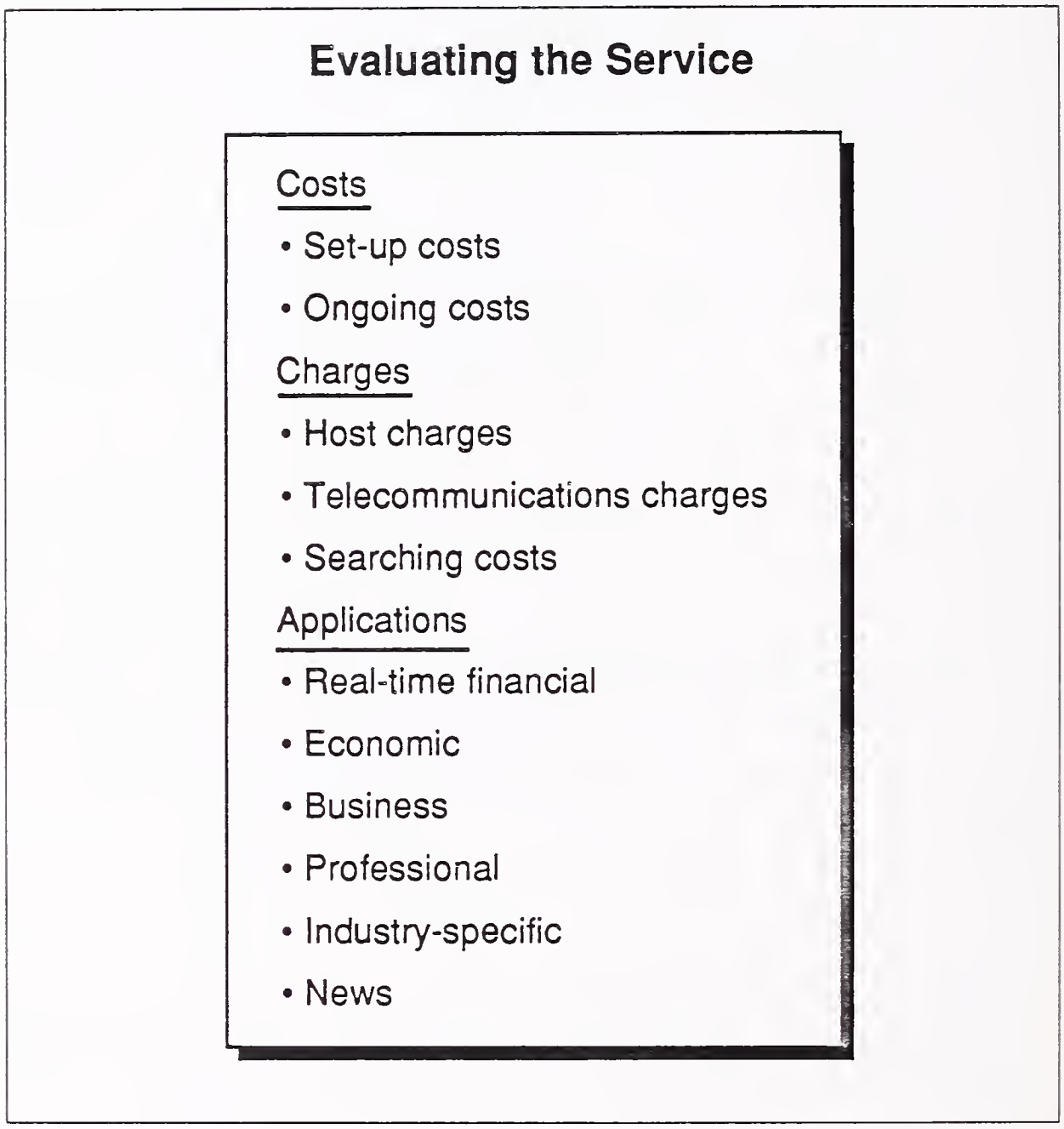
Ease and flexibility of access to results.

Whilst services such as Datastream, Reuters Monitor and Textline offer the facility of a dedicated terminal which can be leased or rented, most users invest in the basic equipment, comprising a PC or terminal, telephone line, modem, printer and communications software. Once signed up, users are issued with a password to allow entry to the service ("logging on"), and an NUI (Network User Identity) giving access to the national telecommunications network through which the service itself is accessed.

1. Cost Factors

INPUT has broken down the factors to be taken into consideration when evaluating a service. These are listed in Exhibit III-3.

EXHIBIT III-3



- Set-up costs - These will include personnel time spent in evaluation and commissioning, the cost of manuals, obtaining a NUI, connection charges sometimes both to access network and the service, and terminal and communications equipment (software, modem).

- Ongoing costs - These include connect time charges and/or annual/monthly subscriptions, printing and data storage charges, telecommunications charges for using the local PSTN and/or the national PDNs, operator costs (including costs of training), administrative overheads and equipment rental (if applicable).

- Host charges - Average on-line connection cost per hour is approximately $100 but can vary between $10 and $300 in exceptional cases. Many hosts such as DataStar and Dimdi charge a separate royalty/ licence fee for accessing certain wellknown databases, whereas others, such as Dialog, include these in the per-hour rate. The majority of supermarket hosts charge on a per-use rather than on a subscription basis. Dun & Bradstreet, when acting as an integrated vendor of its credit files, charges a subscription fee which is calculated on a volume-related sliding scale. In January 1989 ESA-IRS (the host service provided by and for the European Space Agency), started to charge according to the amount of information actually retrieved and dropped all connect-time charges. Average charges decreased and usage increased. This attempt to do away with the discouragement to search further, created by the connect-time charge, has been well received by its user base but not copied by its competitors.

  Off-line prints are cheaper than on-line prints. This involves a request to the host computer to send by mail or fax a printout of the search results printed at the host data centre. Regular search results or file updates may be sent through an SDI (selective dissemination of information) service, but this is always an optional chargeable extra.

- Telecommunications charges - There are a number of different ways of accessing hosts' computers. In the U.K., for example, this can include using one of the Datel services, where data is transmitted either over the public voice telephone network (PSTN), or using a dedicated data communications network such as the Public Data Network (PDN). The International Packet Switching Service (IPSS) allows customers of the PDN to access hosts located overseas. It is currently connected to over 100 networks in more than 70 countries.

Some of the larger hosts offer access through their own private networks, for example Dun & Bradstreet's DunsNet, Dialog's DIALNET and ESA-IRS' ESANET. Telecommunications charges are always additional to the standard search charges.

- Searching - Searching methods vary between different databases and hosts. The usual method of accessing information is by entering keywords and constructing search terms. Training and the use of cheap or free on-line training files are aimed to help users carry out a search in the quickest and cheapest way possible. It is obviously useful to be familiar with the hardcopy version of the database, so the user can anticipate the type of electronic information that will be available. Increased familiarity can make searching much more productive, hence the continuing importance of the professional librarian or information scientist as an intermediary in the access chain.

A database host may have a number of files which could potentially meet the user's requirements when carrying out a particular search. Rather than accessing each one in turn, it is faster and cheaper to cross-search between files, if the host offers this service. The major hosts all offer this facility, sometimes called cluster searching.

There are a number of on-line database directories, such as the services offered by Cuadra Associates, and the European Community Host Organisation, ECHO. These help users identify new and relevant databases for a given subject area.

The main benefits of using an electronic database can be summarised as follows:

- Speed of access (critical in the real-time sector).
- Wide coverage of the available information.
- Manipulability of the information (a key requirement for economic and financial analysis).
- Accessibility at the desk-top.
- Constant updating of the database by an independent organisation.

The not always initially obvious disadvantages with electronic information are:

- The information available will seldom fill the total information need, and supplementary hardcopy material and interpretation will often be required.
- Printed sources are in many ways both easier to use and cheaper.

Whilst some electronic information services (Textline, Datastream, ICC's Viewdata service) are menu-driven and relatively easy to use by an inexperienced user, others like Dialog and Data-Star are best accessed by users who have had the benefits of training and experience in searching techniques.

Although industry-specific databases are strong in some areas such as technology, they still have an enormous way to go before they can be described as comprehensive, and this has so far had an inhibiting impact on the development of the European EI market.

2. Applications

a. Market Analysis

Using market research databases can be a valuable means of identifying previous research which has been conducted in specific areas. Databases such as Findex and Marketing Surveys Index list published research. Predicasts and its subsidiary Infomat are strong in the area of commercial market research in a whole range of industries and geographies.

Research can be focused on specific products; in this area there are a number of patent databases, for example Inpadoc, which contains over 12 million patent documents from 50 countries. Major database providers which offer focused databases include Maid, Dialog, Mead, Data-Star and Pergamon.

b. Industry Analysis

Industry size and forecast data can be obtained through the use of economic services offered by Datastream and other major hosts such as Euromonitor and Maid. There are also specialised industry databases which provide background information, technical information, and news on new products.

Figures can be obtained on industry norms or statistics such as average profit margins and return on capital, through ICC Keynote, Jordan's industry surveys, Dafsa, Datastream, and Industry Performance Monitor. It is also possible to analyse the performance of companies within particular industry sectors—either your own competitors, or all companies listed under a specific SIC code.

c. Company Financial Information and Profiles

Company information is one of the most common applications of on-line databases. A good deal of information can be obtained on a parent company, its subsidiaries and financial strength, and trends, including performance comparisons against industry standards or other companies. Dun & Bradstreet, Moody's and Standard & Poor's are major services for the financial analysis of U.S. companies, and Worldscope, Datastream, Predicasts, Dafsa and Hoppenstedt analyse Europe and the Far East. Major database services for financial analysis of U.K. companies are ICC and Datastream. These services can be supplemented by a search in newspaper and business journal databases, such as Textline and Profile (part of the Financial Times Business Information service division).

d. Customer Analysis

Directory databases form a basis for mail shots and promotional activities, and are a starting point for sales and market planning. Services from ICC, McCarthy, Dun & Bradstreet, Kompass and Hoppenstedt are strong in this area.

Credit databases for companies across Europe are provided by Dun & Bradstreet and Infocheck. Small companies can be checked through the personal credit ratings of their principals. Infolink and CCN are two of the main companies offering credit services in the UK based on personal credit histories.

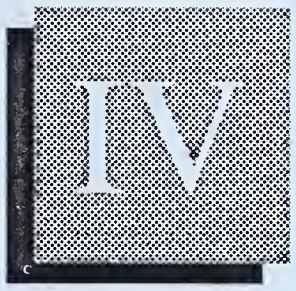
e. Share Prices and Other Investor Services

Electronic information is essential for transmission of data covering share prices, exchange rates, traded options and other securities news. This is available through viewdata (private videotex) services as well as traditional on-line services. TOPIC is the largest private viewdata system in the world, with approximately 3500 terminals in use. It is operated by the London International Stock Exchange.

Other major service providers are Reuters and IP Sharp, Extel, Profile, Datastream, Telerate, Telekurs, VWD, Citicorp and Quotron.

f. Professional

News of developments in technology and new products are contained in the specialist industry, and science and technology databases.



Market Analysis and Forecasts

IV

Market Analysis and Forecasts

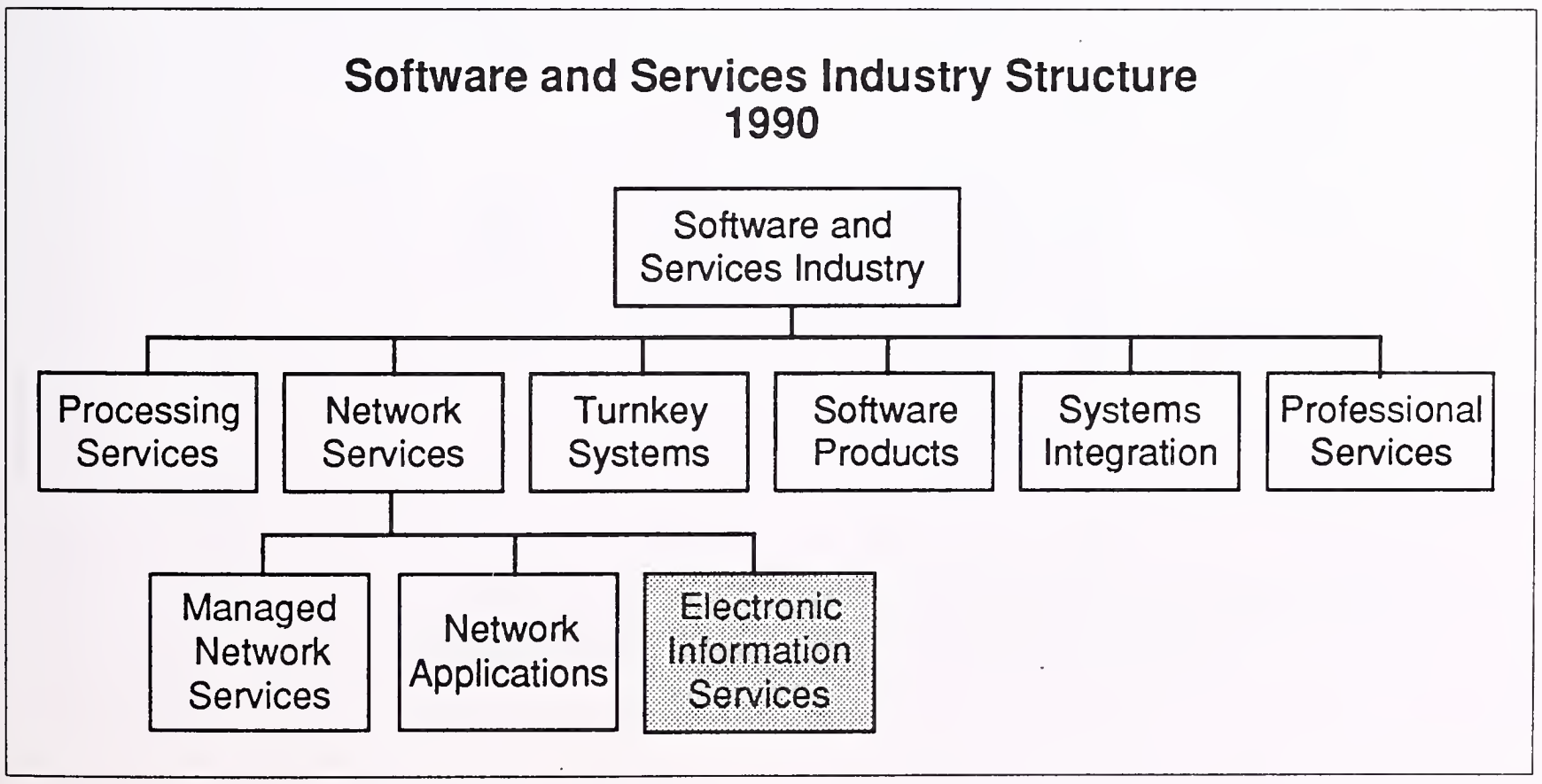
A Market Definition

INPUT has developed forecasts for user expenditures on electronic information services (EI) for Western Europe. These forecasts are based on end-user expenditures and consist of:

- Database lease and royalty fees paid to information providers
- Expenditures for database access and related services paid to systems vendors

INPUT defines electronic information services within the network services sector as given in the overall market structure in Exhibit IV-l.

EXHIBIT IV-1



B

Forecast Methodology

The market forecast was developed from a detailed analysis and evaluation of the current and projected activities in the country markets studied.

The market sectors defined in Chapter 3 were analysed and assessed; the forecast covers the period from 1990 to 1995. The total market is defined in this report as the sum of end-user expenditures for EI, but excludes communications costs for bearer network usage.

Revenues generated by videotex services were included where the service provided was a commercial, public service providing on-line access to stored data. Consumer videotex services were excluded.

Forecasts are made in local currencies for individual country markets and converted into U.S. dollars for aggregation and comparative purposes.

The U.S. dollar exchange rates used are shown in Exhibit IV-2. These rates are INPUT's average exchange rates for 1990. The forecasts are expressed in current year rates, and thus allowance must be made for the rate of inflation. The inflation assumptions made by INPUT are also shown in Exhibit IV-2.

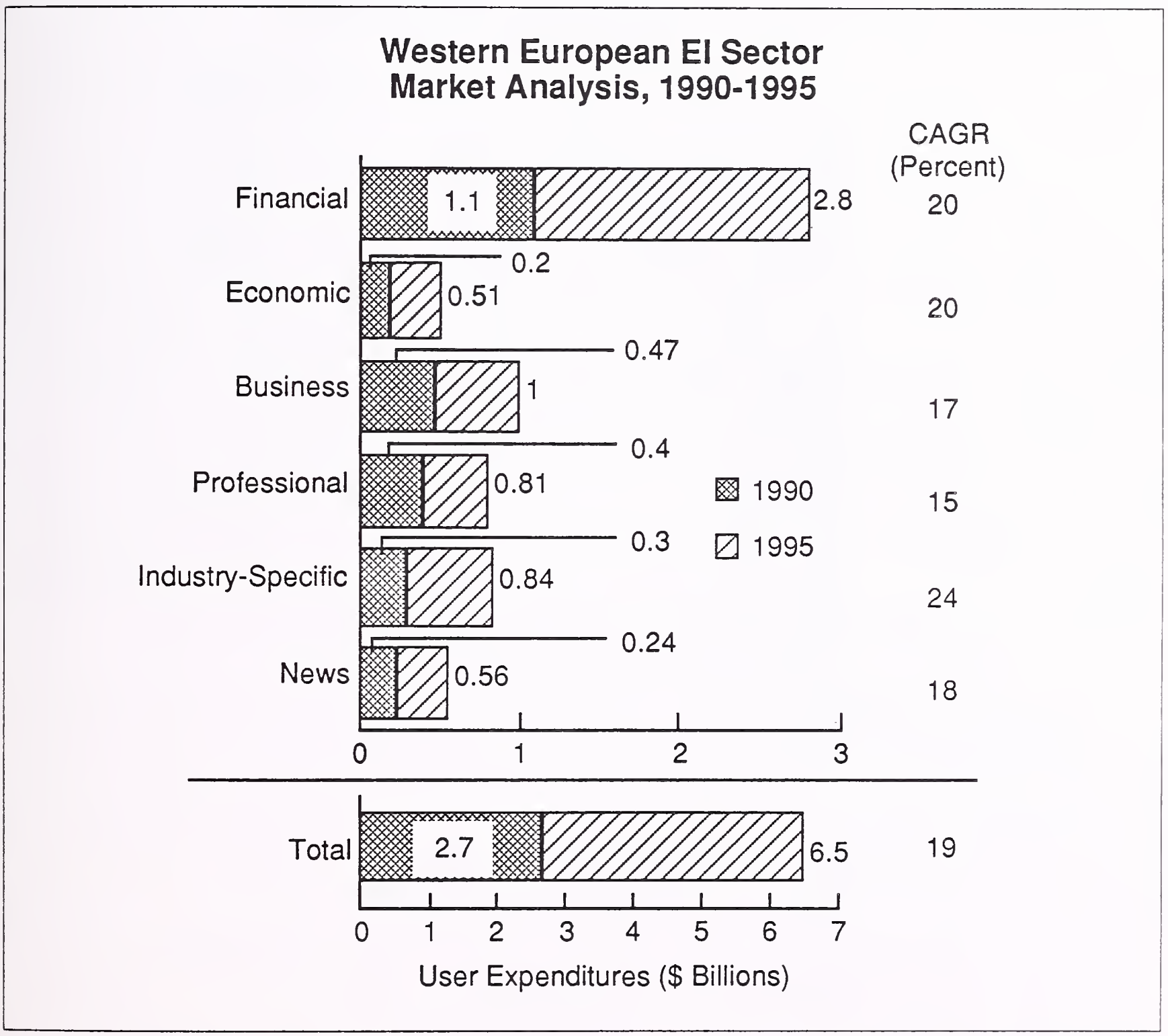
EXHIBIT IV-2

U.S. Dollar Conversion and Inflation Rates

Country	Currency	Dollar Conversion Rate	1990 Inflation Assumptions
Belgium	BF	38.06	4.0
Denmark	DK	7.05	5.0
France	FF	6.17	4.5
Italy	LIra	1,336.00	7.0
Netherlands	Dfl	2.05	3.0
Spain	Pta	115.80	6.5
Sweden	SK	6.39	7.0
U.K.	£	0.63	7.0
West Germany	DM	1.81	4.0

Exhibit IV-3 shows the electronic information services (EI) market from 1990 to 1995, segmented into the six sectors defined in Chapter 3. The exhibit shows the overall market growing at a rate of approximately 19%, and how it is expected to change over the next five years.

EXHIBIT IV-3



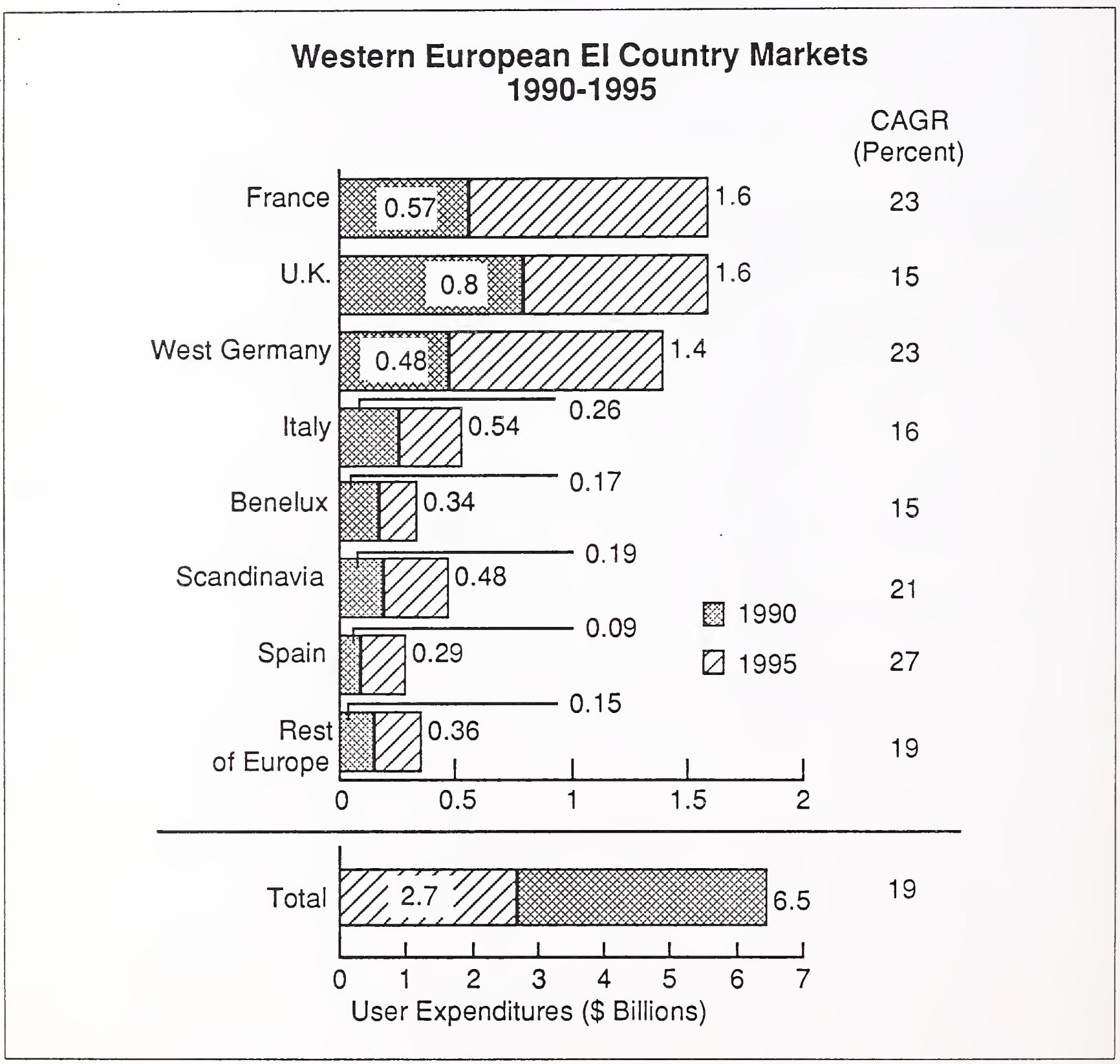
Total market size in 1990 was estimated at $2.7 billion. Forecasts for 1995 place the total market size at $6.5 billion, given the 19% compound annual growth rate (CAGR) between 1990 and 1995.

C

Western European Market

Exhibit IV-4 shows the market breakdown by country for the same period.

EXHIBIT IV-4



Exhibits IV-5 and IV-6 present the user expenditures in each of the years 1990-1995 for Western Europe, by application sector and by country market respectively.

EXHIBIT IV-5

Western European EI Market Sectors 1990-1995

Sector	1990	1991	1992	1993	1994	1995	CAGR (Percent)
Financial	1,090	1,270	1,530	1,860	2,240	2,760	20
Economic	210	240	290	350	430	510	20
Business	470	530	620	740	850	1,025	17
Professional	400	440	500	580	690	805	15
Industry-Specific	290	360	440	550	670	840	24
News	240	280	320	390	470	560	18
Total	2,700	3,120	3,700	4,470	5,350	6,500	19

EXHIBIT IV-6

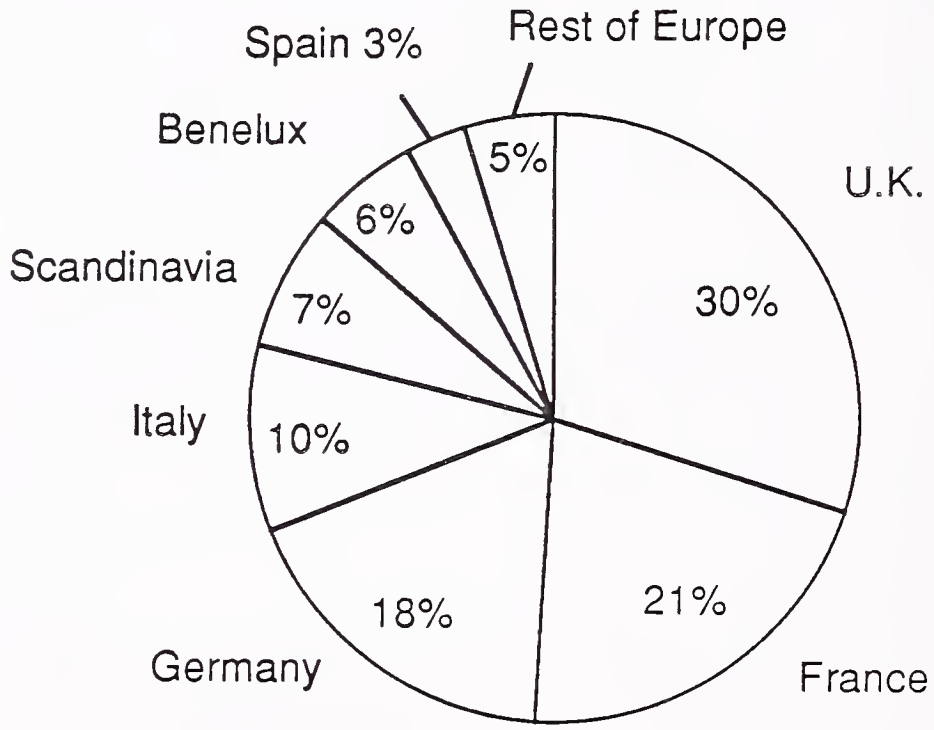
Western European EI Country Markets 1990-1995

Sector	1990	1991	1992	1993	1994	1995	CAGR (Percent)
France	570	660	810	1,020	1,280	1,575	23
U.K.	800	900	1,060	1,215	1,385	,1575	15
West Germany	485	570	675	840	1,010	1,355	23
Italy	260	315	360	420	485	540	16
Benelux	165	190	210	240	280	335	15
Scandinavia	185	210	265	330	400	475	21
Spain	85	105	130	170	210	285	27
Rest of Europe	150	170	190	230	300	355	19
Total (rounded)	2,700	3,120	3,700	4,470	5,350	6,500	19

As can be seen from Exhibit IV-7, the U.K. represents the largest country market, but all country markets will continue to show rapid growth through the forecast period. As can be seen from Exhibit IV-8, the real-time financial sector remains the single largest although even in this sector the established vendors will be challenged by CD ROM providers of digests and historical information.

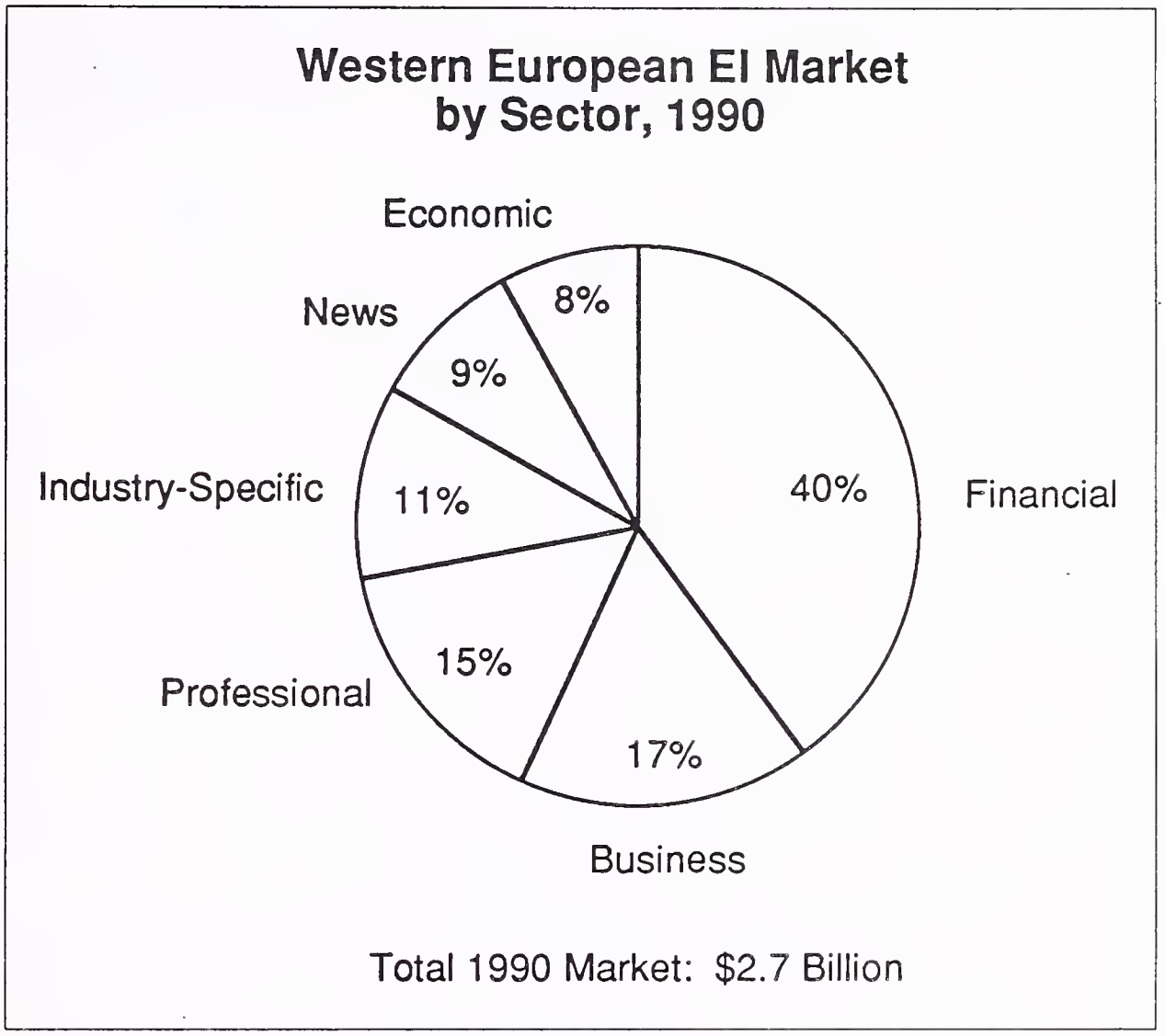
EXHIBIT IV-7

Western European EI Market by Country, 1990



Total 1990 Market: $2.7 Billion

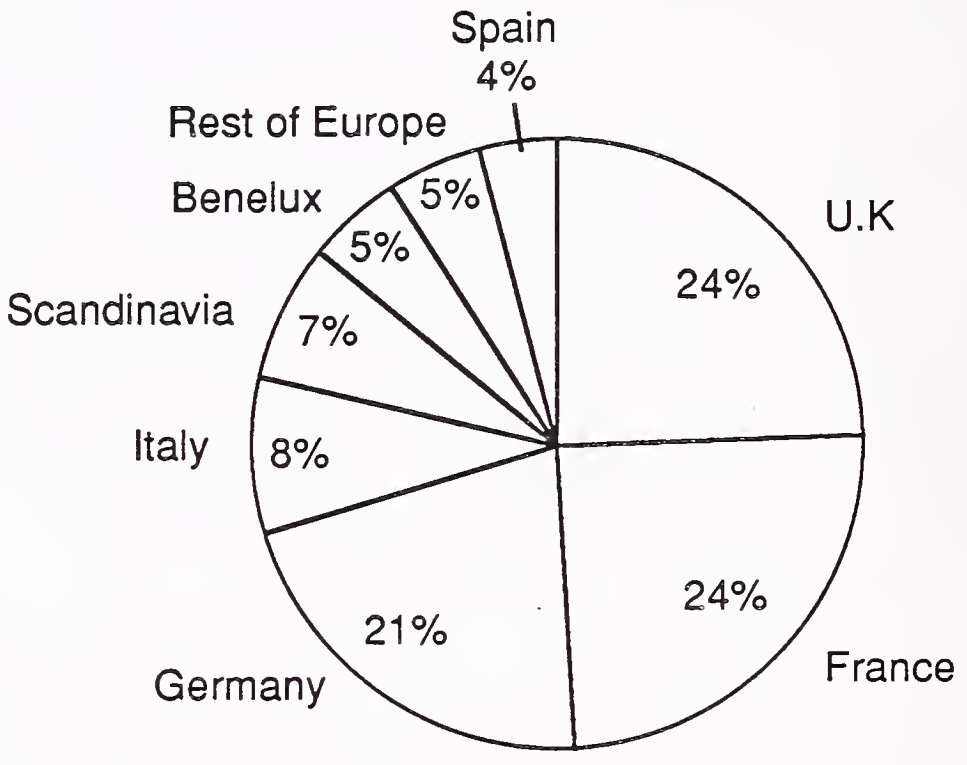
EXHIBIT IV-8



Exhibits IV-9 and IV-10 in pie-chart form give the breakdown of the electronic information services market by country market and industry sector respectively for 1995, showing the continued dominance of the need for financial information, but also the declining share of the UK market.

EXHIBIT IV-9

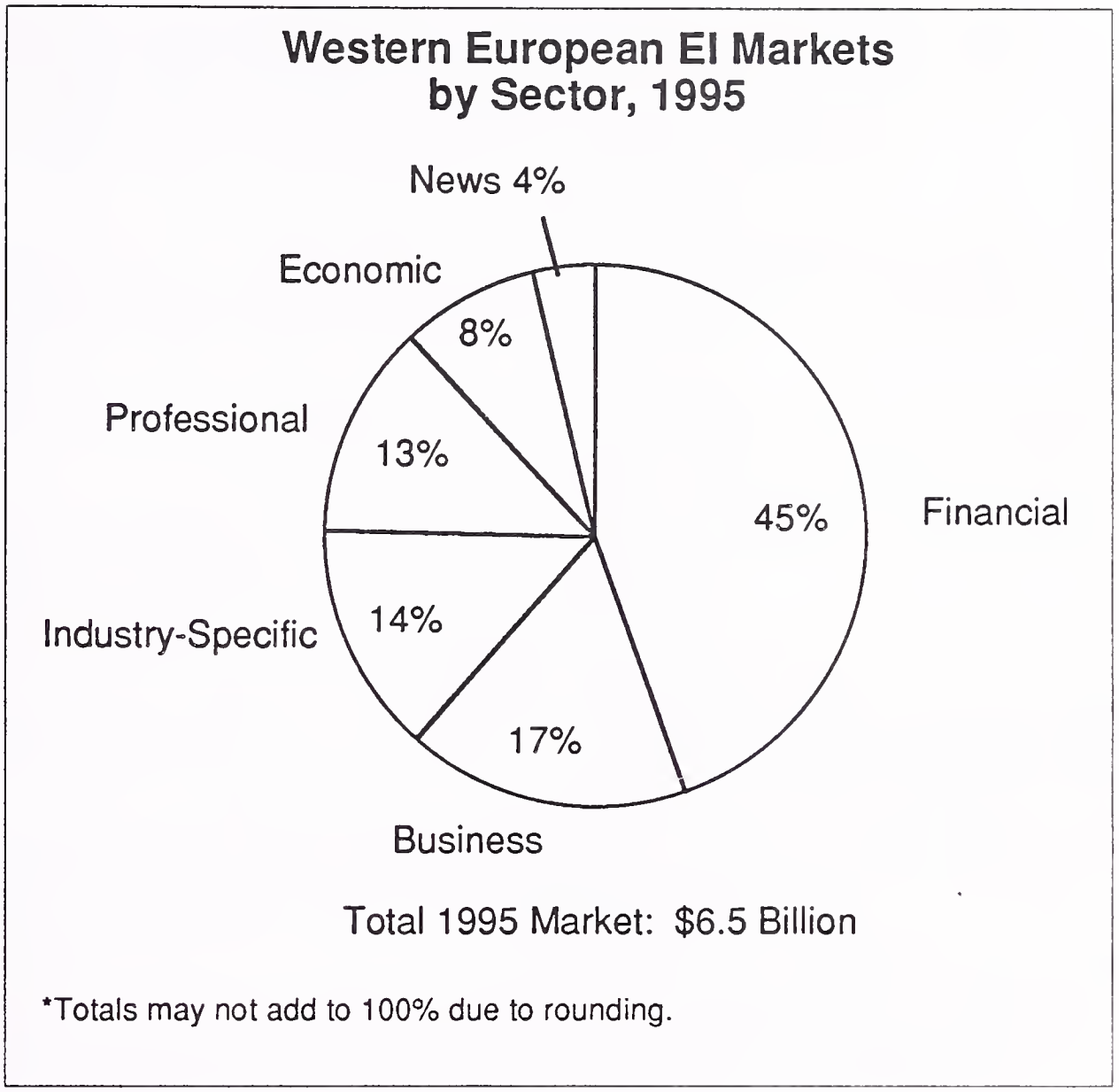
Western European EI Markets by Country, 1995



Total 1995 Market: $6.5 Billion

*Totals may not add to 100% due to rounding.

EXHIBIT IV-10



D

Competition

1. Market Sectors

One of the major inhibitors of the electronic information services market is that it is still at the stage of transferring much of the world's knowledge onto its host systems.

Overall, there are around 1,000 databases originating in Western Europe, with about 300 each produced in the U.K. and France, and 200 in Germany. They are marketed through 50 major hosts. Yet 50 percent of the on-line information obtained by European companies comes from the U.S., where there are 1,500 commercially marketed databases on fewer hosts than in Europe.

The most important type of business information is that involving foreign exchange and securities data with a large transactional element associated with it. This type of information accounts for over 70% of the financial data market. Reuters and Telerate are the market leaders.

There is a strong move in the industry to provide gateways to electronic information services through intelligent menu-driven interfaces that guide the user to the correct data. Many of these are being installed through E-mail services, by information brokers or wholesalers as a one-stop shopping service where users can dial in and be directed to the appropriate hosts.

Deregulation, increasing competitiveness, and internationalism are all driving significant growth in the financial services sector with particularly strong demand for numeric databases. INPUT forecasts that the market for numeric databases will increase from over $1 billion in 1990 to about $4 billion in 1995.

Although the cultural and technological climate for the use of electronic information services outside the financial services sector is becoming increasingly favourable, growth in other sectors will be largely for numeric information, such as corporate treasurers. Consequently INPUT forecasts relatively low levels of growth for textual information services-under 15% over the forecast period in some sectors.

The large profits to be made from the provision of on-line financial information have led to intense competition among companies seeking to introduce innovative products and services. As trading volumes drop in some markets a shake-out of staff and companies can be expected.

On the other hand, the lack of profitability in such areas as textual information services has led to consolidation as vendors seek critical mass. This area is likely to need several more years of high growth before some payback can be achieved.

Many of these market subsectors are industry-orientated and are marketed accordingly. Nearly all services are aimed at the business sector, where there is the highest preparedness to pay for information relevant to a profit-making enterprise.

As with any on-line service, particularly for critical applications like trading, the provision of a very high level of service to the end user is of the utmost importance. Consequently, organisations like Reuters provide a high level of maintenance and service support and are continuing to study ways in which this might be improved.

There are also continuing opportunities for industry-specific and "boutique" services in the textual field, and much of this growth will come from links with transaction-based services such as EDI, and widened distribution via electronic mail.

Certainly in the banking and financial services, the electronic age has arrived with a vengeance. Stock market data is a major growth area, whilst other business disciplines—medical, legal, market research and management—are also avid users of electronic information.

The range and content of electronic information services is growing daily; there are over 3,000 databases available at different parts of the world. As telecommunications links become cheaper, these services are now becoming available to the ordinary PC user.

The range of information on these services is growing too: apart from the normal news clipping and business database services, improvements in electronic typesetting have boosted the growth of full-text databases of all kinds, including a number of new electronic magazines.

a. Financial Services

The keys to success in the financial on-line markets are the flexibility and resources to cope with an environment of rapidly changing customers and technology. Deregulation in the U.K. extended the life cycle of electronic information services in even the most mature market segments, for example, stockbrokerage, and has created a ripple effect into different, but related markets such as corporate treasuries.

There are ample opportunities for new services in a changing environment, especially as the move towards 24-hour global trading puts pressure on the requirement for comprehensive integrated international information sources.

The key strategic trend is to offer comprehensive services to niche markets:

- In the U.K., Telerate and Reuters dominate the securities, foreign exchange and banking sectors.
- Topic dominates the auxiliary banking sector.
- Datastream dominates the investment business sector.

Since the market is subtly differentiated, there is limited head-to-head competition.

This has led to an increase in the use of analytical software to produce added value service enhancements. Users' demands for ease of use, modelling, decision support facilities and integration of multiple information sources has led to the development of PC-based packages for:

- Interactive training, using basic artificial intelligence,
- Analysis tools interfacing with real-time data.

Key opportunities lie in:

- The development of software which facilitates the customisation of information for specific customers.
- Truncated services for infrequent dial-up users.

Owing to the increased flexibility in distribution possibilities offered by technology, brand engineering has emerged as a key marketing strategy. For example, the larger financial institutions require integrated digital data feeds which are then used to distribute own-label client services. There is a constant demand for cheaper infrastructure services to allow for margin to be released for value added services along the distribution chain.

Pricing and discount policies need frequent and careful review as the number of terminals spreads within institutions, especially in France and West Germany. A further aspect of customer closeness is the need to compete on service and offer comprehensive documentation, implementation and support services.

The stock market crash of October 1987 has forced the financial institutions to review their fixed costs, part of which comprised the price of services provided by Reuters, Telerate, Quotron and the London International Stock Exchange. All these vendors have bolstered their traditional services by supplying value-added data and, in some instances, the dealing-room delivery systems themselves. They are now entering a period in which there will be further examination of fixed costs as recession causes trading volumes to stabilise and even fall.

Quotron, acquired by Citicorp for $700 million in 1987, has lost its U.S.-equities-only image by offering products in the foreign exchange and money market areas.

Telerate has been continuing its policy of expansion through strategic alliances, acquisitions and internal developments. It has purchased a stake in Radiocor, the Italian electronic information services provider, and is developing a Global Transaction Services joint venture with AT&T, a foreign exchange dealing system that would form the basis for expansion into other markets.

Automatic Data Processing (ADP), has a relatively low profile in Europe. Its ADP Information Services division is seeking to boost its European presence with its Comtrend, Trendsetter and Marketpulse products. Comtrend comprises ten years of data covering commodities, options, financial futures and foreign exchange, and offers analytics and graphics as well as updates in real time. Trendsetter offers analytics on real-time data for similar market areas. Marketpulse, digital-based, provides real-time coverage of equities, futures and options markets.

Quick of Japan has expanded its client base beyond its predominantly Japanese customers. Switzerland's Telekurs is looking into new areas such as the back office in which it is already strong in its domestic market. There does not seem to be any slackening in vendors' product development; indeed the increased deference to costs is making for more carefully developed products and a wider range of services in a bid to find niches in the market.

CompuServe (via an agreement with Swiss company Tele Columbus's Radio Schweiz division, which handles local marketing and support of the U.S. service) introduced the Europeanised version of the CompuServe service in 1990.

The Reuters Monitor Dealing System continues to handle around a third of the $300-450 billion that is traded daily on the international foreign exchange markets. Introduction of Reuters new range of 2000 series services based on their IDN digital network has been delayed in order to spread development costs over a longer period. Reuters anticipates lower growth rates in the next five years, even down to single figures if volumes do not pick up.

Whilst the growth of real-time financial services has been driven by the increasing velocity of financial movements, which in turn has put a high premium on speed, other kinds of financial network can function at much slower speeds. However, in the two biggest markets, foreign exchange and money markets, there is still a highly profitable, virtual duopoly. Reuters and Telerate are simultaneously seeking to expand into other markets such as futures, equities and commodities.

Telerate has been growing even faster than Reuters. It has an operating margin of around 40% and its annual pre-tax profits have risen 25-fold over the last decade. Virtually the whole of that has come from the market in American Treasury bonds and bills, which it dominates, supplying four-fifths of the world's screens in that sector.

Reuters and Telerate have been able to maintain their dominant position by virtue of their geographic coverage. It is costly to develop new systems. As a consequence, these large information providers have the opportunity to provide products and services that appeal to a large customer base. In Europe however, the market for new screens in Reuters' and Telerate's established services is reaching saturation.

Whether Reuters and Telerate can maintain this duopoly remains to be seen. Both have built their integrated systems around the dealing room. The next stage should be to tie those systems to the back office (e.g., matching and clearing).

These functions, however, are the domain of the equipment vendors such as IBM and Digital. This may be the opportunity for these vendors to attack the Reuters and Telerate market—through the back office. With the big computer firms investing heavily in high-speed networks which link back offices around the globe and switch information simply and quickly, it will be relatively easy in the technical sense to adapt such technology to the dealing room. The marketing challenge is greater.

Electronic information services have played a significant part in the changes to the stockbroking and investment banking businesses. The idea of globally competitive, technology-driven markets, dominated by a few worldwide organisations has not become reality to the extent anticipated. The relationship between market share and profitability in markets like the City of London has changed due to the advent of electronic information services. This is because, in such a market, the best source of profit is information that others do not have.

Electronic information services have made that information more cheaply and generally available. Corporate treasurers and institutional investors can use electronic information services, such as Reuters, to form their decisions.

On the other side of the coin, the era of electronic information services has highlighted over-capacity but increased the call for specialist services. There are significant opportunities for retail banks to expand in this area.

Speed and reliability of information will inevitably become the key value-added features, as technological developments allow other non-specialist sectors to adopt features of the current specialised real-time financial information market. One example of the adoption of such features might be the bringing of relevant information (relating to a

particular client, company or service) instantly to the client on the line. ISDN applications would also be an example, integrating the telephone system with computer applications that hold data about clients, as well as with traditional external information feeds.

Reuters' activities in real-time information serve as an indicator of the development towards analytical tools. These include adding new exchanges and traded instruments worldwide, adding to specialist data from third-party sources, and improving speed and presentation of market news by defining specialist presentation formats for individual markets. In addition there are services such as the Reuter Equity Graphic Service (displays on some of the world's top 2,500 companies), Reuter Chartist (a real-time data feed to personal computers for comprehensive analysis of cash and futures markets), and Marketfeed 2000 (high-speed data on world equities, futures, options and energy markets).

In the field of historical information, Reuters concentrates on two main markets:

- Products compatible with real-time financial services and delivered to the customer base

- Specialist historical information for analysts who do not use the real-time Reuter service

Reuters uses its two historical database subsidiaries, Finsbury Data Services and IP Sharp. These services include Finsbury's database of published text for financial and related markets developed throughout Western Europe and notably in Scandinavia. At the same time, IP Sharp's worldwide packet-switched network, IPSANET, has been integrated into Reuters' communications facilities.

The following is a indication of some of the many services provided by some of the other leading players in the financial and securities sector.

Dialog markets DIALOG Quotes and Trading, a gateway service delivering stock and options quotes.

Extel produces and distributes Earnings Guide, a database of forecasting estimates on U.K. equities, presenting the combined results of the analysis of over 30 leading stockbrokers, with information from Extel's financial share database (Exshare, which covers over 100,000 international equities). The Real-Time Feeds (RTF) service provides a digital data feed of real-time information from a number of markets. The data can be processed by the user for use on in-house computer systems. Exbond is the comprehensive database on over 1,300 international and Eurobonds.

Financial Electronic Publishing, a subsidiary of the Financial Times newspaper group, produces and distributes Finstat, a price service offering a daily electronic feed of statistical data from the Financial Times' Share Information Service, a printed paper system which provides price and yield information on equities and gilts. The company also provides the FT Currency and Share Index Databank, which reports the dealing rates in the foreign exchange, money and gold markets as well as movements on the London Stock Exchange.

- IP Sharp markets databases containing historic information on commodities (metal and soft) and foreign exchange markets—price, volume, etc.

- Reuters, Telerate, Telekurs, Quotron and IP Sharp all compete in offering services to participants in money markets worldwide.

- Telekurs offers:

  - Investdata, a real-time database inquiry system which allows the user to access data on over 200,000 financial instruments traded worldwide.

Indes, an investment decision service providing information on securities price data as well as international and national economic news.

- Datastream produces and distributes Datastream Equity Research Services, covering research on market performance (statistics and graphics), company accounts analysis and search facilities. A subsidiary of the Dun and Bradstreet Corporation, Datastream is the world's leading provider of historical financial information for the investment management community.

- ADP Comtrend in the U.K. provides the Marketpulse service distributing real-time price and trading data from the world's major exchanges. Its systems can generate real-time charts and graphs from commodity information. Other facilities, such as Comtrend Plus and Trendsetter II, enable users to design their own trading models and/or to construct a personal database using a mixture of stored real-time and research information.

- RCI (Reseaux Commercials Informatiques SA) produces and distributes COTA, a service of stock market information on French companies.

- Dafsa produces and distributes:

- Base de Donnees des Obligations Francaises, real-time data on 2,000 French bonds with daily market rates.

- Gestion des Valeurs Mobilieres, a real-time portfolio management service for transferable securities, French and foreign.

- Informatitres, containing information on over 40,000 French and foreign quote and unquoted securities.

• Affarsdata produces and distributes AktieInformation, a service which provides current stock prices quoted on the Stockholm Stock Exchange as well as company information on listed Swedish companies.

b. Textual Information Services

The key opportunity for vendors of textual information services is to develop and package new services which appeal to specific segments of the end-user market. The industry is changing from the "supermarket" approach, originally adopted by vendors like Dialog, of hosting a large number of bibliographic and textual databases, to the "boutique" approach of packaging industry- and user-specific information products.

A possible future for the smaller and largely unprofitable database hosts specialising in textual information is that they become intermediaries, and leave the information providers and database producers to take responsibility for the maintenance and marketing of on-line products.

An important opportunity is to offer intelligent interface facilities for on-line services that provide transparent access to a range of services. These should be offered to small users who do not have the facilities to employ/train their own search staff. Intelligent access has been provided on some new services, but these are normally derivatives of public E-mail systems. Such a development is inhibited because there is not a common standard across all on-line services.

Electronic mail vendors are continuing to offer gateways to a wide range of electronic information services. However, what is required is the development of individually packaged solutions for target vertical segments. Electronic mail, EDI and electronic information services could be marketed as an integrated business expansion facility for many sectors, e.g., shipping and freight forwarding.

Some examples of mixed textual and numeric databases useful to marketers are:

- BOTIS (British Overseas Trade Information System) a U.K. Department of Trade and Industry (DTI) database which covers product and industry information, overseas contacts, export opportunities, promotional events and useful publications.

- EUROLOC is compiled by the European Policies Research Centre to help businesses looking for financial assistance. The database includes finance available to industry from governments and the EEC, and also has news and statistics of interest to businesses located in each country.

IES-DC is a free database of interest to the technology industry, giving details on ventures such as ESPRIT and RACE development projects, listing relevant contacts. It is supplied by ECHO.

- Multilingual capabilities are provided by:

  - Eurodicautom, which includes modern translations for scientific and technical phrases and a list of abbreviations.

  - Mercury, which offers a translation service from English into French, German, Dutch, Spanish, Italian, Portuguese, Danish, Swedish and Norwegian (the charge is $2 per line of translated text or $2.50 for a special priority service).

- Marketing information services include:

  - Eurofile from Dialcom contains data on 12 consumer markets, including size and trends, and lists main companies.

  - Euromonitor offers details on markets in the U.K. and Europe, and provides close scrutiny of particular products.

  - Eurofacts, also from Dialcom, offers statistical information on marketing and industry, including employment, trade, size of market and levels of production.

- As an aid to purchasing management, Kompass Online offers details on 270,000 leading companies in the manufacturing industry, distribution and related services. Information includes the company's sales, number of employees, directors, products and services, and whether they are involved in import, export, production and distribution. This service makes it possible to look for all companies in named countries with a specific turnover and product manufacturing capability.

- Extel offers Examiner, an up-to-the-minute business and financial news service, offering 400 news stories available via a dynamic indexing system with data being presented on printers or monitor screens distributed through local and national networks.

- Reuters has for the last few years been in the historical information sector. As part of its move into this business sector, Reuters acquired the two key companies dealing with historical information - IP Sharp and Finsbury Data whose products have been mentioned. Services also offered include:

- Reuterfile: Users can now access the Reuters' databases on their own PCs instead of having to have a dedicated terminal.

- Textline: Originally from Finsbury, Textline is a large database carrying news stories from all around the world. There are two million articles on file. About 70% are in full text and the rest are abstracts. Reuters is adding foreign language news.

- Dataline: For international company forecasting and company data. This database gives access to accounts and financial statements for the past five years, and includes a financial modelling system for preparing forecasts based on projections of key variables.

- Country Reports: This is a database, by country, on political and economic changes and trends. It is updated daily, by photographers and correspondents around the world.

- Accountline covers U.K. company reports and accounts.

c. Information Brokers

The creation of a single European market will increase the opportunities for information-based services companies such as the well-established international executive search operation called the Transearch Network, whose European division uses the latest database technology to select top calibre individuals. The Transearch European division consists of independent partnerships in the U.K., France, Belgium, Holland, Germany, Spain, Sweden and Italy. They all subscribe to a London headquarters, where Merton Associates coordinates the Transearch service worldwide.

Transearch subscribes to the main on-line services and uses an in-house database called STRIX. The main databases exploited by Transearch include Inter Company Comparisons, Jordans, Predicasts, Key British Enterprises, Financial Times and Textline.

Directories for the Transearch research department used to cost thousands of pounds per year, but databases are more economical, as they are only accessed for the required information. In this case electronic information services have enabled the business to develop.

A U.K. company, Computerscan, offers a technically similar situation. It provides an IT industry "match-making" service based on a set of detailed questionnaires about their products taken from software and hardware suppliers. These are compared to find the ideal system for a client. This on-line service is used mainly by accountants and management consultants to advise their clients on the best systems to buy.

2. Market Developments

a. European Economic Community

The European Commission's Directorate General for Telecommunications, Information Industries and Innovation (DG XIII) has been playing a key role in the development of the European Information Services market in an attempt to stimulate an internal information services market that strengthens Europe's information services suppliers.

The vehicle for this market stimulus is the IMPACT programme which aims to:

- Create a European Information Market Observatory (IMO). This organisation will gather and analyse market statistics and data on the information market itself to help policy makers and business managers.

- Propose ways of eliminating the legal, administrative and technical red tape that prevents the establishment of a pan-European information market.

- Bring together the public and private sectors in Europe.

- Set up pilot demonstration projects to develop new information services and make them accessible to users who may not be familiar with the technology.

- Promote the use of the new services (by providing multilingual directories) and give advice about the services available.

The Commission's host service, ECHO, which was created in 1980, has been helping within the newly agreed programme IMPACT. ECHO's own aims are to:

- Provide multilingual services about community information services.

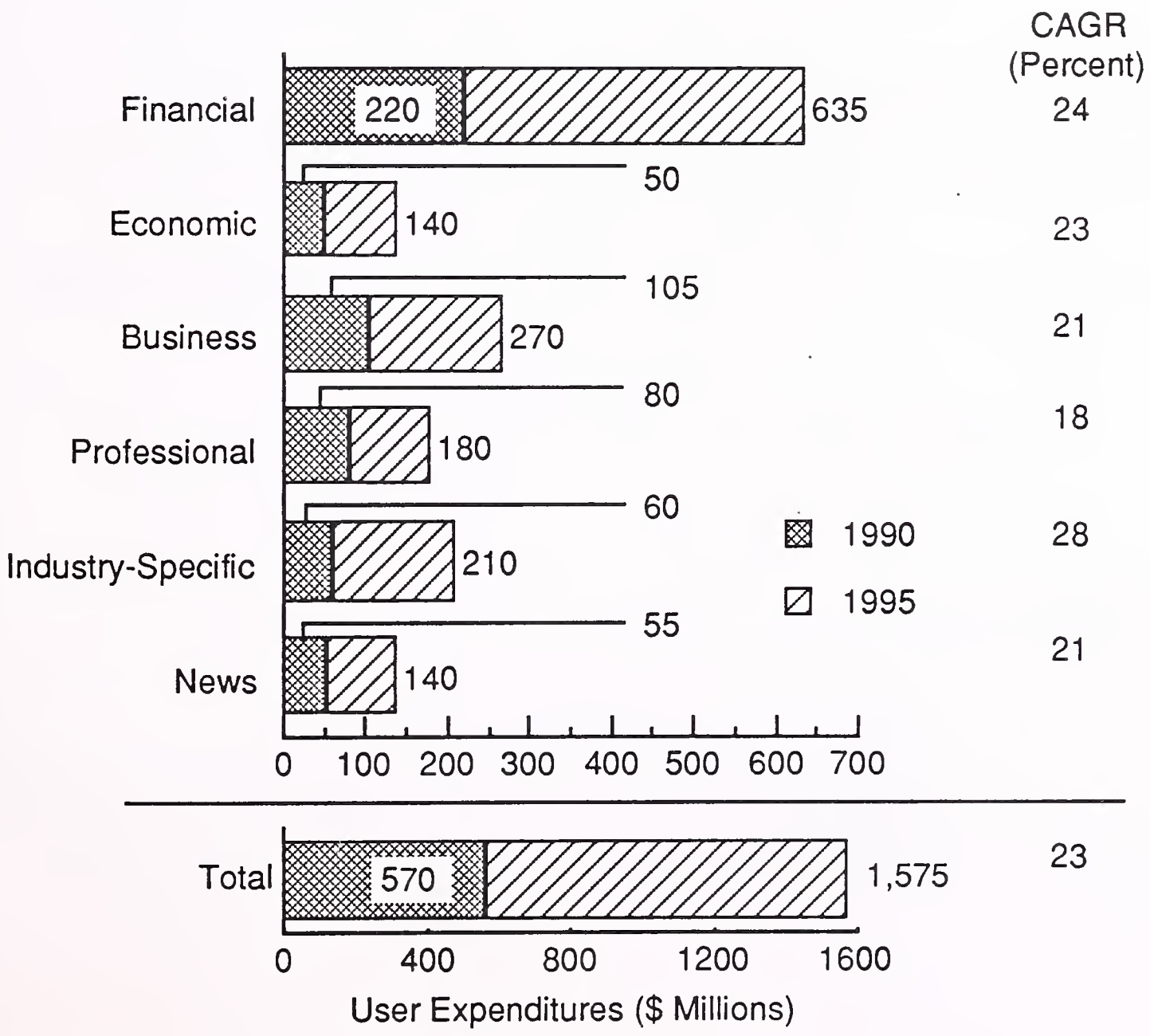
- Give guidance and training for users, with the emphasis on regions where access to electronic information is not so common.
- Act as an outlet for advanced information services.

b. France

The French market is expected to grow at a compound annual growth rate of 23% during the forecast period. A breakdown of the French EI market by industry sector is given in Exhibit IV-11. France has one of the most sophisticated telecommunications environments in Europe, and videotex is further advanced in France than anywhere else in Europe, due in part to substantial government subsidy.

EXHIBIT IV-11

French EI Market Analysis, 1990-1995

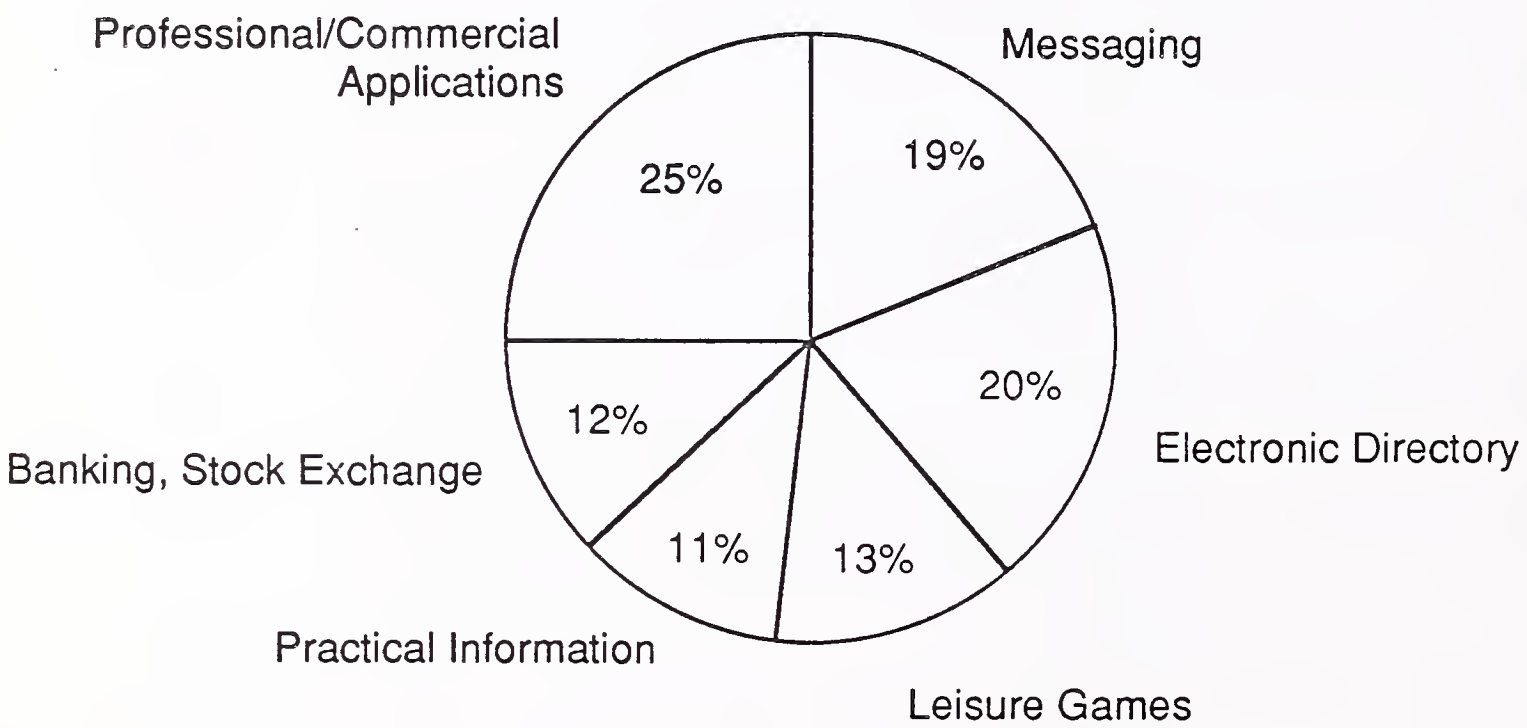


Videotex systems are geared towards business and industry-specific sectors, and this explains France's lead over the rest of Western Europe with regard to on-line selection and ordering electronic information systems.

In terms of users, France's Teletel access service, which supports the country's Minitel terminals, is the dominant service in the world's videotex market. INPUT's estimate of the Western European videotex market is $1.5 billion, with France accounting for over $1 billion. Fifty-three percent of Transpac's traffic is accounted for by Teletel. A breakdown of Teletel traffic by application type is shown as Exhibit IV-12.

EXHIBIT IV-12

Breakdown of Teletel Traffic by Type, 1989



Source: INPUT estimates

Without question, the Minitel's success in France proves the existence of a far wider consumer market than is currently being reached. The French ideal of universal service provision via modern, unified networks run by a national monopoly, France Telecom, results in charges on Minitel based on time, not distance, with costs kept low to encourage use.

This charging system is a key development, because it enables service providers to choose from different services with different rates. Charges are levied via the telephone billing system, with service providers being paid by France Telecom. Users pay their charges with their telephone bill. This offers two advantages:

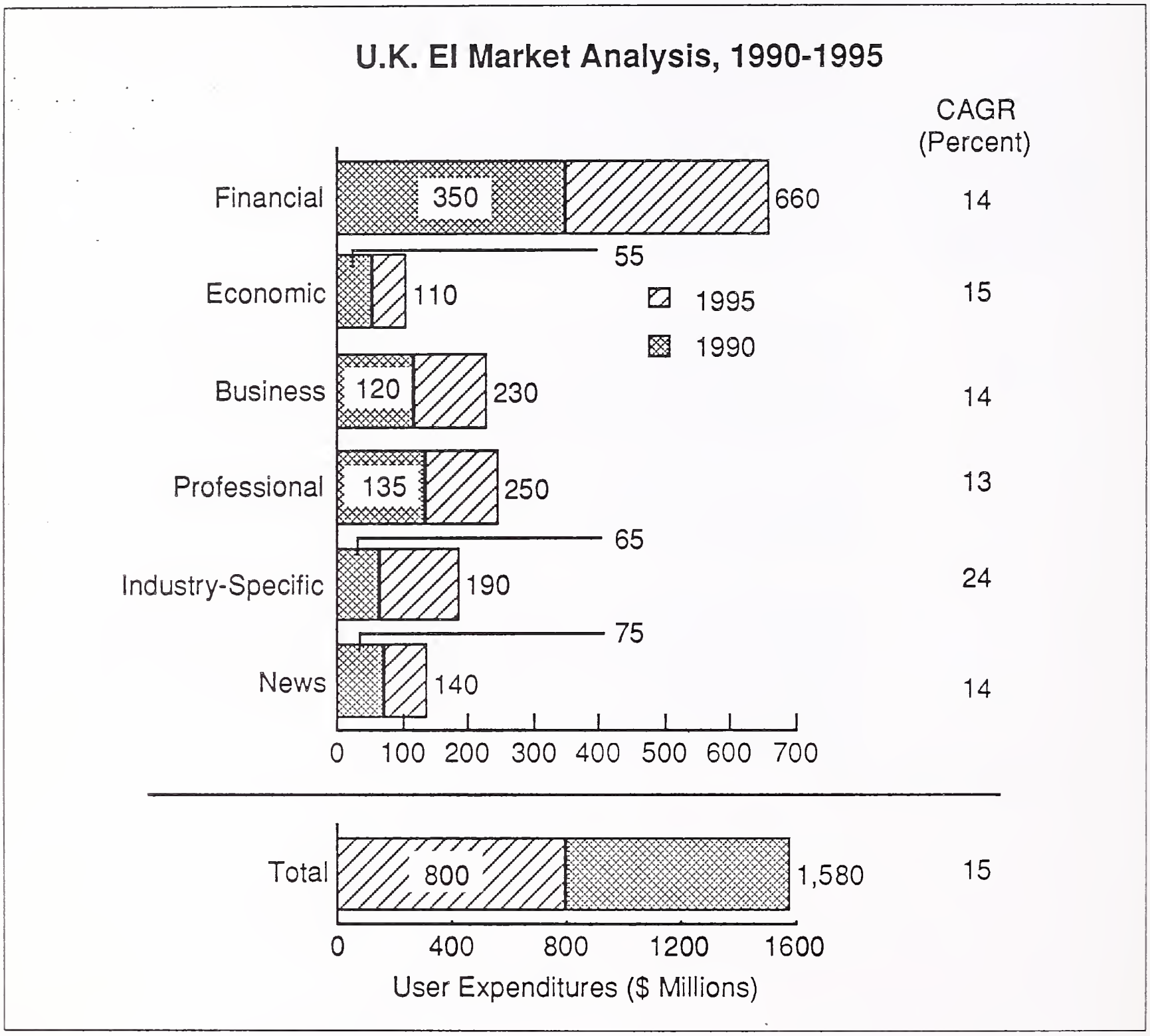
- Small charges are recovered economically for the service providers.
- Users remain anonymous.

c. U.K.

The U.K. market for electronic information services was estimated for 1990 at $800 million and is forecast to grow at a compound annual growth rate of 15% to reach $1.6 billion by 1995. This is the lowest growth rate for any country market in Europe and is largely the result of the severity of the U.K. recession. A breakdown of the U.K. EI market by industry sector is given in Exhibit IV-13. It is the single largest market in Western Europe but by the end of the forecast period it will have been equalled by that in France.

The major reason for the U.K.'s position is the presence of London as a leading world financial centre, and the large market for electronic information services in this area. Furthermore, the shared language between the U.K. and the U.S. has aided the market's development, as U.S. producers are able to launch services in the U.K. that require minimal linguistic modification.

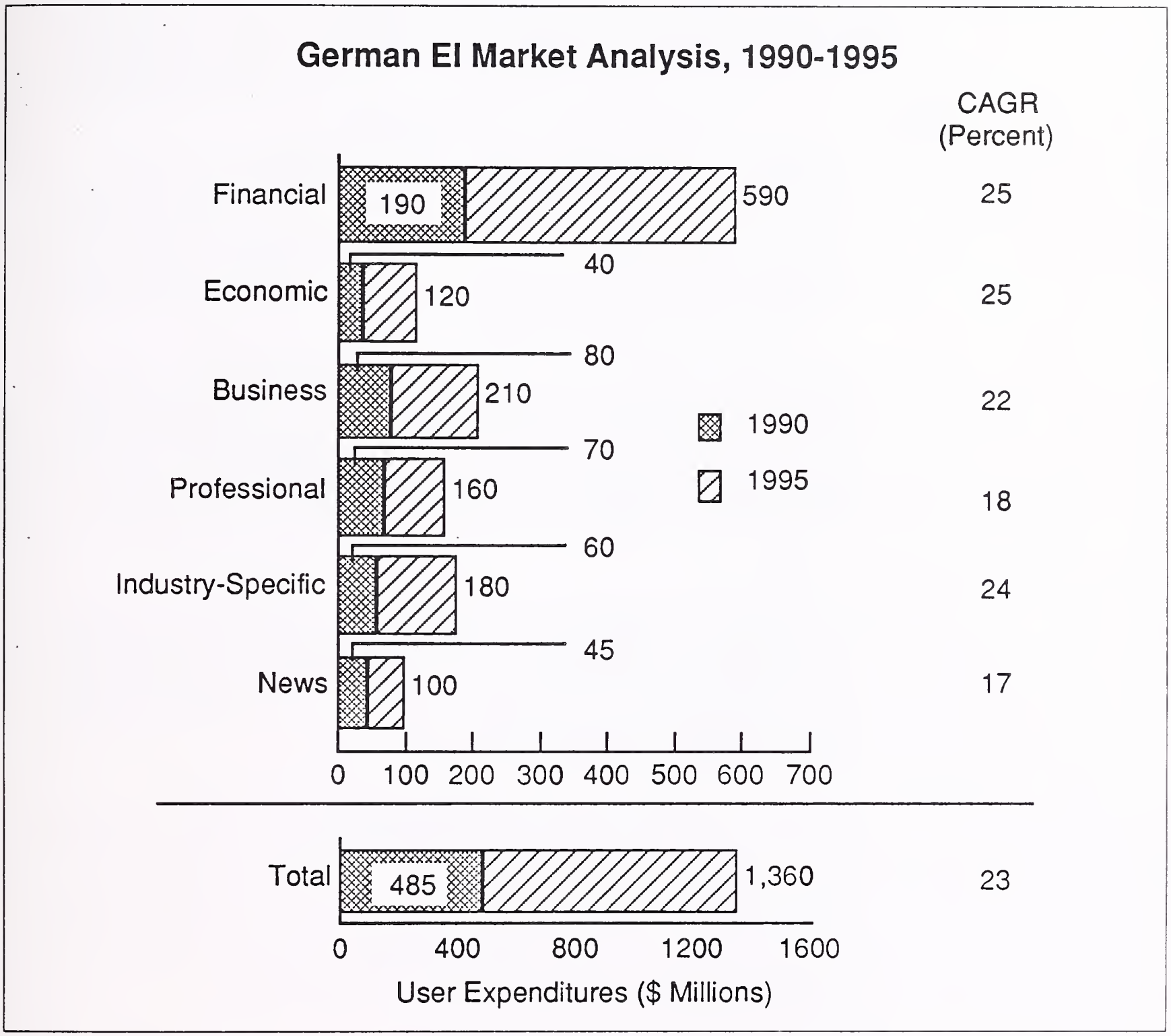
EXHIBIT IV-13



d. West Germany

The West German market is particularly strong in the areas of business, professional and industry-specific information, as can be seen from the breakdown of the West German market by industry sector in Exhibit IV-14. However, these are traditionally the smallest sectors of the market and the German market is smaller than the U.K. or France. It is expected, however, to grow from $485 million in 1990 to $1.4 billion in 1995, a compound annual growth rate of 23%, which is considerably above the industry average.

EXHIBIT IV-14



Currently, the monopoly position of the Deutsche Bundespost and high communications costs have conspired to slow market growth in West Germany. However, the rapidly expanding banking sector will be a principal driver leading to the overall growth in the market.

One of the biggest vendors, Bertlesmann, produces and provides Firmen-Info-Bank, a database providing information on about 20,000 firms in West Germany, with references to over 150,000 decision makers. Bertlesmann is targeting departments dealing with imports, market research, planning, marketing, management, journalists, advertising agencies, research institutes, unions and political associations.

Both Bertlesmann and Genios offer Verband der Vereine Creditreform, a quarterly series of financial and textual reports on over 300,000 German companies. Genios also offers FINF-Numeric from GBI (Gesellschaft fur Betriebswirtschaftliche Information mbH), which gives annual results and commercial balance sheet figures of German industrial companies.

Genios and FIZ Technik offer GBI's BLISS database (Betriebswirtschaftliches Literatur-Suchsystem), an economic and literature search system which offers information on German and international economic literature. It is unquestionably the leading German language literature service covering most vertical sectors, using trade magazines, essays, dissertations and research reports as source material, and containing over 93,000 records.

Hoppenstedt is a large database producer in West Germany, providing electronic versions of the directory, Handbuch der Grossunternehmen, which gives detailed descriptions of almost 40,000 German companies. Both Dialog and Data-Star distribute this in West Germany, with a similar directory existing for Austria, but for under 4,000 companies.

e. Italy

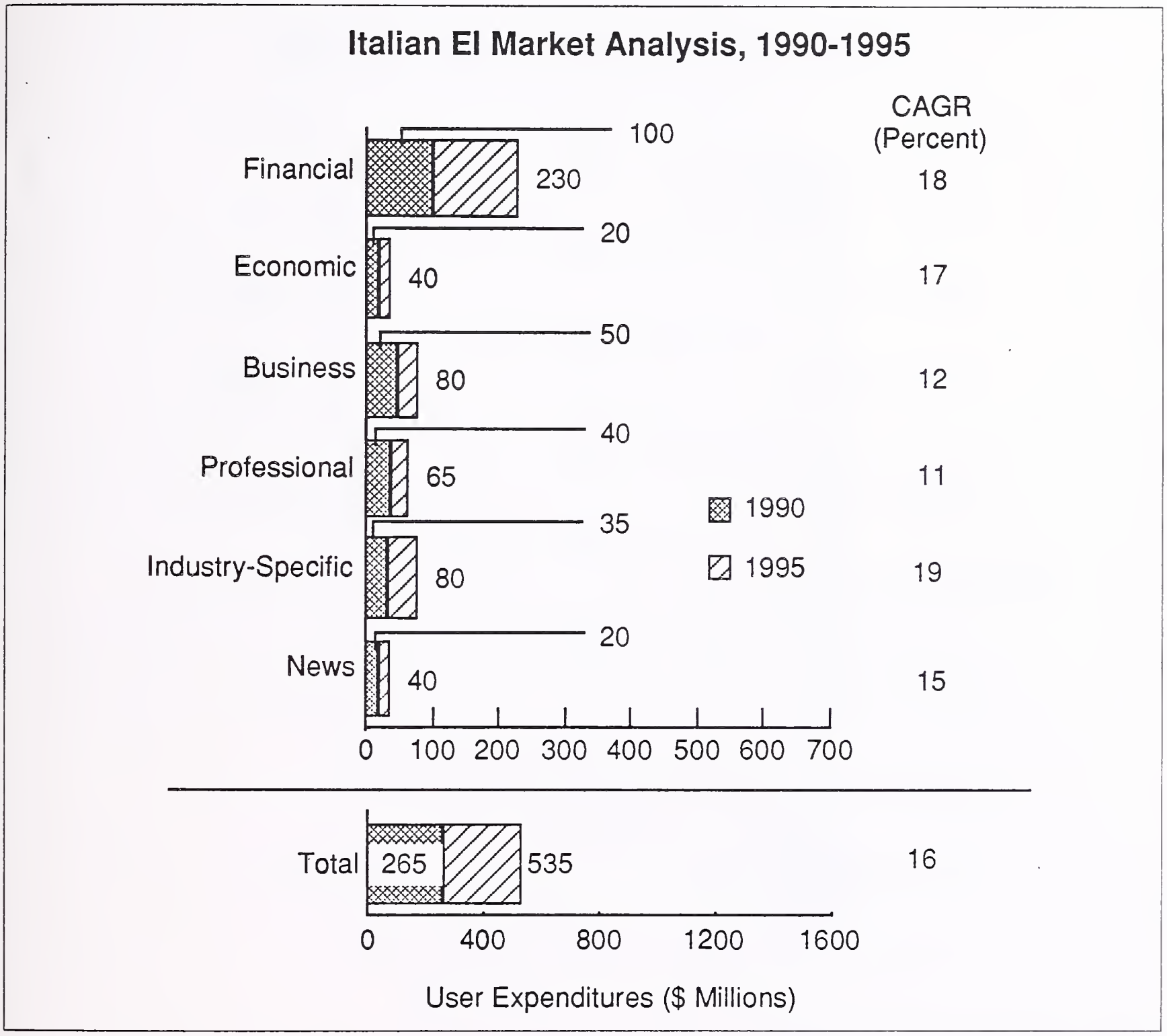
Developments in the Italian market have been slowed by the poor telecommunications environment. Exhibit IV-15 gives INPUT's industry sector breakdown for the EI market. Currently worth $265 million, the market is growing at a compound annual growth rate of 16% and will reach $535 million in 1995.

A feature of the Italian electronic information services market has been the provision by professional bodies of electronic information services as part of an annual subscription for other services, e.g., by Cerved, the computer services bureau which provides business services on behalf of various Chambers of Commerce. Although such services increase potential interest, there is a major long-term problem in that users become conditioned to the unrealistically low price environment.

Cerved also offers the leading Italian news agency's ANSA's DEA database, an on-line news service on company events such as purchases, disposals and press releases on annual balance sheets with full-text news articles and abstracts abstracted since 1983.

The Italian market is highly fragmented and some of the services available highlight this. For example, the host Sirio provides the Assolombardo database, Dati Anagraphici di Impresse Lombarde, a database providing basic information on over 14,000 industrial companies in Milan and the Lombardy region.

EXHIBIT IV-15

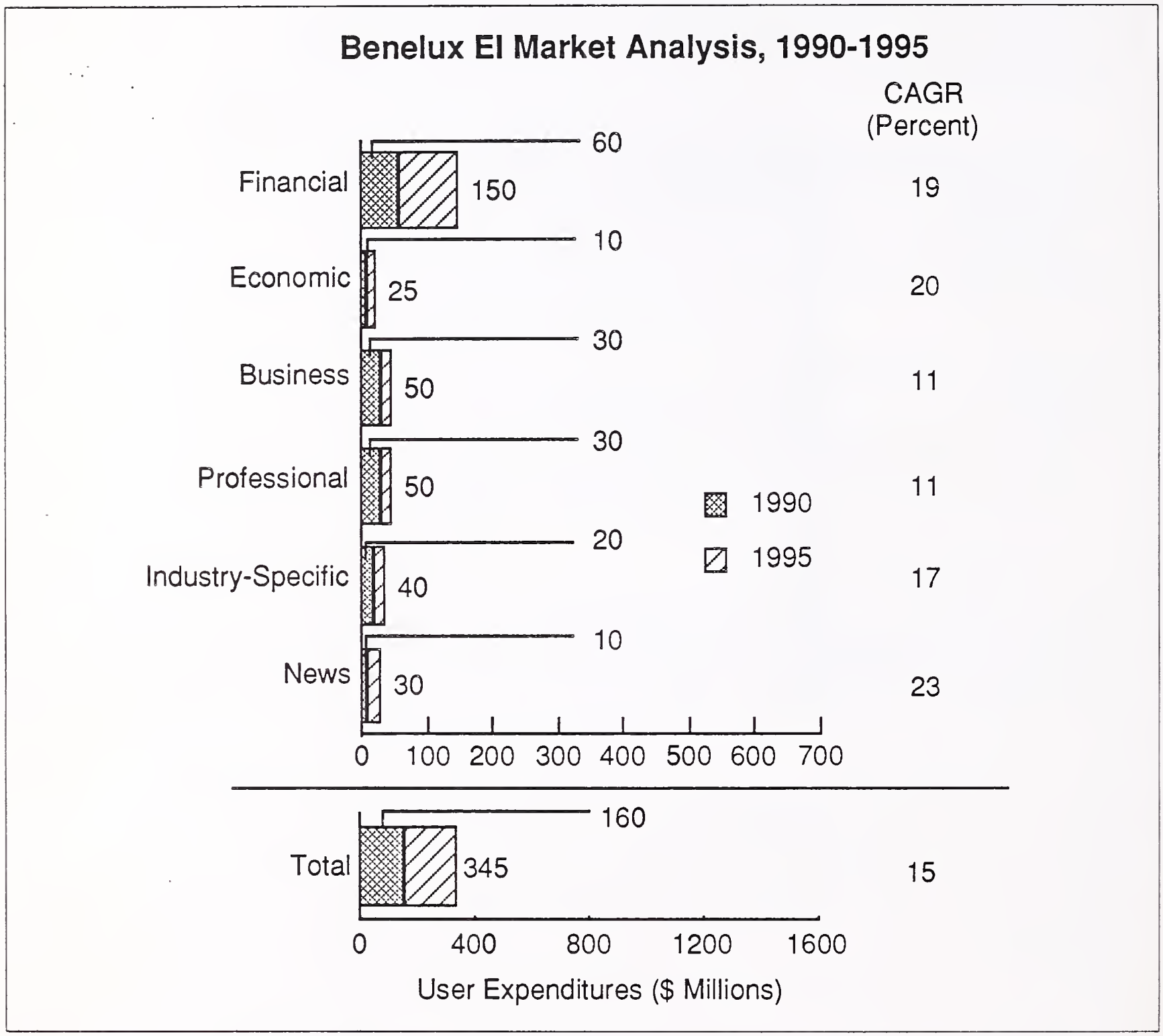


An example of commercial service sponsors is Pagine Gialle Electroniche, produced by Sarin and distributed by Seat. This "Electronic Yellow Pages" provides basic information for over 800,000 Italian companies with full product information for over 100,000 of these.

f. Benelux

The Benelux market for electronic information services was estimated to be $160 million in 1990 and to be growing at a compound annual growth rate of only 15% (lower than the industry average) to reach $345 million at the end of the forecast period. A breakdown of the Benelux market by industry sector is given in Exhibit IV-16.

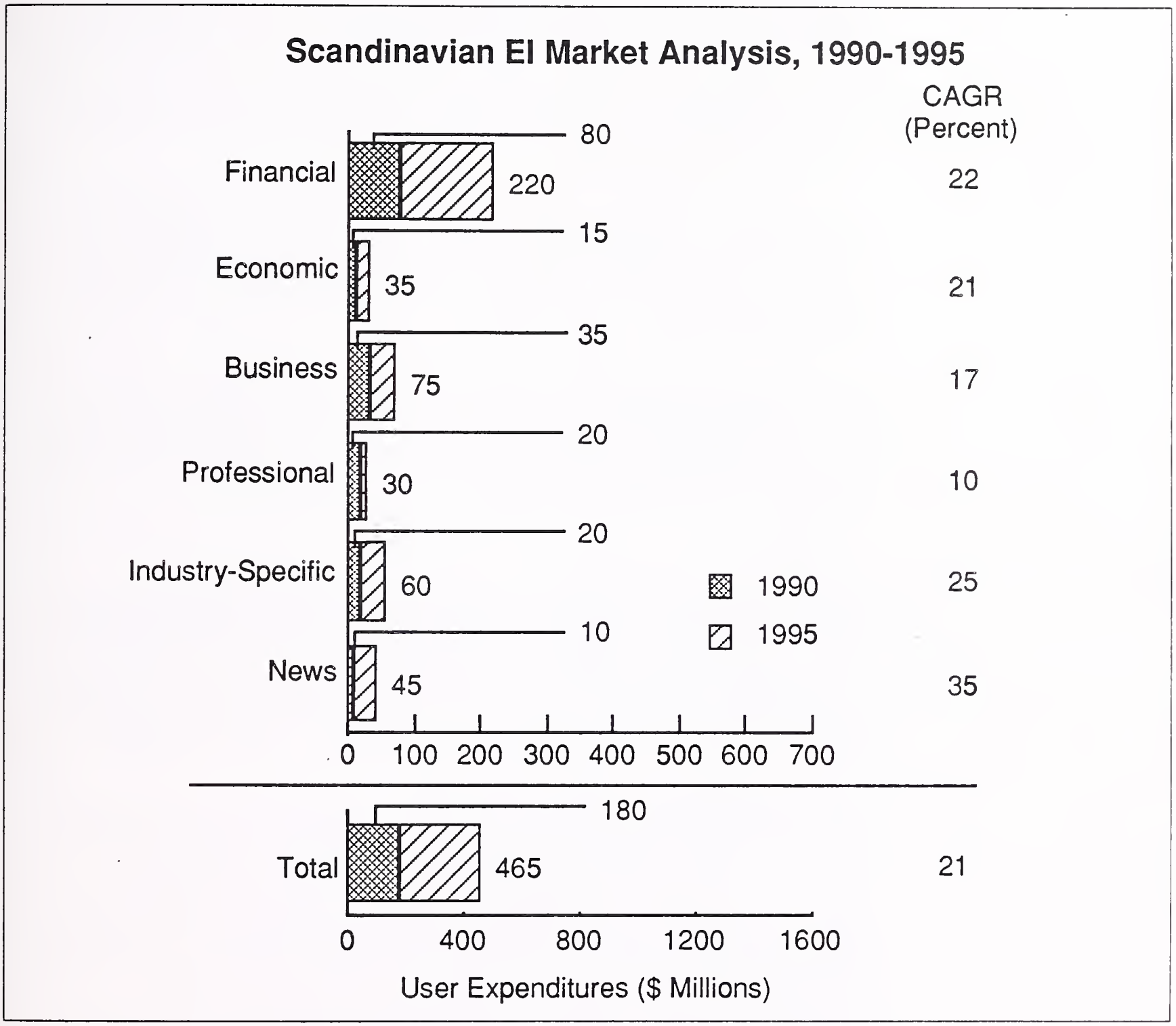
EXHIBIT IV-16



g. Scandinavia

INPUT estimates the total Scandinavian market for electronic information services to be worth $180 million in 1990, and expects the market to benefit from a compound annual growth rate of 21% over the forecast period, to reach $465 million by 1995. A breakdown of the Scandinavian EI market is given in Exhibit IV-17.

EXHIBIT IV-17



Findata is one of the major electronic information sources for financial and economic data in Sweden, and is both producer and provider. The company has capitalised on the need of U.S. customers to access Swedish information and to overcome the differences in Swedish accounting rules, by offering a service which goes beyond the sale of pure information into the realm of a company investigation, and the supply of tailor-made software that assists in the interpretation of this financial and economic data.

Another Scandinavian host, Affarsdata, offers the Kompass directories on-line for Sweden, Norway, Denmark and Finland, as well as for West Germany. These are available in English as well as native languages. Affarsdata also produces and distributes Stor-Tele, yellow-pages-type information for over 100,000 Swedish companies, as well as Sveriges Handelskalander, a database containing information similar to the Kompass directories but with a broader product classification, for over 15,000 Swedish companies.

In Denmark, the Information Bureau of the Trades Association produces and distributes Soliditet Online Service (SOS), a factual database containing information about all joint stock companies, private companies, parent companies, and subsidiaries or other affiliated companies registered in the country.

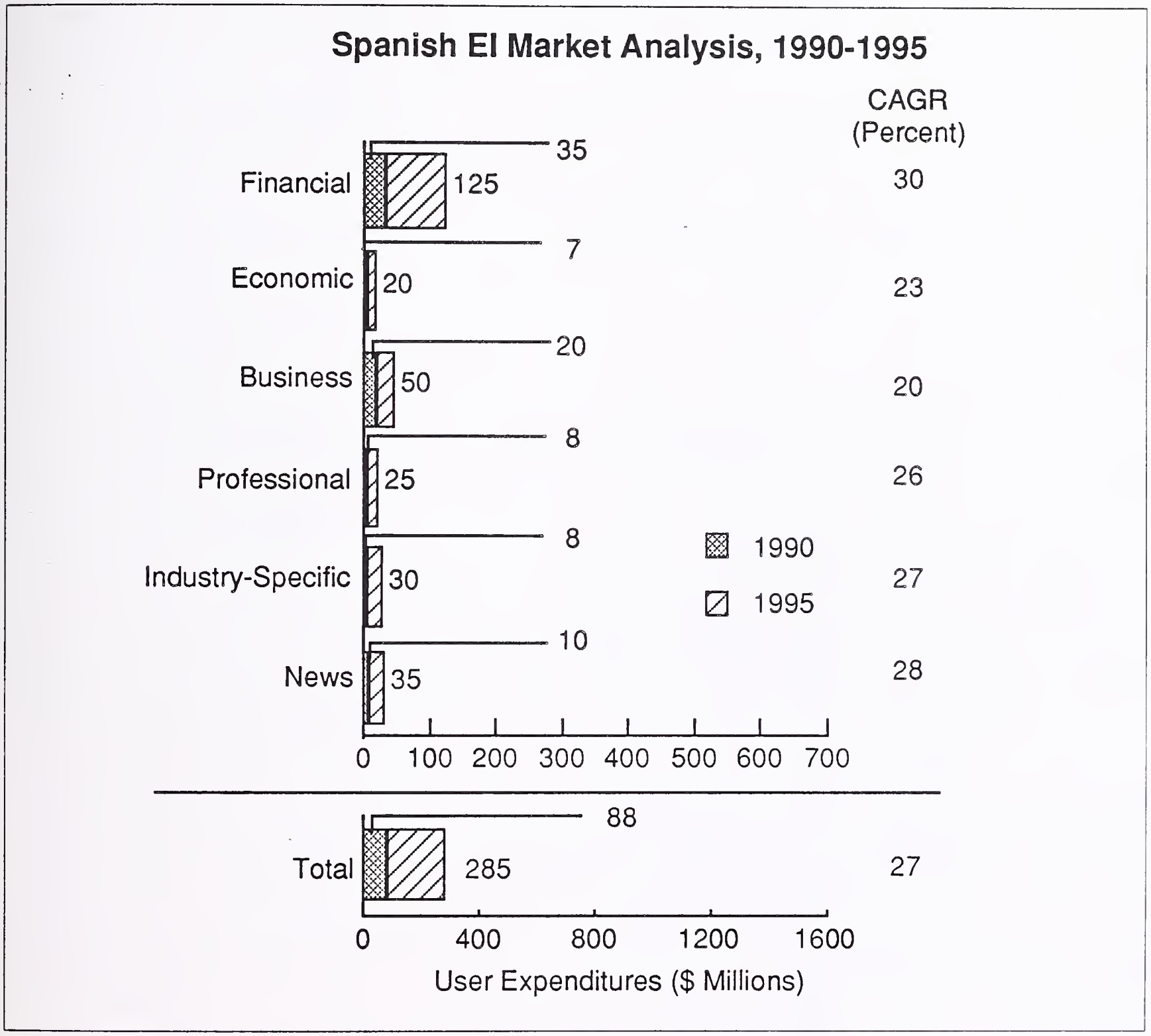
Borsinformation Telecom produces and distributes Telecom, a full-text database in Danish containing financial and political news both from Denmark and abroad, as well as holding accounting details of companies registered on the Copenhagen Stock Exchange.

h. Spain

INPUT estimates the Spanish market for electronic information services to be worth only $88 million for 1990 but expects the market to benefit from the highest compound annual growth over the forecast period of any European country—25%—to reach $285 million by 1995. A breakdown of the Spanish EI market by industry sector is given in Exhibit IV-18.

The Spanish market is still in an early development phase, as evidenced by the fact that the majority of databases are offered by chambers of commerce and government institutions. Thus, the Instituto Espanol de Comercio Exterior (ICEX) distributes Oferes, a database providing basic company details on over 30,000 Spanish exporting companies, produced by the Instituti Nacional de Formento de la Exportacion (INFE). Complementing the Oferes file is SYCE, also produced by INFE and distributed by ICEX, which provides data on Spanish exporting companies, including the value of exports, thus allowing users to rank companies by export volume.

EXHIBIT IV-18



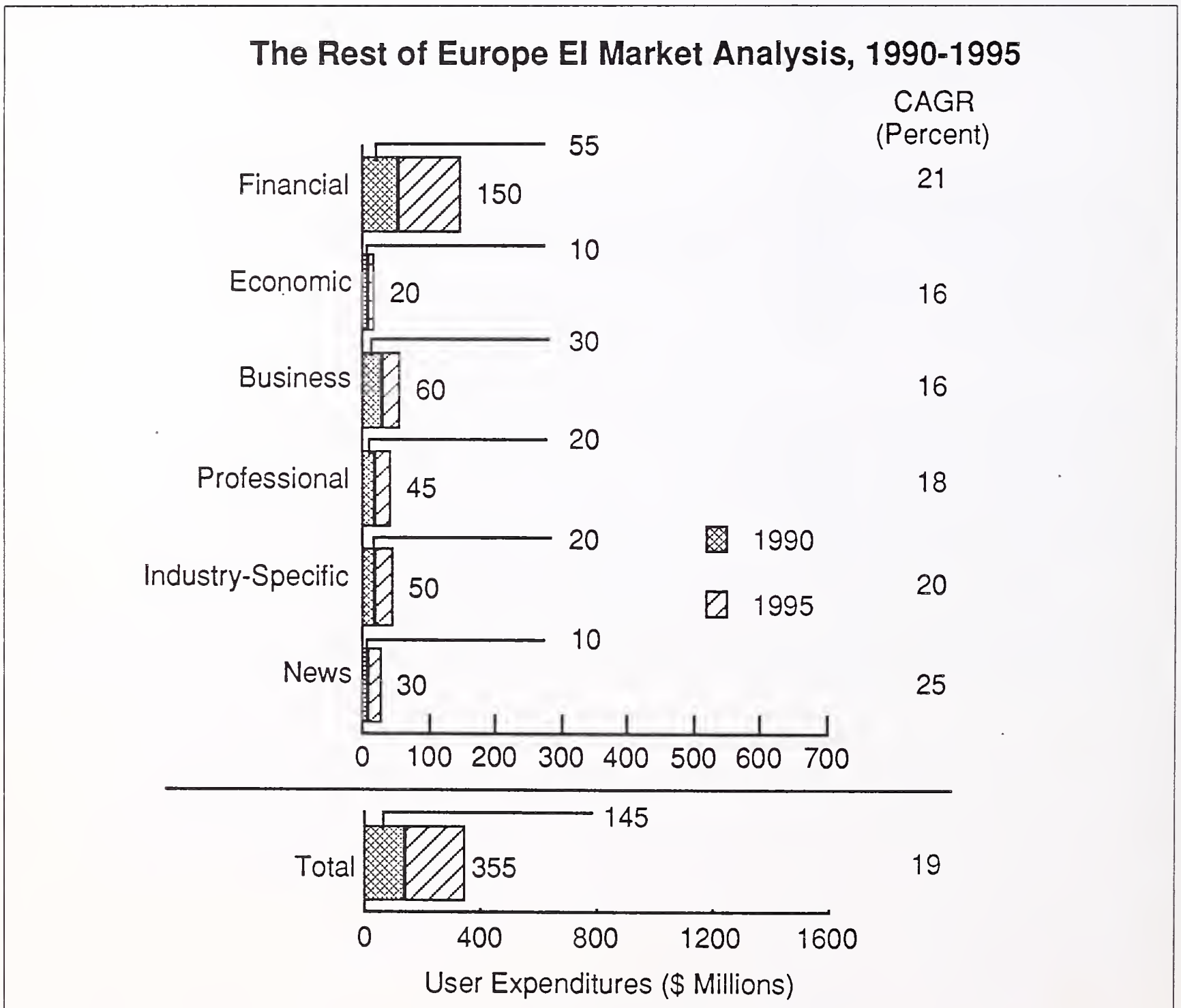
i. The Rest of Europe

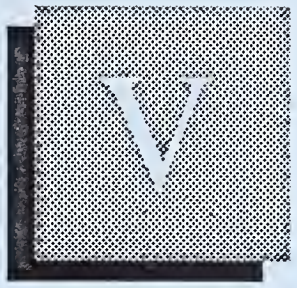
In the rest of Europe the majority of the $145 million EI market in 1990 was provided by Switzerland's Telekurs. A breakdown of the EI market for the rest of Europe is provided as Exhibit IV-19.

Telekurs offers an alternative to the financial offerings of Reuters, Telerate and Quotron and dominates the Swiss market with its three main services:

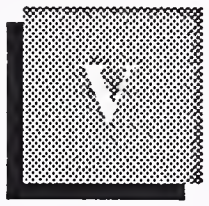
- The Investdata system,
- The Teledata service (TDS),
- The Valordata system.

EXHIBIT IV-19





Market Environment



Market Environment

A The Status of EI

The electronic information services market continues to be dominated by the Financial Information sector in which a few large vendor corporations such as Reuters, Dow Jones, Telerate and Citicorp take the most important market shares.

However, the looming world recession, which has been felt soonest and most sharply in the U.S. and the U.K., threatens to slow down dramatically the rate of growth of these leading players.

The nonfinancial on-line sector has continued to grow but, due to problems of profitability, many, especially the smaller vendors, still fail to return an adequate profit on the considerable investments which need to be made in marketing and product development.

The growth of the electronic information services industry can be indicated by the following key statistics, summarised in Exhibit V-l.

- Between 1980 and 1990 the number of databases available worldwide on-line increased sixfold, from 600 to over 4,000.

- In the same period, the number of database records mounted on hosts worldwide grew from 200 million to over 2 billion.

- By 1990, an estimated 2.2 million customers were served worldwide by over 500 online services, 1,500 publishers and over 15,000 videotex services.

In contrast with the above, however, Dialog, the world's largest supermarket host, which has more databases mounted than any other, has only 80,000 customers worldwide. This indicates that the electronic information services industry is far from fulfilling the information needs of every information-hungry worker.

- In the developed world alone the percentage of office workers who regularly access external electronic information sources is no higher than 1-2%.
- Revenues generated by the industry during the 1980s increased at a CAGR of under 25% which is not characteristic of a young industry and indicates the long-term nature of the struggle which EI has to compete with the printed word.
- In the last two years vendors of on-line databases have started to withdraw database services and products which were not producing a profit, indicating an increased degree of financial maturity in the industry.

EXHIBIT V-1

The Importance of EI Worldwide

- Over 2 million users
- 4,000 databases
- Over 2 billion records
- 1,500 publishers
- 500 on-line vendors
- Over 15,000 videotex services

Electronic information services can be considered in horizontal layers comprising producers, distributors and users. However, marketing electronic information differs from traditional publishing in that electronic information is highly fluid and not restricted to single distribution systems. As one descends through the distribution chain, the value of information at each stage increases, while the ability of the preceding groups to control the information decreases. This, in combination with new production and distribution technologies, is blurring the boundaries between the groups in the chain. The increasing complexity of the interaction between these groups becomes more evident when the supply side of on-line database publishing is examined as part of the whole network services industry.

Exhibit V-2 shows the division of the EI market into four layers, lists the typical participants within each layer, and outlines their principal business objectives. The electronic information services industry is technology-dependent but not technologically driven. The need for databases

was recognised long before high-speed, low-cost computer equipment and communications networks made them both technically and economically viable. However, the technological developments and resulting cost reductions are key development forces for the El market.

The availability—throughout Western Europe—of public packet-switched networks (even if this happened much later than in the USA) as well as the improvements in communications standards, has led, and will continue to lead, to a wider range of services. Furthermore, the existence of extensive network-based service providers offering new delivery modes is also a key driver of this market. Many vendors are looking to integrate EI with other applications, such as electronic mail and electronic data interchange.

1. The Communications Environment

Much will depend on Europe's achieving a breakthrough to a real single market for telecommunications by 1992. The telecommunications link is vital to an increased rate of growth in on-line services. Accessibility, cost and the service level of Europe's communications facilities are key. High-capacity networks will be an essential and dynamic element in Europe finding a greater productive capability in the face of its competitors in world trade, North America and the Far East.

The development of distance-independent public packet-switched networks, such as Transpac in France, has helped the development of EI throughout Europe. In addition to the public packet-switched networks, EI has benefited from the existence of large private networks, as well as the development of value-added services from third-party vendors throughout Europe.

Electronic information services (EI) still suffers from problems of definition. There are the 4,000 worldwide databases which can be accessed using a modem and communications software. This is the traditional on-line database sector. However, the growth of CD ROM technology and its entry into the financial information market, as has happened with Lotus's One-Source (a compilation of financial reports from publicly-held companies) is changing the dynamics of the market. Off-line services are effectively mounting a new challenge.

There are also the newer transmission/delivery mechanisms, such as local distribution using radio systems or satellite technology (Lotus's Signal system for example, which distributes real-time securities quotes using FM-radio technology).

EXHIBIT V-2

EI Industry Segments

Segment	Participants	Objectives
Information Providers	• Publishers • Database producers • News services • Market research organisations	• Increase royalty revenues • Expand markets • Defend revenue base • Bypass intermediaries if sensible
Systems Vendors	• EI vendors • Videotex services • Processing services companies • Publishers	• Add value to information • Protect investment in network • Defend traditional revenue sources
Infrastructure Companies	• PTTs • Network services • TV companies • Software companies	• Increase demand for core businesses • Extend network • Exploit new markets
Service Sponsors/ Brokers	• Financial companies • News companies • Specialist agencies/ brokers	• Differentiate and add value to products • Improve productivity of basic functions • Develop new markets

Broadcast technologies such as radio and satellite are ideal for applications where the data has to be current, for example stock prices that are being used to manage a pension fund. However, they are not interactive. One of the more recent services uses satellite transmission to the U.K. It is called Satquote and is offered by the Euro American Group of London. The system covers most U.K., U.S. and Canadian equities and futures, and operates over Eutelsat 4, in geostationary orbit over the mid-Atlantic. The service transmits data as it is generated by Standard and Poor's, and can be picked up via a dish aerial and receiver.

The Satquote service costs approximately $400 a month, considerably less than the cost of land line services at around $2,000 a month.

Broadcast technology is having an impact in the following areas:

- Financial/Economic Information i.e., general data on company performance, capital markets, national and international economies, etc.
- News—Full text or abstracts of daily newspapers, national wire services and current magazine issues.
- Full text—Entire articles from magazines and journals can be despatched from a central store.
- Abstracts—Synopses of articles, books, and dissertations which a researcher might require urgently.

Currently, providers furnish the facilities to run the database, such as the software and the telecommunications, and the producers rent space on the providers' machines to offer their database to a wide market. The producers keep a percentage of the hourly usage charge incurred when someone uses the database, and the providers receive the balance to defray the costs of running the system and to provide their profit margin. Producers require distribution; providers have that distribution in place via their networks.

However, data broadcasting's first applications will be in-house e.g., the provision of one-way links between company head offices and their branches. For example, banks could reduce the sums spent on private couriers for interbranch communications, whilst telephone companies could be sending updates of business or other telephone directories stored on their databases.

However, although the European Commission indicated that countries should allow business customers throughout Europe to use small dish (VSAT) terminals to accept signals from any satellite by the end of 1989, the licences issued by the U.K. stipulate that they can only broadcast to receivers in Britain. Most Western European countries are following a similar slow path towards amending their laws. This legislative inhibitor, coupled with the perceived technical difficulties, will undoubtedly affect the crucial infrastructure phase.

When compared to the ease of leasing a line, satellite technology is behind. The position of British Satellite Broadcasting's (BSB) Datavision, after BSB was merged with Rupert Murdoch's company Sky TV, is indicative of the lack of profitability in the sector.

2. Regulation

The twin forces of technology-push and market-pull are redrawing the lines of telecommunications regulation. In the International Telecommunication Union, new rules were laid out at the 1988 World Administrative Telegraph and Telephone Conference that will smooth the way for competition on international voice and data lines. Furthermore, calls for the abolition of market access barriers have led to telecommunications services being included in the General Agreement on Tariffs and Trade (GATT) talks for the first time. In the European Commission, a group of policy initiatives is aimed at speeding the liberalisation process.

Six major factors influence European telecommunications reform, and are likely to delay the widespread liberalisation of Europe's data services as promised in the Green Paper (the European Commission's plan to open the market for telecommunications equipment and services by 1992). These factors are illustrated in Exhibit V-3.

Whilst concepts such as Open Network Provision (ONP) in Europe and Open Network Architecture in the U.S. point to policy convergence, there is still a considerable range of opinion from country to country on the means and pace of reform. Political, financial and trade worries are leading to a split between the countries that feel they will gain from reform and those that believe they have much to lose.

France, Italy, Belgium, Spain and Greece all oppose the services directive drafted by the Commission in December 1988 that calls for all services other than voice telephony and telex to be released from the monopoly control of national telecommunications administrations by January 1991. These countries are unwilling to radically liberalise their leased-line policies, and do not want to surrender their monopolies over basic data transmission. Many European telecommunications administrations want to delay competition until they are ready to compete.

However, taking the U.K. as an example, it is likely that such attempts to protect current revenue streams coming from public switched networks and value-added services will result in users looking to independent and private networks for the answer to their needs.

France is leading the opposition to deregulation. Although the French telecommunications administration is advanced technologically speaking, they have a feeling of vulnerability, in that it has not been able to generate the volume of transatlantic traffic it will need to compete with British Telecom and the major North American carriers.

The French also reject the Commission's argument that data transmission must be opened up to competition in order to spur growth, arguing that users' needs are already satisfied by Transpac, the national public switched data network. Transpac's monopoly means that private service providers are restricted from offering end-to-end service, and their traffic must be trunked through the Transpac network.

EXHIBIT V-3

Factors Influencing European Telecommunications Reform

- Uncertainty engendered by war and regional instabilities
- Political ideology
- Cross-subsidy of nonprofitable services
- Union opposition
- Fear of competition
- Recession

The situation in Italy highlights many of the problems facing the European Commission:

- The Italian government does not wish to liberalise basic data transmission because its own switched network is not yet in a good enough position to compete on an open market. However, the government is considering opening up network services to full competition. This is partly because the restrictions on third-party services have not prevented users from doing what they want; major service providers are already carrying services via their leased line networks.

Belgium is in a similar situation. Although GEIS has submitted a complaint to the European Commission about the PTT's leased-line policies, the RTT (Belgium's public service operator) is reluctant to change policies that both users and independent service providers consider anticompetitive. The Belgian stance is that they are operating in a monopolistic environment, and that if reorganisation is to come, it must be introduced slowly.

West Germany's recent liberalisation has highlighted the problems of late liberalisation, with the West Germans only recently gearing the basic structures to the process of change, instead of already having a firm basis from which to concentrate on the changes in the market and technical innovations. The West German reforms include permitting a second provider of mobile telephone service, open competition for all terminal equipment, lifting restrictions on third-party data traffic and abolishing volume-sensitive surcharges. West Germany's position is that nothing other than voice should remain under monopoly control.

The Netherlands is also trying to change the management of its telecommunications administration, by developing new market strategies and service offerings. In January 1989, the Netherlands telecommunications administration became a limited liability company, with terminal equipment and value-added services opened up to the competition. The privatised services wing of the new company has a remit to develop and provide value-added services to third parties.

In the U.K., competition is between British Telecom and Mercury in local, long distance, mobile and value-added services. Terminal equipment, satellite communications and pay phone markets have also been liberalised. Starting in July 1989, British companies were allowed to sell spare capacity on lines leased from BT and Mercury to third parties for basic voice and data transmission. This facility, known as simple resale, is not permitted anywhere else in Europe. The only company making any significant play in this area is the national Post Office, whose internal networking division now offer customised data and voice services under the new label of the National Data Corporation.

INPUT believes that it will be the countries that listened to users' demands for international services that will benefit from their decisions to liberalise. Frustrations have led users and private service providers to reroute data traffic to nations offering more flexible environments, and to move their European computer centres away from countries still protecting their public-switched networks. What the European telecommunications administrations share is a growing vulnerability to competition, if radical changes are not made in the way they run their businesses. The failure of the proposed pan-European MDNS (Managed Data Network Service) has exacerbated their problem.

B

Technology

The technological drivers (both vendor and user) enabling the development, production, distribution and use of EI, are listed in Exhibit V-4. Present and near-term technological improvements at the publisher's and vendor's end include:

- Advances in optical character recognition (OCR) and full-page scanning, automated indexing and abstracting.

- Speech processing to assist with data input.
- Mass storage and processing speeds that make it possible to handle vast amounts of data efficiently.
- The proliferation of new media, like optical disks, that increases the variety of possible distribution channels and reduce storage costs.

Technology-based advances at the user's end of the connection include:

- Greater machine-embodied intelligence on the desktop, via personal computers.
- More sophisticated search assistance software, some with artificial intelligence-based learning abilities.
- PC-compatible mass memory devices for optical storage media.
- Cheaper high-speed modems, some now coming as standard equipment on PCs.
- Use of more powerful output devices, including wide-screen monitors, laser printers and facsimile hardware.

However, there remain a number of very intractable inhibiting factors which are the cause of the slowness of the penetration of EI among executives and professionals who are not trained librarians or information scientists. These are listed on the right of Exhibit V-4.

1. Standards

Without standards, complex technology-dependent markets can deteriorate into chaos. The lack of industry-wide search standards is often cited as a reason why more users have not plugged into on-line services.

The proliferation of EI standards across Western Europe, and indeed across the world, creates problems. Some of these standards problems are:

- The character set conventions, which have evolved like the ASCII de facto standard for text-based data dating from the days of the teleprinter-type terminal.
- The multiple videotex standards across Europe (Cept3, Teletel, Prestel).

EXHIBIT V-4

Technology Factors

Drivers	Inhibitors
Vendor-Inspired	Fear inspired by technology
Advances in OCR	Confusion caused by numbers of options
New media	Complexity of search languages
Speed of access	Hostility to the screen medium
Increased distribution channels	Value of professionals' time if "wasted" searching
Standards	Resistance to information addiction
User-Inspired	
PCs	
AI	
Optical storage	
Cheaper software for communications	
Integration	

- The number of CD ROM standards for recording and searching.
- The electronic mail standards (at least until X.400 and X.500 have become commonplace).
- The ISDN voice/data/image integration standard, where commercial services or field tests are being carried out by PTTs in most Western European countries.

New users need a standard methodology and language to search any database, from any database publisher, from any information retrieval service, as easily as possible. ECHO's work in standard methodologies and languages can be regarded as an extremely important start in this area. Vendors throughout Western Europe agree that the development of X.25 packet-switching techniques had greatly improved the standards situation, and many were keen to see the developments that satellite would bring to the area.

2. Videotex Services

The relative failure of videotex (with the notable exception of France) since its optimistic beginning has led to an intensification of the debate as to where videotex fits into the spectrum of user solutions. In contrast to the elaborate user interfaces of most on-line services, videotex access makes few demands on the user, and yet its very distinctness is what makes many reject it as unsuitable or simplistic.

Successful videotex applications appear in three areas:

- Consumer orientated services, which include electronic shopping, home banking, interactive games and electronic mail.

- Private services, which are usually designed to supply proprietary information to groups of paying customers (e.g., to stockbrokers or travel agents), or in-house information to branches or to out-workers.

- Public access services, which take the form of advertiser-supported or subsidised public kiosks that offer directory, public services or shopping information.

There are optimistic signs for videotex, caused by the success of the Minitel service in France, which shows that consumer-orientated videotex can find a market, given government encouragement and subvention. Whilst the Minitel service is not yet profitable, the development of critical mass is regarded by the French as more important during the key development phase. Although something like 40% of accesses to French services in 1990 were made via Minitels and the Teletel system, it has been calculated that the cost of doing it this way instead of going via a host service can be up to three times as expensive. The growing preference on the part of the French for using their Minitels for this activity can be explained because the videotex system is user-friendly and neutralises some of the technological inhibitors listed in the previous exhibit (Exhibit V-4).

However, ultimately, with the existence of personal computers, videotex's importance has been seriously undermined. Technological developments have eroded the original strategic concepts upon which videotex systems were based. It is likely that the applications and the concept will continue to influence the development of the EI market, and that videotex as a technology will remain predominantly in publicly accessible services.

3. Electronic Bulletin Boards

In terms of user accessibility, an electronic bulletin board system lies between videotex and the on-line database. Bulletin boards have grown from the increase in personal computers, and can be easily assembled with rudimentary PCs and software. They can download or upload files or software, marketing information, sales reports, research data, community news, or virtually any other kind of message. Bulletin boards have attributes unique to EI applications, which are listed in Exhibit V-5.

Bulletin boards provide a minor fillip to the electronic information services market in that they provide invaluable first-hand experience to new users of computer networks. Their growth in Western Europe will affect the PSTN and videotex ends of the market, where hobbyist and consumer services are sold. Both videotex and bulletin boards could prove important to the emerging markets in Eastern Europe.

4. Network Services

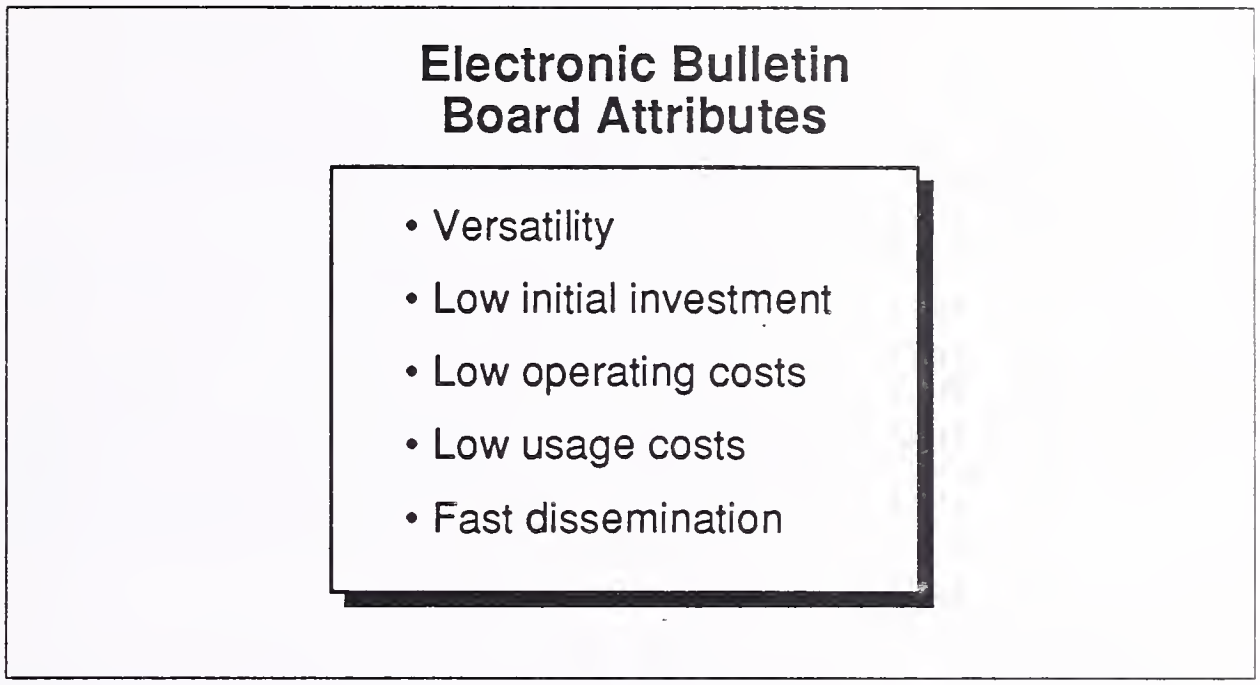
While raw, unprocessed data have low added value, interpreted and analysed data and the supply of additional services to augment basic electronic information services have high value, and these represent the key ingredients for marketing and expanding profitable opportunities for all types of vendors.

Network infrastructure companies and the network services providers, with their traditional electronic mail and electronic data interchange products, are in a unique position to innovate in the EI area with on-line delivery services. Gateways, cross-vendor searching and support for home banking, electronic shopping and personal networking services are examples of the way services can be constructed out of various elements. These companies are, therefore, likely to become increasingly involved in the EI market.

They can offer some or all of the following components of service:

- Speed and ease of access relative to extent of data.
- Uniqueness of information presentation.
- Levels of processing to refine data into information.
- Provision of decision support elements—software, graphics, etc.
- Customised software enhancements.
- Consultancy, training and other professional services.

EXHIBIT V-5



5. Artificial Intelligence

On-line searching would at first appear ideal for the application of knowledge-based expert systems. With the growing number of databases now available, even selection of the appropriate database is an area in which users, especially new users, often require help. However, most of AI's solid successes have come in areas where tight (even if complex) logic structures are in use, and database searching is still very much an art. Nevertheless, there are many serious attempts being made to create AI systems to assist in searching.

In the financial information sector, software products relying on massively parallel front-end processing of full-text electronic files using selection templates containing criteria specified by the user are replacing and supplementing traditional keyword searching.

The use of hypertext and hypermedia techniques are also gaining favour, especially in connection with optical storage methods.

These products will ultimately threaten current systems with obsolescence, and as a consequence, the major equipment vendors such as IBM and Digital are looking to develop such systems, although at present they can only be developed cost-effectively in a highly profitable environment.

6. Optical Media

CD ROMs have taken much of the media attention in the EI industry over the past five years. The reason for this attention focuses on their huge storage capacity—600 megabytes of data on a single disk—and their potential as software media for personal computers. Moreover, CD

ROMs are relatively cheap to produce. A master disk can cost between $3,000 and $10,000 with reproductions only a few pounds. The current constraint on their wider use is the "front-end" cost associated with the CD player or disk drive, which is typically of the same order as a PC.

CD ROMs represent an opportunity and a challenge for current EI market participants. Whilst information providers welcome CD ROMs as a more direct route to end users, with a bonus of greater editorial control, systems vendors see CD ROMs as a threat to the on-line services medium. Naturally, the larger end users will find CD ROMs attractive because they offer unlimited searching at a single subscription price, free of open-ended access and telecommunications charges. CD ROMs will not suit those seeking up-to-the-minute information nor very infrequent users.

Most of the large EI vendors, such as Dialog, Mead and Maxwell (Pergamon/BRS) have also entered the CD ROM business in order to provide alternative delivery modes.

If you compare the one million 1995 penetration figure for CD ROM in the table in Exhibit V-6 with the estimated number of personal computers likely to be in use then, (over 50 million), the immediate slowness of the CD ROM market becomes apparent. It is of course competing not only with other EI modes but, more radically, with the printed word in the form of reference books.

The growth of CD ROM is highlighted by the fact that there are around 500 compact disk databases on offer to the market.

7. Image-based Databases

The advent of cheaper and more capable computer graphics software as well as optical disks, has resulted in the advent of image databases. The other restriction, that of narrow bandwidths, has been eased by data compression advances, and will eventually be overcome by the omnipresence of fibre optic networks. Whilst several numeric databases currently offer the capability to plot time-series or econometric data, and many videotex applications use graphics as a presentation medium, most image-based data is stored off-line.

It is likely that there will be a considerable increase in activity in this area during the forecast period, especially from database publishers on optical media. Areas of opportunity are in architecture and design, business graphics, education, geography, town planning, broadcast media, military, medical, scientific, real estate and travel applications. Questel is one vendor which has pioneered in this area.

8. Datacasting

Datacasting works by using a spare line of television transmission (a vertical blanking interval—VBI) with some 14.2 kilobits transmittable per second. Presently, two such VBI lines are used from each of the two BBC channels in the UK. Up to four could come to be used in the next five years.

Satellite television can also apply this technique. An experiment on the Direct Broadcasting payload of the European Space Agency's Olympus satellite, called BBC Eurocast, is intended to show the feasibility of replicating Datacast across Europe.

It is also possible to use FM sideband (Sub-Carrier Authorisation) and the European Broadcasting Union's Radio Data Service (RDS) for the transmission of data. Encoding would ensure that there was no interference to the main radio broadcasting services. BBC Radio already uses RDS for its U.K. network, passing on station identification and automatic tuning facilities to a new range of RDS receivers.

Information services taking advantage of the already installed infrastructure of data broadcasting are beginning to expand rapidly. Rather than using terrestrial data networks, which are still largely controlled by PTT monopolies, such data broadcasting services work out efficiently and do not entail customers having to access packet-switched data nodes which may be some distance from their place of work.

For volume use the price becomes very competitive. For example, for just over $2,000 per annum, unlimited use of the London International Stock Exchange financial information service, Market Eye, can be supplied. The price includes all rental charges on the equipment, which consists of a box of electronics, a colour video monitor and a simple 20-button keypad. The information available includes real-time access to prices and movements of SEAQ equities, market indices, traded options, ticker tape on all trades, and other information.

EXHIBIT V-6

CD ROM: Installed Base in Western Europe

Country	1990	1995	CAGR (Percent)
France	12	160	68
U.K.	11	150	69
Germany	13	175	68
Italy	27	200	49
Benelux	5	80	74
Scandinavia	6	75	66
Spain	6	100	76
Rest of Europe	5	90	78
Total Western Europe	85	1,030	65

1. Economic

The leverage on electronic publishing is considerable, once business exceeds a certain volume. Whilst development costs are high, marginal costs can approach zero over wide ranges of use. Those producers with early offerings in the right market sectors can gain considerable advantage. However, the high margins invite intense competition.

The attitude of systems vendors is markedly different to that of the producers, since it matters little to them what services are being accessed by end users. Their priority is to offer ease-of-use features and unambiguous pricing, which encourages users to switch between services. Because the marginal costs of delivery are so low, vendors are developing pricing strategies that optimise their returns across different levels of use.

In professional markets, vendors have traditionally structured their prices around price insensitive heavy users. Factors which are now prompting vendors to deviate from this approach include:

- Increasing competition in the broad on-line markets.
- Challenges posed by the distributed medium of CD ROM.
- A more sophisticated population of heavy users attempting to drive prices down by their superior buying power.
- A desire to extend services to populations that include more casual users.

On account of this, a pricing dilemma is being created as vendors look beyond their existing markets, to build usage without jeopardising their revenue base. Some responses by major vendors in Western Europe have been significant:

- Price increases, particularly in display or printing charges, have again been occurring at the end of 1990.
- Retrenchment and removal of databases from on-line status.
- Consolidation of similar databases into larger files.
- Creation of second versions of established services at lower cost but with fewer features.
- Extending off-hour rates to more users.

Compounding these changes is an estimated 25% per year projected rate of improvement in the price-to-performance ratio of data processing and communications technologies. Rapidly declining distribution costs give a distinct advantage to smaller producers who can afford to serve smaller niche markets.

CD ROM is affecting pricing strategies. There is reason to expect that a proliferation of disk-based databases will encourage "supermarket" on-line vendors to return to subscription fee policies, so that like can be compiled with like.

2. Users and Usage

In Europe there are some 35 million personal computers, but less than one million are connected to modems. The number of heavy, regular users of electronic information services is only a fraction of this, say 20% with the remaining 80% being infrequent end users. These numbers are tiny when compared with the total European population of information workers, an estimated 75 million.

The slow speed of uptake can be attributed to many factors, the most significant of which are:

- Nonspecialists are confronted with technically complex systems and difficult access to networks.

- Many managers prefer to receive information on paper—even from databases because the paper medium allows more easily for reflection on what is being assimilated.

The key vendor challenge is to bring information to the user rather than the user having to search the services. Advanced electronic information services need to offer various services for different target groups of users. These should be based on preselection and editing by the information provider, taking into account the specific information needs or profiles of the target group. Exact, concise, appropriate and timely information aids decision making.

The bulk of on-line users are still professional searchers supported by corporate research budgets. Barriers to the use of electronic information services are numerous: for many potential users, EI is another data source that compares unfavourably with volumes of free, subsidised or advertiser-supported information. In addition, the technical nature of electronic information services requires that users master a series of new techniques. This results in user resistance and a need for vendors to address several issues that are listed in Exhibit V-7.

- Overcome the techno-fear.

- Understand the rudiments of modems and communications software.

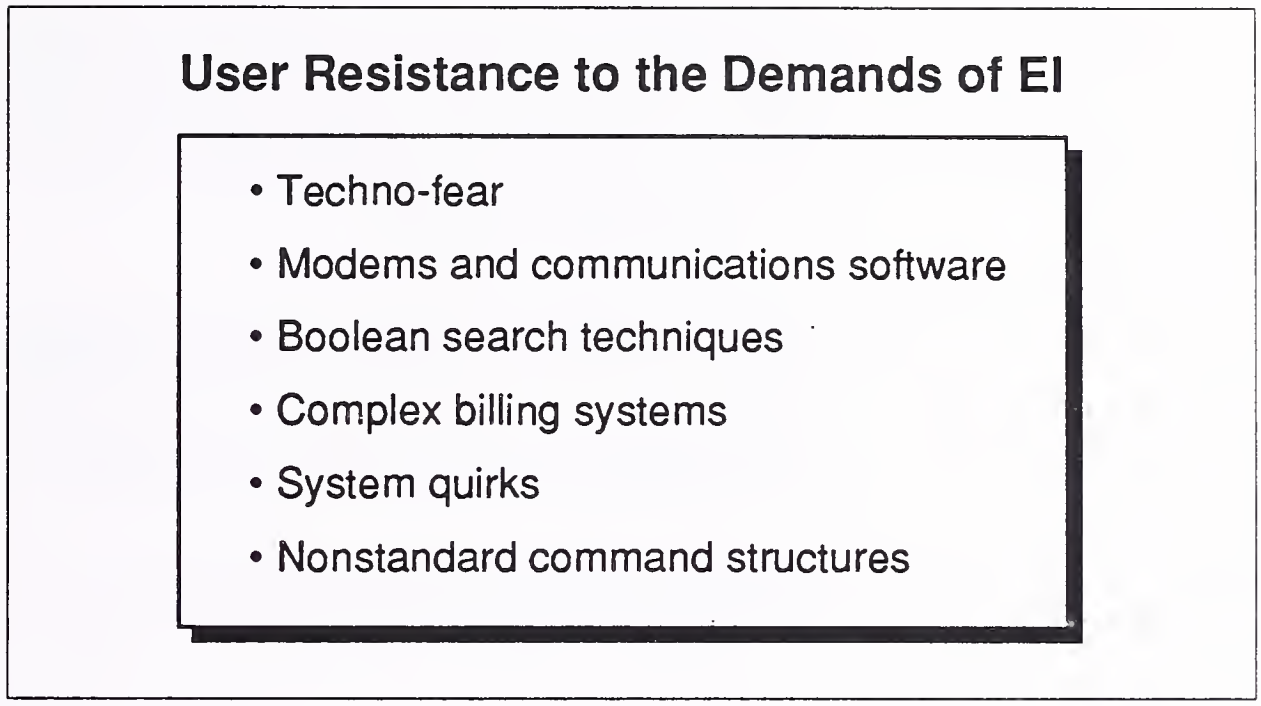
- Master basic Boolean search techniques for on-line searching.

- Tolerate steep prices and complicated billing systems.

- Accommodate systems quirks and non-standardised command structures.

"Ease of use" is now the key issue in the EI market, intensified by the advent of optical media which takes the ease-of-use requirement further by relieving the user of the intricacies of on-line communication. Investment in CD ROMs or diskette-based data alters the economic relationship between user and data.

EXHIBIT V-7



Many vendors, like Dialog and Kompass, sponsor extensive user training courses in order to help users along the learning curve. Beyond training, another ease-of-use innovation is the gateway, essentially networks interconnecting multiple vendors' electronic information services in a way that is transparent to the user. In effect, gateways dissolve the distinctions between on-line vendors. The last few years have seen agreements between services such as Questel and GSI or PFDS and Profile.

Cross-vendor searching is another variation on the gateway theme. Users can tap into a bundled service such as ComputerScan at an hourly rate (payable only if the search yields results) and at a standard hourly on-line charge.

Ease-of-use thinking has also spawned an increasing amount of front-end search software such as that developed by Reuters and AP Dow Jones. Most packages lead the user through a series of user-friendly menus and has been termed the "Bring" principle.

Dow Jones has a service which delivers the news to its customers and allows them to converse in English rather than in an esoteric retrieval language. SDI, selective dissemination of information, using a standardised search, is a traditional technique, and the latest products not only collect information according to defined rules, but insert it into word processing or spreadsheet software automatically. The customer can ask normal language questions for supplementary information.

Dow Jones is also revolutionising its charging policy. Companies subscribing to the new service—like ESA-IRS—will no longer be charged on an inefficient time-based scale. Dow Jones will levy charges based on the number of computers on a local-area network.

INPUT believes that the "Bring" principle must be used to indicate a true breakthrough of electronic information services from the relatively small market of current users to the much larger market of users who require better information to make them more productive.

3. Strategic Perspectives

Electronic information services have not as yet revolutionised our way of doing business in quite the way that was anticipated almost a decade ago. The reasons that this phenomenon has not reached its full potential have been discussed in previous sections and can be summarised as follows:

- End users still suffer from a combination of techno-fear and fear of incurring the "lost opportunity" cost.
- Customers are not sophisticated enough to fully utilise on-line data.
- On-line searching is expensive.
- The industry has failed to accommodate its biggest revenue-producing market: the Western European corporate sector.

This last reason may seem flawed when over half the industry's revenues are derived from the use of financial and credit-related databases. But examination of the EI market's history suggests that vendors have been slow to target the marketing and sales marketplaces. Some of the key EI niches are listed in Exhibit V-8.

EXHIBIT V-8

EI Sector Niches

Sector	Leading Vendors
Financial	Reuters, Telerate, Dow Jones, Dun & Bradstreet
Economic	IP Sharp, Dialog
Business	Dialog, BRS
Full-text	Mead, Dow Jones, Reuters
Legal/Medical	Mead, Context

From its origin as a supplier of data to government and library markets, to its belated entry and success in business markets, the on-line database industry is now reaching a new watershed: the buyer's market. Even the business information market is becoming deluged with databases. Vendors are less likely to be able to dictate the market.

Participants in each of the four EI layers tend to approach the on-line database industry with different strategic perspectives:

- Information Providers often find their objectives at odds with earlier and stronger commitments to print media.

- Systems Vendors are seeing their revenues squeezed by publishers who are able to bypass traditional networks and reach end users more directly.

- Infrastructure Companies are threatened by increasing competition from other infrastructure companies, as well as changes in government regulations.

- Information Brokers/Service sponsors are looking at database markets as vehicles for extending their existing vertical market services into new areas.

The Systems Vendors (some of whom were formerly the Remote Computing Services Vendors) market the service on behalf of the database creator or information provider, in some cases merely providing the computer host facilities while the information provider takes charge of the marketing (as with scientific and/or technical databases, for example).

Of the vendors interviewed regularly by INPUT for this study, over 50% fall into this category. Increasingly, systems vendors are establishing separate divisions or business units to service the electronic information services marketplace, e.g., GSI-ECO and Telesystemes Questel.

A further category of activity is that of the totally specialist electronic information service, a "supermarket amongst hosts". In the case of Dialog, for example, the entire operation is dedicated to the use of electronic information.

The information broker is at an intermediary stage between the database service and the end user, and has become significant on account of the generally perceived difficulty in accessing electronic information services. With the increase in the number of services, the broker has seen his role assume the further requirements to reduce on-line connect time and the number of accesses.

A number of organisations are specifically information brokers, and a list of some of the more prominent ones in Western Europe are included in Exhibit V-9.

EXHIBIT V-9

Information Brokers in Western Europe

Country	Information Broker	Hosts
France	• Bureau Marcel van Dijk • Information on Demand	Dialog, ESA-IRS, PFDS Mead, Questel, G-CAM, Kompass, Fiz-Technik, STN
U.K.	• FT Business Information • Information Unlimited	Blaise-line, Profile, Dialog, Kompass, Data-Star, ESA-IRS, Questel, BRS, FDS, STN
West Germany	• GBI • Siedel & Bonin	Data-Star, Dialog, ESA-IRS, Fiz-Technik, Genios, Questel, PFDS, Dimdi, STN, BRS
Italy	• Online SAS • System SRL	Dialog, Data-Star, IP Sharp, PFDS, ESA-IRS, Questel, G-CAM, Profile STN, Cerved, SEAT
Belgium	• Bureau Marcelvan Dijk • Bibliotheque Royale Albert 1er	ESA-IRS, Intea
Netherlands	• Cobidoc BV • Infotech Research • Johan Van Halm & Assoc.	Profile, Genios, STN, Dimdi, Dialog, Questel, ESA-IRS, PFDS
Denmark	• Alberg Universtatbibliothek	Alba, Aramis, Blaise-line, Byggak, Data-Star, Dialog, Dimdi, ESA-IRS, Nordisk BDI-Indiks, PFDS, IP Sharp
Sweden	• Update Scandinavia	Tess
Switzerland	• Prognos AG	
Spain	• Generalitat-Valenciana Impiva	Data-Star, Dialog, ESA-IRS, RPI, IP Sharp, Questel

Information brokers have a vital role to play in furthering the acceptance of electronic information services. This is because many hosts, Dialog for example, are becoming more selective about what they include in their catalogues. Dialog's Business Connection contains data from many leading business information providers, including Disclosure Inc., Dun & Bradstreet, Moody's Investors Service, Predicasts, Standard & Poor's Corporation, etc. The databases are organised into five separate applications areas:

- Corporate intelligence.
- Financial screening.
- Sales prospecting.
- Products and markets.
- Travel planning.

Reportedly, only a small percentage (10%) of products are selected from the hundreds of proposed databases Dialog evaluates each year.

A parallel and opposite trend is the continuing profusion of small databases. Products are repackaged to serve smaller niche markets. In addition, the declining cost of producing and distributing information is giving the smaller publishers an opportunity to enter the new markets. Their entry into the EI market, either directly or through alliances or agreements with commercial services sponsors or with the national PTTs (as distributors), will accelerate the trend towards a more fragmented market.

a. Joint Ventures

Joint ventures and strategic alliances are only one manifestation of the competitive forces at work in the electronic information services industry. Since alliances often represent a firm's earliest attempts to develop new products or enter new markets, alliances can be excellent advance indicators of company strategies or market trends.

Besides full mergers or acquisitions, there are two other types of joint activity to consider:

- Product development agreements—Joint product developments enable companies to share development costs and risks as well as to explore emerging markets. Several on-line industry alliances observed over the past year have aimed at the development

  - User friendly software for database searching—CD ROM products comprising a database and appropriate search software.

- Joint distribution agreements—These are often used by infrastructure firms to interconnect networks, or by database publishers to reach wider markets. For example, FT Profile and Nihon Keizai Shimbun have agreed to permit access to each other's systems of news and business information abstracts.

Deviation from this familiar pattern, i.e., linkups between information providers and commercial service sponsors, might be a cause of concern to systems vendors, but should be welcomed as an opportunity to provide a facilities management deal.

Mergers and acquisitions are more intense forms of alliances, generally requiring longer, deeper and more costly commitments. For most industries, merger and acquisition activity is a primary indicator of increasing consolidation and how an industry is changing shape.

Some territories where merger and acquisition activity is reshaping the EI industry include the boundaries between:

- Hardcopy and on-line information providers—Many of the major publishers have accelerated their moves into electronic publishing by taking over the on-line operations of a small producer or host.

- Software companies and information providers—Software vendors and systems companies can choose to specialise as industry-specific or application-orientated information vendors. CD ROM offers the best opportunities for this class of vendor.

b. Western European Cross-Flow

Though most of the world's database publishers and vendors have been and still are concentrated in Europe and North America, electronic information respects national boundaries no more than do global telephone networks.

Concern in previous years over transborder data flow and offshore data entry has been supplanted by official worry over how on-line databases compromise the regional integrity of Europe and its ability to compete in world markets. Entry by foreign firms into the domestic EI marketplace has also been of concern to national governments in Europe. During the 1980s the tide has started to flow in the opposite direction.

Some examples of European penetration overseas include: the Maxwell acquisition of Orbit and BRS, British Telecom's takeover of ITT's Dialcom, and Questel and Data-Star's opening of U.S. offices.

Electronic information providers are aware of the impact of 1992, and this has heightened their awareness of the need to integrate national databases into international networks of databases. The demand for standardised and comparable information about European companies is being addressed by vendors such as Jordans, Marcel van Dijk and ICC.

There are still serious problems with regard to the provision of pan-European electronic information. Firstly, the relative parochialism of European companies means that there are many national databases, but few that are truly pan-European. Those which are more international tend to duplicate information on large quoted companies but neglect the smaller and medium-sized organisations.

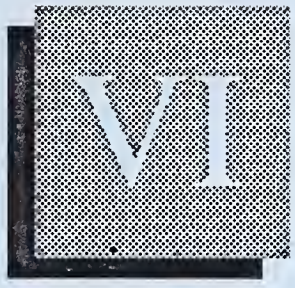
However, companies like ICC are trying to overcome this problem by integrating national databases in similar formats. Jordans has set up a CD ROM system with Bureau Marcel van Dijk of Belgium to provide company information about the U.K., France and Belgium; Cerved is working with the same company to cover Italy and Spain.

Also, Extel has moved into the market with a new international database called Global Vantage, offering detailed analysis of more than 6,000 international companies. Dafsa in France, and Handelsbank in West Germany are offering similar products.

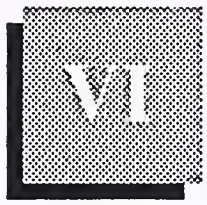
The problems with attempting to provide comparable data are considerable: there are different accounting practices, varying availability of information in different countries, different classifications of business activity, currency fluctuations and different languages. From a technological standpoint, the lack of standardised retrieval systems is a key problem.

Whilst expert systems will be of assistance in overcoming most of these difficulties by using reasoning techniques to eliminate inconsistencies, companies are currently having to use analysts to interpret the data.

Companies, such as Infocheck and Dun & Bradstreet, aware of this opportunity are sidestepping the issue of accounting procedures by using data supplied directly by the companies concerned.



The Impact of Mobile Communications



The Impact of Mobile Communications

A Introduction

There are five key areas of change currently influencing the telecommunications industry in Western Europe:

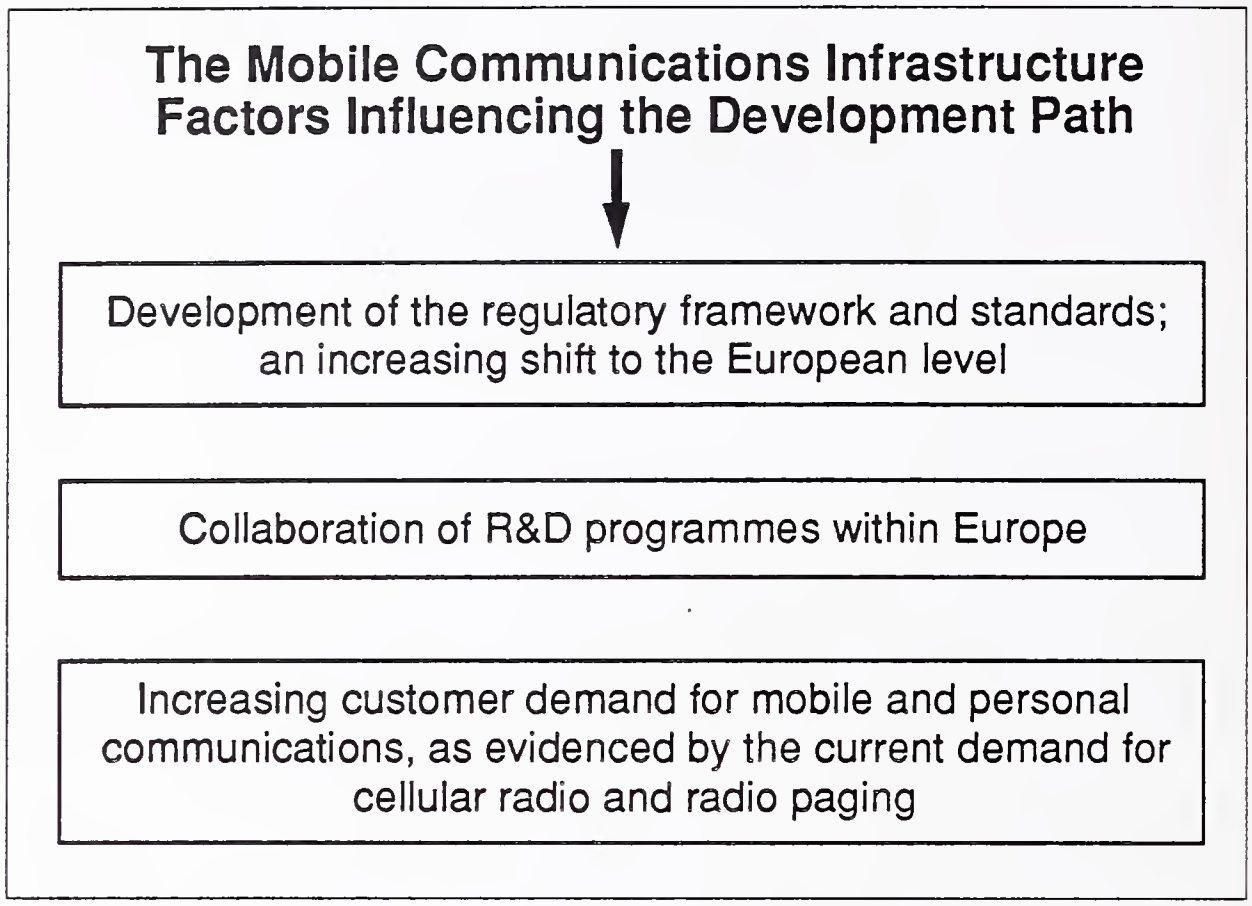
- Technological convergence.
- An increasingly liberal regulatory framework.
- European co-operation on standards, regulations, R&D etc.
- Product innovation.
- Emergence of new mobile services.

All of this is happening in an increasingly complex and competitive business environment. These factors are summarised in Exhibit VI-1.

The communications infrastructure has traditionally been dominated by two transmission networks—telephony and radio. The convergence of these technologies is helping to generate industry momentum. Yet there are still problems inherent in the fixed wire network, the PSTN, and it will be the mid-199Os before these are resolved. The optical fibre networks being used in specific situations offer considerable advantages over the older wired networks and the opportunity has been given to operators to create their own radio transmission specialist voice-orientated network systems.

Mobile communications is one of the fastest growing sectors of the telecoms industry. The last decade has seen the introduction of a number of new services; most important of these is the cellular systems which have been successful in the U.K., Scandinavia, and to a lesser extent in Italy, France and Germany.

EXHIBIT VI-1



Most recently there have been new developments:

- The specification for a pan-European cellular service (GSM).
- Satellite communication trials.
- The ERMES pan-European paging project.
- Second generation cordless (CT2) phones.
- A specification for a European cordless system (DECI).
- The announcement of licences to be awarded to operators of PCNs (Personal Communications Networks).

Cordless telephony (CT) is one of the most recent of these developments and Telepoint services based on this technology are now being launched. Earlier (CTl) technology used analogue transmission on a pre-set frequency; CT2 technology, developed over the last decade, uses digital transmission in the 864-868 Mhz range at a power of 100kw.

The initial focus of attention was the potential offered by the business/ office market; but for this to become reality some form of cordless PBX is required. Attention has now turned to the public sector and to the domestic/residential market, although in the longer term the business sector will yield the greater number of service opportunities.

Telepoint offers the mass market a public mobile personal communication service, or at least a portable service. Forecasts by technology consultants encouraged all those working in the field, and particularly Ferranti, in the belief that considerable potential exists for a public cordless phone system.

In January 1989, in the U.K. four licences were awarded to consortia consisting of a variety of major names in the communications field:

- Phonepoint—with BT, STC, NYNEX, France Telecom, Deutsche Bundespost.
- Zonephone—with Ferranti Creditphone on its own.
- Callpoint—with Mercury Communications, Shaye, and Motorola.
- BYPS—with Barclays, Philips, and Shell.

Since then:

- Callpoint and BYPS have announced their intention to merge.
- Hutchison Telecom (UK), a cellular radio service provider, will be the vehicle for the acquisition of BYPS by its Hong Kong based parent, the Hutchison Whampoa group controlled by Mr Li Ku-Shing.

The licences stipulated that by the end of 1990 all handsets should operate on a common standard: the common Air Interface (CAI) and that inter-system roaming should be allowed.

Network management will be a major issue that will have to be resolved once this common standard becomes a reality. Systems are required that will cater to subscriber identification, authorisation, credit control, metering and billing, to be carried out in real-time across all four systems.

The development of PCNs will give added impetus to this development if only as a result of the enthusiasm and commitment from the various consortia that clearly see this as another way of printing money. But what is the real potential offered by PCNs; how does this affect the development of Telepoint and CT2 in general?

B

The Evolution of Mobile Communication

Mobile Communications has evolved since the 1950s. The early days of private mobile radio and paging have given way to a range of products and services that encompass wide area paging, public access mobile radio, short range radio (due for introduction in 1991/2), satellite communications and cordless telephony in its various forms. The U.K. is used in the description below to illustrate the evolution to the current status.

Prior to the launch of cellular radio with Cellnet and Racal Vodafone in the mid-1980s, there were two existing mobile telephone services available in the U.K.

- BT System 3: an expensive manual (operator controlled) service covering Southern England; the equipment was bulky and capacity was limited by the number of radio channels available. This service was phased out during 1987/8.

- BT System 4: a fully automatic non-cellular service, introduced in 1981 and covering all of the U.K. By 1985 this service was facing capacity problems in areas such as London, thus creating the interest—and pent-up demand—for cellular. This service is now being withdrawn.

A similar situation existed in most European countries; radio telephone services were available, albeit expensive with limited capacity and geographic coverage. In response to what was perceived to be a growing demand for a more widely available and extensive service, the European PTTs began to develop a network that would appeal to a wider market.

It has been recognised for some time that the radio spectrum, particularly in the lower frequencies, was a scarce resource. One way of overcoming this problem was to limit the power of the transmissions so that exactly the same frequency could be reused some distance away. This is the basis for cellular radio: the same radio frequencies can be used many times across the country without interference between users.

In Europe, the Scandinavians were the first to take advantage of this market opportunity, launching the Nordic Mobile Telephone (NMT) Service in 1981. This was a fully automatic cellular system and has grown rapidly to become the model for many other countries. Because of their early experience, the Scandinavians have been very successful in exporting their technology and NMT systems have been established in Spain, Austria, Switzerland, Belgium and the Netherlands. Ericsson and Nokia have been the two companies able to take commercial advantage of this situation by supplying equipment and services for the infrastructure in these countries.

The systems established in other countries vary. The U.K. and Ireland have imported a U.S. technology called TACS; the German system has been developed by Siemens, that in Italy by Italtel and the system in France by Matra.

In the U.K. the Government licensed two operators, Cellnet and Racal Vodafone, to provide cellular radio services. These became operational in London in 1985 and for the first time there was a mobile communications service generally available to the public.

The demand for these services has come from the business market. Nevertheless the systems are designed to provide coverage of all but the remotest parts of the country; some 95% coverage of the U.K. population is now claimed.

Since the launch of a national cellular service, progress in the mobile communication field has been rapid both within the U.K. market and within the larger European arena. Over the last ten years developments have been gathering pace:

- The development of a pan-European cellular network to an agreed specification drawn up by a European consortium, Groupe Speciale Mobile (GSM). Cellnet was hoping to be the first operator in Europe to launch a digital pan-European service in July 1991 amidst growing doubts that full GSM implementation will be feasible by the self-imposed target date of 31st December 1991. Cellnet and Vodafone awarded their preliminary equipment orders to Motorola and Orbitel respectively against stiff competition from GPT, Nokia, Philips, Siemens and Ericsson.

- The development of satellite communication. Use of satellites in non-geostationary orbits for mobile communications in moderate latitudes; a series of land-based tests of INMARSAT's Standard-C satellite communications systems—its relatively low cost text-based satellite messaging system currently used by small ships is being adapted for existing land-based mobile communications.

- The proposed implementation of the ERMES project, a pan European paging service with roaming facilities.

- The development of a specification for the planned Digital European Cordless Telephone (DECT) standard, separate and distinct from the U.K.'s CAI specification.

- The sanctioning by the U.K.'s DTI of the complementary DTI/SERC LINK project for the Personal Communications Programme which together with publication of the DTI's discussion paper, Phones on the Move, is designed to make universal communications a reality by the mid-199Os.

- The announcement of the competition for the award of two PCN licences and the submissions of eight applicants.

- The launch of services from the U.K.'s Telepoint licencees.

Two basic transmission technologies are available with digital cordless telephony; FDMA (frequency division multiple access) and TDMA (time division multiple access). The UK approach to CT2 uses FDMA technology whereas the rest of Europe favours a TDMA approach. However, the European solution, a single digital European cordless telephone (DECT) standard, is still at the theoretical stage; the CT2 technology using FDMA is tried, proven and is up and running.

TDMA is seen as being much more suitable for use with cordless PABXs and is also being used in the proposed pan-European (GSM) cellular system. It is however at least two years behind FDMA technology in terms of development.

The intention of the UK's DTI (Department of Trade and Industry) is to pre-empt the DECT standard and, by establishing CAI in the UK and demonstrating its capabilities in real life, to create a de facto European standard. This is somewhat of a gamble but may succeed.

CT2 (and Telepoint) are but part of an increasingly complex range of communication services which use either the fixed network or radio frequencies. In this context the UK is ahead of the rest of Europe in terms of the development of mobile services.

C

Cordless Telephony - From CTl to CT2

Cordless telephony is based upon the idea of using relatively low power radio transmissions to replace the fixed wire links for a number of applications—in the home, in the office, even in the street. Analogue cordless (CTl) phones were introduced into the USA and Japan in 1982 and made their appearance in Europe shortly thereafter.

At the outset CTl phones operated in unlicensed frequencies, and it was not until 1984 that European countries began to regulate both their power output and the frequency bands in which they operated.

In 1986, U.K. Iegislation imposed restrictions on their use; their range was limited to 1020 metres from a base station. In reality this did not alter their general utility in the home.

CTl terminals are only allowed to be installed where the telephone subscriber is already linked to the fixed wire network (PSTN); it is presented as a value-added accessory and does not constitute a replacement for the fixed wire connection.

Based on analogue transmission, with eight channels which are factory pre-set to a single frequency, CTl phones suffer from both poor call quality and channel interference factors which may be annoying but are not critical in the domestic environment within which these phones are primarily used.

In the UK, CTl phones have proved to be (somewhat unexpectedly) popular; estimates of the number of CTl phones in use vary enormously, from some 600,000 to well over 1 million.

There has been an attempt to develop a European cordless telephone standard. This began as a counter attack to the imports flooding in from the Far East and allowed European manufacturers to establish a position in their home market. A number of manufacturers started producing first generation systems; these were based either on the US standard as in the UK (and subject to interference, poor reliability, poor quality, etc.) or on a CEPT analogue standard operating at 900 MHz. The CEPT standard was over-specified and the equipment was therefore expensive. Some countries do in fact still make these products but as the frequencies used are part of the channels allocated for the GSM system, such products will be useless after 1991.

The main point of departure between the UK and Europe was the development of second generation, digital cordless telephones, CT2.

In comparison with CTl, CT2 operates over 40 channels offering significant improvements in performance by using the 864-868 Mhz range at a power of l00kw (giving an operating range of 200 metres in open areas and 100 metres in urban areas). Channel selection is made via a process of dynamic channel allocation, and FDMA (frequency division multiple access) technology is used, being well proven and readily available.

The main focus of attention initially was the business/office market but for this, some form of cordless PBX is required. A simple base station and handset (common to both CTl and CT2 systems) may be adequate for domestic use and for very small businesses; it is of limited value in a normal office or business environment.

The view was taken that for CT2 to be a success, value had to be added to the ordinary cordless telephone. Encouraged by the forecasts being made of the potential offered by a public service, consideration turned to developing such a concept.

Thus CT2 technology very early on stated to be seen in the context of three distinct but overlapping markets:

- The domestic market where CT2 is a straightforward replacement of the analogue products in residential use.

- A business/office market which is largely dependent on the development of a cordless PBX.

- A mass market public service.

This latter concept was thrust upon the (largely unsuspecting) public in January 1989 when the DTI announced that four licences had been awarded for the operation of such a service called Telepoint.

D

Telepoint

Telepoint is the generic name given to the public cordless telephone service now being introduced in a number of European countries. Using a CT2 handset a caller can make outgoing calls via a publicly located base station as long as he/she is within some 100-150 metres of it.

The Telepoint base stations are connected to the fixed wire network in a similar way to any residential station. The main difference from a residential base station is that the Telepoint system can identify subscribers and through multiplexing is able to take more than one call at a time. Final billing functions and network management are carried out by each network's operating support systems.

The concept of a mass market public mobile personal communications service is essentially a laboratory development. The Telepoint experiment in the UK is the first opportunity to test the technology in commercial terms.

By the late 1970s UK telecommunications companies such as BT, Ferranti, GEC and Plessey were independently researching the generic concept of a universal cordless telephone combining private cordless telephone, the cordless PABX and a public (Telepoint) service into a common system, utilising a single universal handset.

The combination of two factors—recognition that cellular would not evolve into a mass market service, and research which indicated a latent demand for a public, low cost, mobile service—resulted in industry attention being focused on developing a prototype system for use in the domestic/public environment rather than the office.

The assumptions that underlie this belief were:

- Concern about the problems with public payphones—theft, vandalism, etc.

- Existing PSTN communications infrastructure could be used to build up a public network.

- This network could be produced at low cost and would have enough capacity to service high demand, assuming reasonable allocation of frequency spectrum.

- It could establish a new digital cordless (CT2) market and provide volume sales and hence decrease manufacturing costs.

Given this encouragement, the concept evolved and prototypes of CT2 handsets using analogue technology were available by 1987. During this time other mobile communication services were moving ahead steadily—particularly cellular. Nevertheless it was CT2 technology, being used in a mass public service (Telepoint) with the promise of high quality at inexpensive prices that was seen to launch the age of mass mobile communications services.

In January 1989 the DTI announced that licences had been awarded for the operation of such networks. These were for 12 years and will be monitored and enforced by Oftel (the UK's regulatory body).

The licences contain two clauses of particular interest: the Common Air Interforce and Inter-System Roaming:

Common Air Interface (CAI). It has been stipulated that from 1991 all handsets will have to operate on all base stations; until then each of the four licencees is allowed to operate its own proprietary system. However, pre-CAI users must be fully supported in the transition to CAI.

- Inter-System Roaming. The intention is to allow all Telepoint users to use all public base stations but only subscribing and paying call charges to one operator. This of course raises questions as to the systems to be used and the agreements to be reached between operators —on such issues as billing, credit control and user authentication. The whole subject of system management then starts to become a major issue.

Since this appears to be a technology-driven revolution with its concentration focused on ensuring that transmission performance over CTl is improved, an overlay network will be deployed. This approach seems logical, as long as roaming between competing systems is disallowed the distributed architecture seems robust enough to deliver a high quality performance. With the Common Air Interface (CAI) becoming available after 1990, the inherent advantages of a distributed architecture could present a serious constraint to customer performance expectations.

The major problem that needs to be resolved is not a hardware one but a system management and administration one. The drive to secure the lead in technology for mass market, personal cordless sales, pushed on even more rapidly by the fiercely developing competitive marketplace for roaming, will put before the industry a major administration service problem.

Systems are required that will allow for roaming identification, authentication, credit control, metering and billing. Such systems are complex but essential. What is more it is the development of these systems that will define the essential path for a fully flexible public service.

E

FDMA & TDMA - The Question of Standards

The European debate on digital cordless telephony splits into two camps, those in favour of frequency division multiple access (FDMA) and those in favour of a time division multiple access (TDMA) solution.

Both camps are firmly entrenched in their views but the arguments expressed tend to reflect vested interests as much as a desire to find the best solution for a pan-European system. The CEPT decision in Oslo in 1987 in favour of a digital European cordless telephone (DECT) standard based on a TDMA approach, rather than easing the situation, seems to have aggravated it.

The TDMA approach is led by Ericsson and Philips with support from Switzerland, Netherlands, Denmark and to some extent West Germany. TDMA is a less well-established radio access method than FDMA but is seen as more suitable for use with a cordless PABX and is an integral part of GSM development.

Ericsson has argued quite forcibly that it is the business user who will stimulate demand for CT2; a public service will simply not be able to offer anything to the business user until it can offer enhanced features such as Centrex. Others argue that once a user has a cordless telephone, then use of the service will grow.

It is generally acknowledged that the cordless PABX is a particular application of CT2. But this in turn raises other problems; even BT has admitted that the cordless PABX currently in development will require between 8 and 30 MHz frequency to support several extensions. Spectrum allocation problems, together with a limit on capacity, are to be expected.

The argument has been put forward that since TDMA is being used for GSM, it should also be employed for CT2. This is not as simple as it sounds. There are various technical reasons (e.g., base station transmitter requirements) why FDMA is better suited to micro-cellular cordless technology and TDMA to cellular. The TDMA supporters view the UK

approach of offering an immediate interim solution as viable only for the short term. Even so the UK is not alone in its support for FDMA; interest has been expressed by France and by Spain, Italy and some of the RBOCs.

The reasoning behind the decision to opt for TDMA for DECT is to many minds unclear. The two year lead time that FDMA has had over TDMA does not seem to have been taken seriously. It is argued that in opting for TDMA, CEPT has neglected the consumer's interests and disregarded the potential demand that could exist for CT2 as it now stands in the market-place.

Following this reasoning the UK government is thus at present pursuing an independent line vis-a-vis its European counterparts by implementing its own CT2 cordless protocol standard using FDMA/TDD (frequency division multiple access/time division duplex) transmission technology in the 864-868 MHz frequency range. The remainder of the European community is proposing a standard (DECT) based upon TDMA technology operating in the 1.6 GHz waveband for introduction in 1992/3.

The rationale behind the different approach is understandable. The UK government and UK industry players such as Ferranti, Shaye, GPT, STC, BT and Orbitel wish to exploit their current technological lead in CT2 and then to export this to Europe, in the belief that a market for public Telepoint services exists.

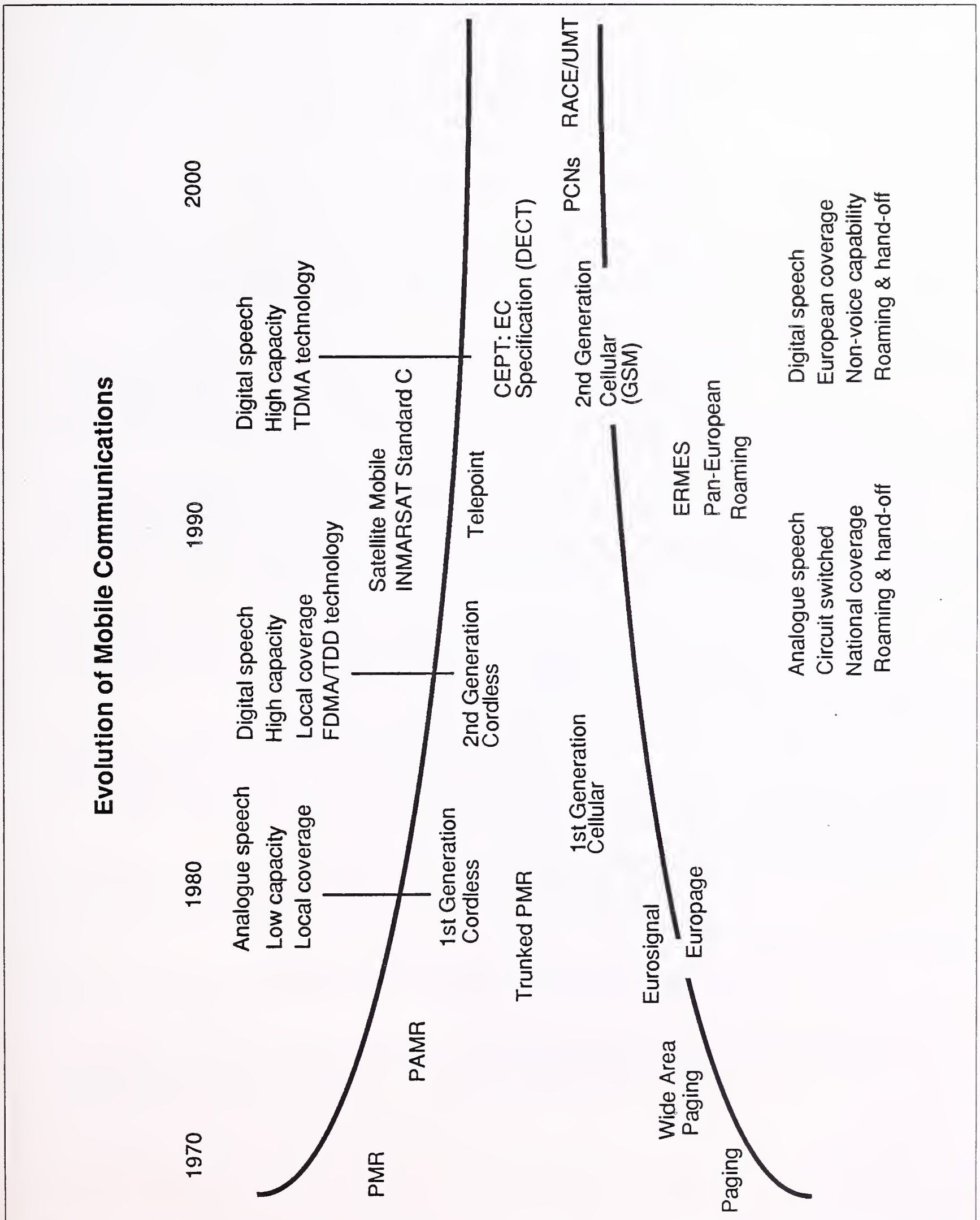
The UK remains optimistic regarding the acceptance of the CAI standard by European PTTs which would in essence establish it as a de facto European standard. Lack of agreement on frequency allocation could seriously hinder the success of the UK initiative in Europe. Nevertheless it is increasingly felt that the DECT standard may never get off the ground. It is argued that the CAI standard can be upgraded to comply with the European DECT standard, and can incorporate future-proofing features. Interestingly all the manufacturers involved have stated that their long term strategy is to use the 1.6 GHz operating frequency as defined by DECT. According to some industry observers a 1.6 GHz CT2 product will not be technically feasible before 1995.

It must be borne in mind that the focus for setting standards is increasingly shifting to Europe to take into account the importance of international perspectives in data communications and telecommunications, and the increasing dependence of the business community on reliable and efficient telecommunications networks. This implies considerable co-operation at the supranational level regarding not only the harmonisation of product standards but also the interworking of networks and the allocation of frequency spectrum for multiple mobile services.

There is no doubt that cordless telephony will ultimately lead to the development of the personal portable communicator. It is the precise evolutionary path that is in doubt.

Exhibit VI-2 illustrates the likely evolution and convergence of mobile communications systems up to the end of this century.

EXHIBIT VI-2



F

Product/Service

Any mobile communications service (voice, data or a combination) in general fits within an increasingly complex web of communications services which includes:

- Cellular.
- Public Mobile Radio/Band III.
- Satellite.
- Short Range Radio.
- Paging Services.
- Payphones.
- Voice Messaging.

These services revolve around use of either the existing fixed network (wire and optical fibre) or radio frequencies, or any combination of the two.

The process of innovation has led to an overlap of competing services which address particular market requirements. These services have developed along different evolutionary paths allowing increased application functionality to be built into systems and services.

The situation in the UK is different from the rest of Europe where the continuance of an uncoordinated policy regarding frequency allocation and product standards has severely impeded the growth of mobile services. Initiatives are, however, under way to rectify this.

Second generation cordless telephony products and related services open up a whole new array of application areas, primarily due to the performance improvements achieved by the use of digital technology. This has a number of advantages:

- It overcomes the technical constraints which have inhibited the use of analogue cordless phones in the business environment, offering high immunity to noise and mutual signal interference, and providing improved speech quality and security.

- In conjunction with the public Telepoint service, it allows the business user to combine on-site mobility with the occasional need for off-site PSTN connection.

- It offers eventual use as a wireless PABX attachment to allow mobility within the office environment.

- It provides a complementary service to paging and voice messaging with possible eventual integration to allow for 2-way communication.

- In the domestic environment it offers replacement of analogue CTl handsets while in the business field it opens up a potentially vast market.

- In the business environment it offers a new form of access at the personal level to a whole range of potential information services based on voice-activated and voice-coded output.

G

Personal Communications Networks (PCNs)

No sooner had the ink dried on the DTI's award of four licences for Telepoint, than another competition was launched—for personal communications networks. For some this was seen as the greatest prize yet, opening up the door to a truly mobile personal communication system. Judging by the attention the concept of PCNs has received, from journalists and from industry, it is not surprising that companies have been scrambling to put forward their case. Others however are somewhat more sceptical of the whole idea of PCNs and the potential they might offer.

The development of personal communications as envisaged by those applying for PCN licences can be along a CT2 or a cellular route. Most of the licence applicants, and particularly those with strong interests in cellular technology, believe that the route is via cellular technology.

We would not argue with this. However in the rush towards the PCN nirvana we should not lose sight of the potential offered by CT2 and even Telepoint.

The basic unit within the Telepoint system is the handset. This unit is able to be endowed with its own unique identification. This allows the unit to be used to make and receive calls in the office or in the home via a privately owned base station. It can also be used to make calls from a public Telepoint base station.

Private base stations whether in the home or in the office are connected directly to the PSTN by plugging them into any standard socket. The unique handset serial number allows for any handset to be enrolled on any base station.

If the base station has more than one handset enrolled on it, every handset rings on the receipt of a call. However a call transfer facility can be used to transfer the call from one handset to another.

When using a public Telepoint base station an additional step is necessary - the identification and verification of the handset and user.

It is argued that both the cellular system and cordless telephony (particularly CT2) will converge into personal communications. Ferranti has already identified a number of areas of overlap and a number of applications where cellular equipment could use the CT2 handset as a cordless alternative to the cellular handset. This would enable the user of a cellular mobile for example to make cellular calls anywhere within 100 metres of his car.

It is generally thought that the Telepoint system will not pose any significant challenge to cellular. Some users will no doubt upgrade from Telepoint to cellular; some will switch from cellular to Telepoint. However these will remain a minority.

The GSM development is seen as offering some benefits and perhaps some modest increases in traffic-carrying capacity but probably no significant reduction in manufacturing cost. Eventually, the major increases in traffic capability will come from shrinking down the cell size. This would provide real cost benefits and ease the battery problems for the cellular portable.

However it will make the task of locating handsets for an incoming call more difficult, as it will the hand-off problem. Locating the user's handset at very high user densities is perhaps best done by paging technology.

In relation to the cordless side of convergence, the proliferation of Telepoint base stations and handsets will result in areas of the country—particularly highly populated urban areas—where near total coverage could be obtained.

The incorporation of a paging function in the handset could then provide facilities for an incoming call. Duplication of the transceiver could be the sort of route which could lead to a built-in hand-off capability. Providing hand-off capability this way has the virtue that each additional handset sold provides the extra hand-off capability needed by the system.

These two routes to a common personal communications technology are likely to be followed by their adherents and are therefore both worth examining and watching.

Certainly the adoption of 16 k-bit speech doubles the capacity of a system relative to the current 32 k-bit speech of CT2. It does this at the expense of quality, complexity and cost in the user's handset.

Halving the cell size achieves the same capacity increase for a given spectrum, even though this may be at some extra cost to the infrastructure. However it could well be offset by better quality and lower cost in the handset. This kind of development may therefore give a better return than the 16 k-bit approach.

H

The Business/Office Environment - The Cordless PABX

Although the current major UK thrust for CT2 technology by UK manufacturers and service operators has been the establishment of a Telepoint public service, CT2 has other potential and varied applications providing effective improvements in communications in both the domestic and business environments.

There is no doubt that in the early stages Telepoint application of CT2 technology caught everyone's imagination and led to a flood of wildly optimistic forecasts of the long term potential; at one point some observers were forecasting up to 50% of the population having a CT2 handset of some kind by the mid-1990s. Such forecasts are no longer made.

It is in the business area where CT2 technology is likely to have the most profound impact. Certainly the current debate on personal communications has been stimulated by the advantages seen with CT2.

Most industry participants both in the UK and Europe believe that the larger and more lucrative market for CT2 technology will be in the office and business environment for both on- and off-site communications. This will combine the advantages of cordless phones (eliminating costly cable installation, wiring, maintenance and rewiring) with those of digital technology. This offers not only the capability of improved voice transmission, higher channel capacity, low cost equipment and improved security but also the future possibility of embracing data applications.

Current government regulations for CT2, however, only cover voice transmission, and there are technical, regulatory and commercial constraints which will inhibit the growth of cordless PABX facilities for a number of years.

The UK has decided to exploit frequency division multiple access technology, pioneered originally by Ferranti, on the assumption that this provides a solution to the fading problem in an office environment. The costs of developing a cordless PABX were seen to be commercially prohibitive, and emphasis was transferred to developing personal communication handsets to be used in the Telepoint and domestic environment, for which FDMA was appropriate and was also cheaper and quicker to develop.

It is, however, recognised that TDMA is more suitable for facilitating the development of cordless PABXs, particularly in relation to hand-off capability between base stations. This is necessary so that the users can move around sites without losing contact and can be located by the PABX whilst moving around away from base. Another problem associated with FDMA is that of potential adjacent channel interference.

These technically feasible applications echo development work undertaken in the USA, where research into digital cordless telephony has focused on integrating digital radio into the local subscriber network, as opposed to current UK initiatives which have concentrated on developing a cheap alternative to cellular. Bellcore has for some time been analysing the feasibility of providing voice and data communications over low-cost digital radio links. It is believed that a wireless digital local loop will integrate easily into existing fixed optical fibre and copper wire networks offering significant cost and quality benefits. Bellcore is currently investigating the feasibility of using time division multiplexing of voice and data channels transmitted on a radio carrier in the 1-3 GHz frequency band.

NYNEX has already shown interest in cordless communications both in its shareholding in the UK Phonepoint Consortium, and also in its investigation into cordless distribution via the local loop.

In Europe the DECT development mirrors a similar approach to the USA. A European Commission study has highlighted the importance of the cordless phone in the fixed wire business environment. It predicted a market of $2 billion by 1995 on handset equipment expenditure alone.

The benefits of cordless technology linked to a local subscriber loop will not have escaped the attention of the PTTs. In the UK two-way CT2 communications are technically feasible and hence can be exported in the local loop. The current Telepoint licences restrict operation to offering a one-way public communications service, but it is likely that the regulatory environment will change, separating the operation of cordless phones in the local loop and in the public Telepoint networks. The likely change in the regulatory environment when the current duopoly comes under review in 1991 may substantially change the balance in favour of increased competition in the local loop.

We have already discussed the CT2 vs. Cellnet routes to a single universal personal communicator; the situation is now even more complex given the attention being given to the award to licences for Personal Communication Networks (PCNs).

Whether it is via CT2 or cellular it would seem clear that the logical development route is a network of microcells. Subscribers would have radio links to a base station and each base station would have links to (or in fact be) a microcell. The microcells could be linked to each other via a radio network or via the PSTN.

Of course roaming in such an environment creates immense network management problems—problems which can be overcome, in time, and with considerable investment.

The focus of attention on PCNs has tended to ignore the potential offered by CT2 technology in competing with cellular for the development of a personal communication system.

It is generally acknowledged that cellular technology provides a truly mobile service. The problems to date are:

- Congestion.

- High usage cost.

The result of the former is disaffection with the service and a resulting poor image for the operator, the service and the technology. As far as cost is concerned there is an increasing number of people who buy equipment and then are shocked by the high cost of usage. However, such people are still a minority. Nevertheless, it does highlight the fact that cellular is not a mass market product.

Even so, in most people's opinion, cellular is expected to grow and by the start of 1991 will have reached over 750,000 subscribers.

We take a more sceptical view of the potential offered by cellular and are far more cautious in our forecasts of the cellular market as it now exists. Of course a number of factors could change this view—for example, a reduction in the cost of usage or a more aggressive and competitive market with the introduction of GSM.

In comparison with cellular, CT2 technology offers portable communications. With the flexibility that will be offered by the introduction of the cordless PABX and with the growth of CT2 in the domestic and Telepoint environments, then the potential for CT2 is enormous.

There would seem little doubt that CT2 and cellular technology can exist side by side. However it is the CT2 technology that offers the opportunity of providing a mass market product and service at a cost that people can afford. This may not be truly mobile, but is this really a major disadvantage? Certainly there will be a market for those who are willing to pay for true mobility.

However, if CT2 technology develops and gradually establishes itself via Telepoint, via domestic usage and via the cordless PABX, then the potential available to the PCN licences may be more limited than anyone has been forecasting to date.

In all of this it must be borne in mind that CT2 provides the technology to access the existing PSTN. Thus Telepoint is a method of access and an extension to the fixed network.

PCN is a further network concept—not a technology. It is the management and administration of this network that is the crucial factor; indeed it is the very essence of the PCN concept. The technology now exists, it is the network management systems that have to be developed.

The emphasis will therefore shift more and more to viewing these new products as services. Telepoint offers a means of accessing the fixed network, cheaply and conveniently, but it is Telepoint as a strategic service concept that will increasingly become the focus of attention. This will be even more true for PCNs.

Exhibit VI-3 illustrates the positioning of applications for mobile communications between different mobile technologies. Exhibit VI-4 shows the main equipment supplier strengths and weaknesses in terms of their positioning vis-a-vis the different technologies.

Market Segmentation by Application

Mobility Level	Type of User: Consumer	Small Business Proprietors	Medium Business Professionals	Large Corporations
Home Base	In the home	Office/home	Office Away from the desk	Away from the desk In the building
On-Site	In the garden	Bar, restaurant Own or customer use	In the building	Factory, plant On-site
On Location	Friend's home Housing estate Block of flats	On the job Checking in	Customer premises On-site	Customer premises On-site, factory, plant
Between Locations	Phoning home Railway station Petrol station Motorways, etc.	Phoning home/base Checking in	Checking in Next call	Checking in Next call
On the Road	On the move Phoning home	On the move Next job	On the move Next call	On the move Next call

Key: CT1 ▭ CT2/Telepoint ▭ Cellular ⋮

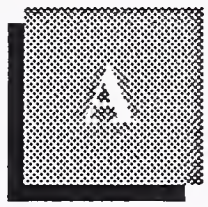
EXHIBIT VI-4

Mobile Communications Europe: Supplier Positioning

	Cellular Systems	Cellular Terminals	Paging Equipment	PMR Equipment	Cordless Telephone
Alcatel	*	**	**	**	-
Ericsson	***	***	**	**	-
GPT	*	*	**	**	*
Matra	-	*	-	**	-
Motorola	**	***	***	***	-
Nokia-Mobira	**	***	***	**	**
Philips	-	**	**	***	*
Racal	-	*	*	-	-
Siemens	*	**	-	*	*
STC	-	*	**	*	*

Key: *** Strong, ** Moderate, * Weak Presence

Appendixes



Definition of Terms

A

Overall Definitions and Analytical Framework

Information Services - Computer/telecommunications-related products and services that are oriented toward the development or use of information systems. Information services typically involve one or more of the following:

- Processing of specific applications using vendor-provided systems (called **Processing Services**)
- A combination of hardware, packaged software and associated support services which will meet a specific application processing need (called **Turnkey Systems**)
- Packaged software (called **Software Products**)
- People services that support users in developing and operating their own information systems (called **Professional Services**)
- Bundled combinations of products and services where the vendor assumes responsibility for the development of a custom solution to an information system problem (called **Systems Integration**)
- Services that provide operation and management of all or a significant part of a user's information systems functions under a long-term contract (called **Systems Operations**)
- Services associated with the delivery of information in electronic form—typically network-oriented services such as value-added networks, electronic mail and document interchange, on-line data bases, on-line news and data feeds, videotex, etc. (called **Network Services**)

In general, the market for information services does not involve providing equipment to users. The exception is where the equipment is bundled as part of an overall service offering such as a turnkey system, a systems operations contract, or a systems integration project.

The information services market also excludes pure data transport services (i.e., data or voice communications circuits). However, where information transport is associated with a network-based service (e.g., EDI or VAN services), or cannot be feasibly separated from other bundled services (e.g., some systems operations contracts), the transport costs are included as part of the services market.

The analytical framework of the **Information Services Industry** consists of the following interacting factors: overall and industry-specific business environment (trends, events and issues); technology environment; user information system requirements; size and structure of information services markets; vendors and their products, services and revenues; distribution channels, and competitive issues.

All **Information Services Market forecasts** are estimates of **User Expenditures** for information services. When questions arise about the proper place to count these expenditures, INPUT addresses them from the user's viewpoint: expenditures are categorized according to what users perceive they are buying.

By focusing on user expenditures, INPUT avoids two problems which are related to the distribution channels for various categories of services:

- Double counting, which can occur by estimating total vendor revenues when there is significant reselling within the industry (e.g., software sales to turnkey vendors for repackaging and resale to end users)

- Missed counting, which can occur when sales to end users go through indirect channels such as mail order retailers

Market Sectors or markets are groupings or categories of the users who purchase information services. There are three types of user markets:

- *Vertical Industry* markets, such as Banking, Transportation, Utilities, etc.

- *Functional Application* markets, such as Human Resources, Accounting, etc. These are also called "Cross-Industry" markets.

- *Generic* markets, which are neither industry- nor application-specific, such as the market for systems software.

Specific market sectors used by INPUT are defined in Section D, below.

Captive Information Services User Expenditures are expenditures for products and services provided by a vendor that is part of the same parent corporation as the user. These expenditures are not included in INPUT forecasts.

Non-captive Information Services User Expenditures are expenditures that go to vendors which have a different parent corporation than the user. It is these expenditures which constitute the information services market.

Delivery Modes are defined as specific products and services that satisfy a given user need. While *Market Sectors* specify *who* the buyer is, Delivery Modes specify *what* the user is buying.

Of the eight delivery modes defined by INPUT, five are considered primary products or services:

- *Processing Services*
- *Network Services*
- *Professional Services*
- *Applications Software Products*
- *Systems Software Products*

The remaining three delivery modes represent combinations of these products and services, bundled together with equipment, management and/or other services:

- *Turnkey Systems*
- *Systems Operations*
- *Systems Integration*

Section B describes the delivery modes and their structure in more detail.

Outsourcing is defined as the contracting of information systems (IS) functions to outside vendors. Outsourcing should be viewed as the opposite of *insourcing:* anything that IS management has considered feasible to do internally (e.g., data center operations, applications development and maintenance, network management, training, etc.) is a potential candidate for outsourcing.

IS has always bought systems software, as it is infeasible for companies to develop it internally. However, all other delivery modes represent functions or products that IS management could choose to perform or develop in-house. Viewed this way, outsourcing is the result of a make-or-buy decision, and the outsourcing market covers any product or service where the vendor must compete against the client firm's own internal resources.

B

Industly Structure and Delivery Modes

1. Service Categories

The following exhibit presents the structure of the information services industry. Several of the delivery modes can be grouped into higher-level **Service Categories,** based on the kind of problem the user needs to solve. These categories are:

- **Business Application Solutions** (BAS) - prepackaged or standard solutions to common business applications. These applications can be either industry-specific (e.g., mortgage loan processing for a bank), cross-industry (e.g., payroll processing), or generic (e.g., utility time-sharing). In general, BAS services involve minimal customization by the vendor, and allow the user to handle a specific business application without having to develop or acquire a custom system or system resources. The following delivery modes are included under BAS:

  - *Processing Services*
  - *Applications Software Products*
  - *Tumkey Systems*

- **Systems Management Services** (SMS) - services which assist users in developing systems or operating/managing the information systems function. Two key elements of SMS are the customization of the service to each individual user and/or project, and the potential for the vendor to assume significant responsibility for management of at least a portion of the user's information systems function. The following delivery modes are included under SMS:

  - *Systems Operations*
  - *Systems Integration*

Each of the remaining three delivery modes represents a separate service category:

- *Professional Services*
- *Network Services*
- *System Software Products*

Note: These service categories are a new concept introduced in the 1990 MAP Program. They are purely an aggregation of lower level delivery mode data. They do not change the underlying delivery modes or industry structure.

2. Network Services

Network services typically include a wide variety of network-based functions and operations. Their common thread is that most of these functions could not be performed without network involvement. Network services is divided into two major segments: *Electronic Information Services,* which involve selling information to the user, and *Network Applications,* which involve providing some form of enhanced transport service in support of a user's information processing needs.

• *Electronic Information Services (EI)*

Electronic information services are data bases that provide specific information via terminal- or computer-based inquiry, including items such as stock prices, legal precedents, economic indicators, periodical literature, medical diagnosis, airline schedules, automobile valuations, etc. The terminals used may be computers themselves, such as communications servers or personal computers. Users typically inquire into and extract information from the data bases. Although users may load extracted data into their own computer systems, the electronic information vendor provides no data processing or manipulation capability and the users cannot update vendor's data bases.

The two kinds of electronic information services are:

- *On-line Data Bases* - Structured, primarily numerical data on economic and demographic trends, financial instruments, companies, products, materials, etc.

- *News Services* - Unstructured, primarily textual information on people, companies, events, etc.

While electronic information services have traditionally been delivered via networks, there is a growing trend toward the use of CD ROM optical disks to support or supplant on-line services, and these optical disk-based systems are included in the definition of this delivery mode.

• *Network Applications*

- *Value-Added Network Services (VAN Services)* - VAN services are enhanced transport services which involve adding such functions as automatic error detection and correction, protocol conversion, and store-and-forward message switching to the provision of basic network circuits.

While VAN services were originally provided only by specialized VAN carriers (Tymnet, Telenet, etc.), today these services are also offered by traditional common carriers (AT&T, Sprint, etc.). Meanwhile, the VAN carriers have also branched into the traditional common carriers' markets and are offering unenhanced basic network circuits as well.

INPUT's market definition covers VAN services only, but includes the VAN revenues of all types of carriers.

- *Electronic Data Interchange (EDI)* - Application-to-application exchange of standardized business documents between trade partners or facilitators. This exchange is commonly performed using VAN services. Specialized translation software is typically employed to convert data from organizations' internal file formats to EDI interchange standards; this software may be provided as part of the VAN service, or may be resident on the organization's own computers.

  - *Electronic Information Exchange (EIE)* - Also known as Electronic Mail (E-Mail), EIE involves the transmission of messages across an electronic network managed by a services vendor, including facsimile transmission (FAX), voice mail, voice messaging, and access to Telex, TWX, and other messaging services. This also includes bulletin board services.

  - *Other Network Services* - This segment contains videotex and pure network management services. Videotex is actually more a delivery mode than an application. Its prime focus is on the individual as a consumer or in business. These services provide interactive access to data bases and offer the inquirer the capability to send as well as receive information for such purposes as home shopping, home banking, travel reservations, and more.

Network management services included here must involve the vendor's network and network management systems as well as people. People-only services, or services that involve the management of networks as part of the broader task of managing a user's information processing functions are included in Systems Operations.

C

Vendor Revenue and User Expenditure Conversion

The size of the information services market may be viewed from two perspectives: vendor (producer) revenues, and user expenditures. While the primary data for INPUT's research is vendor interviews, INPUT defines and forecasts the information services market in terms of end-user expenditures. End-user expenditures reflect the markup in producer sales when a product such as software is delivered through indirect distribution channels, such as original equipment manufacturers (OEMs), retailers and distributors. The focus on end-user expenditure also eliminates the double counting of revenues which would occur if sales were tabulated for both producer (e.g., Lotus) and distributor (e.g., BusinessLand).

For most delivery modes, vendor revenues and user expenditures are fairly close. However, there are some significant areas of difference. Many microcomputer software products, for example, are marketed through indirect distribution channels. To capture the valued added through these indirect distribution channels, adjustment factors which incorporate industry discount ratios are used to convert estimated information services vendor revenues to end-user expenditures.

For some delivery modes, including software products, systems integration and turnkey systems, there is a significant volume of intra-industry sales. For example, systems integrators purchase software and subcontract the services of other professional services vendors. And turnkey vendors incorporate purchased software into the systems which they sell to end users.

To account for such intra-industry transactions, INPUT uses other conversion ratios to derive the estimate of end-user expenditures.

The following table summarizes the net effect of the various ratios used by INPUT to convert vendor revenues to end-user expenditure (market size) figures for each delivery mode:

Delivery Mode	Vendor Revenue Multipler
Application Software Products	1.18
Systems Software Products	1.10
Systems Operations	1.00
Systems Integration	0.99
Professional Services	0.99
Network Services	0.99
Processing Services	0.99
Turnkey Systems	0.95

D

Sector Definitions and Delivery Mode - Reporting

1. Industry Sector Definitions (Vertical Markets)

INPUT has structured the information services market into 16 generic industry sectors, such as process manufacturing, insurance, transportation, etc. The definitions of these sectors are based on the 1987 revision of the Standard Industrial Classification (SIC) Code system. The specific industries (and their SIC Codes) included under these generic industry sectors are detailed in the attached table.

2. Cross-Industry Sector Definitions (Horizontal Markets)

In addition to these vertical industry sectors, INPUT has also identified seven cross-industry or horizontal market sectors. These sectors or markets involve multi-industry applications such as human resources systems, accounting systems, etc. In order to be included in an industry sector, the service or product delivered must be specific to that sector only. If a service or product is used in more than one industry sector, it is counted as cross-industry. The seven cross-industry markets are:

- *Human Resources Systems*
- *Education and Training*
- *Office Systems*
- *Accounting Systems*
- *Engineering and Scientific Applications*
- *Planning and Analysis Systems*
- *Other Applications (including telemarketing, sales management and electronic publishing)*

3. Delivery Mode Reporting by Sector

The tables below show how market forecasts for individual delivery modes are related to specific market sectors.

Vertical Market Sectors Only

The following delivery modes are reported by industry sector (vertical market) only:

Delivery Mode	Applicable Submodes
• Network Services:	Network Applications
• Systems Operations:	All
• Systems Integration:	All
• Professional Services:	All

This reporting structure is intended to provide expenditures by industry sector. However, it is recognized that many of the services provided are not necessarily specific or unique to any of the individual sectors.

Vertical and Cross-Industry Market Sectors

The following delivery modes are reported by industry sector and cross-industry sector (vertical and horizontal markets):

Delivery Mode	Applicable Submodes
• Processing Services:	Transaction Processing
• Software:	Applications
• Turnkey Systems:	All

All of these delivery modes represent specific business application solutions.

Vertical and Generic Market Sectors

The following submode is reported both by industry sector (vertical market), and the generic market:

Delivery Mode	Applicable Submodes
• Network Services:	Electronic Information Services

While some electronic information is industry-specific (e.g., farm crop reports), much of it is relevant to or may be used by any industry (e.g., data base services such as Dialog).

Generic Market Sector Only

The following delivery modes are so generic that they are not reported by industry or cross-industry sector (vertical or horizontal market):

Delivery Mode	Applicable Submodes
• Processing Services:	Utility Processing Other Processing
• Software	Systems (All)

B

U.S. Dollar and ECU Exchange Rates and 1990 Inflation Assumptions

EXHIBIT B-1

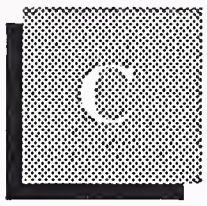
U.S. Dollar and ECU Exchange Rates, 1990

Country	Currency	U.S. Dollar Exchange Rate	ECU Exchange Rate
France	FF	6.17	6.87
Germany	DM	1.81	2.05
United Kingdom	£	0.631	0.74
Italy	Lira	1,336.0	1,502.0
Sweden	Sek	6.39	7.41
Denmark	DK	7.05	7.8
Norway	NK	6.85	7.94
Finland	FM	4.21	4.84
Netherlands	Dfl	2.05	2.3
Belgium	BF	38.06	42.29
Switzerland	SF	1.61	1.8
Austria	Sch	12.77	14.39
Spain	Ptas	115.8	129.7
Rest of Europe	$	1.0	0.83

EXHIBIT B-2

Inflation Assumptions

Country	Assumption 1989-1994	Assumption 1990-1995	Change
France	4	4.5	+0.5
Germany	2.5	4	+1.5
United Kingdom	5.5	7	+1.5
Italy	6	7	+1.0
Sweden	6	7	+1.0
Denmark	6	5	-1.0
Norway	4	5	+1.0
Finland	6	6	0.0
Netherlands	2	3	+1.0
Belgium	3.5	4	+0.5
Switzerland	2.5	5	+2.5
Austria	3	4	+1.0
Spain	5.5	6.5	+1.0
Rest of Europe	8	10.0	+2.0
European Average	4.5	5.5	+1.0



Lists of Database Hosts and Producers

U.K.

ADP Comtrend
ADP Financial Information
ADP Network Services
AP-Dow Jones News Services
Agra Europe
Associated Press
Blaise-Line
British Library
BRS Search Service
Business Direction (British Telecom)
Butterworths Telepublishing (distributors of LEXIS)
CAB Abstracts
CCN Systems
CD Plus
CISI Wharton
Citibank
Compu-Mark
CompuServe
Context Limited
Data-Star
Datastream (subsidiary of Dun & Bradstreet)
Derwent Publications
Dialog
Dun & Bradstreet
ESA-IRS
EDICLINE
Economist Intelligence Unit
Euromonitor
Financial Times
GE Information Services

GSI (U.K.)
ICC
Infocheck
Infolink
Infomat (Predicasts subsidiary)
INSPEC
Jordans
Kompass Online, Reed Information Services
Longmans
Lotus Development Corporation
Maid Systems
McCarthy Information
Mead Data Central
Orbit Search Service (division of Pergamon Orbit Infoline)
Pergamon Financial Data Services
Predicasts
Prestel Citiservice
PROFILE Information
Reuters Holdings
IP Sharp
Silver Platter
STN
Telecom Gold
Telesystemes Questel
Telekurs

France

Agence France Presse
Banque Francais du Commerce Exterieur
Bottin
Cedocar
Dafsa
Dialog
Dun & Bradstreet
DUPLEX
ESA-IRS
FININFO
Fiz-Technik
G-CAM Serveur (Data-Star agent)
GSI-ECO
GAMA
Groupe DPV
Groupe Galande
Infoline
Kompass
Mead

Merlin Gerin
OR-Telematique
Questel (Telesystemes Questel subsidiary)
Reseaux Commerciales Informatiques (RCI) Calvacom service
STN
Telekurs
Telesystemes Questel

West Germany

Bayer AG
BRS
BTX Sudwest GmbH
Burda GmbH
Bertlesmann
Business Datenbanken GmbH
D-S Marketing (Data-Star)
Deutsche Bibliothek Institut (DBI)
Dialog
DIMDI
ESA-IRS
FIZ-Technik
Genios
GBI (Gesellschaft fur Betriebwirtschaftliche Information mbH)
Hoppenstedt
Nomos Datapool
ICONDA
Online GmbH
Pergamon
STN (INKADATA)
Telekurs
Telesystemes Questel

Italy

Assolombarda
Cerved
Confindustria
Data-Star
Data Resources (DRI) Division of Standard & Poor's FEICO
Dialog
ESA-IRS
G-Cam
GIANO
Istituto Centrale di Statistica (ISTAT)
Pergamon
Profile

SARIN SpA
SEAT SpA
IP Sharp
STN
Sirio
Telesystemes Questel

Belgium

Universite de Bruxelles
Belindis
C & L Belmont
Compu-Mark
Credoc asbl
ESA-IRS
Intea

Holland

ABC Voor Handel en Industrie
Datastream
DIMDI
Dialog
ESA-IRS
ESTC
Genios
Pergamon
STN
Telekurs
Telesystemes Questel

Luxembourg

ECHO
EUROSTAT

Switzerland

Data-Star (Radio Suisse) FIZ-Technik agent
Telekurs

Scandinavia

Aarhus School of Economics
Affarsdata AB (Data-Star agent)
Alba
Aramis

BDI-Indiks
Blaise-Line
Borsinformation Telecom
Byggak
Datacentralen
Data-Star
Dialog
DIMDI
ESA-IRS
Esselte On-Line
IP Sharp
NORDICOM
Nordisk
Pergamon
SCB Statistics
Tess

Spain

Bolsa de Madrid
Camerdata
Data-Star
Dialog
ESA-IRS
Entel SA
IP Sharp
Micronet
RPI
Telesystemes Questel

Report Quality Evaluation

To our clients:
To ensure that the highest standards of report quality are maintained, INPUT would appreciate your assessment of this report. Please take a moment to provide your evaluation of the usefulness and quality of this study. When complete, simply fold, staple, and drop in the post.

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1. Report title: ***Western European Electronic Information Services, 1990-1995*** (NEISO)

2. Please indicate your reason for reading this report:
   - ☐ Required reading
   - ☐ Area of high interest
   - ☐ Area of general interest
   - ☐ New product development
   - ☐ Business/market planning
   - ☐ Product planning
   - ☐ Future purchase decision
   - ☐ Systems planning
   - ☐ Other _____

3. Please indicate extent report used and overall usefulness:

	Extent		Usefulness (1=Low, 5=High)				
	Read	Skimmed	1	2	3	4	5
Executive Overview	☐	☐	☐	☐	☐	☐	☐
Complete Report	☐	☐	☐	☐	☐	☐	☐
Part of Report (_____ %)	☐	☐	☐	☐	☐	☐	☐

4. How Useful was:

Data presented	☐	☐	☐	☐	☐
Analyses	☐	☐	☐	☐	☐
Recommendations	☐	☐	☐	☐	☐

5. How useful was the report in these areas:

Alert you to new opportunities or approaches	☐	☐	☐	☐	☐
Cover new areas not covered elsewhere	☐	☐	☐	☐	☐
Confirm existing ideas	☐	☐	☐	☐	☐
Meet Expectations	☐	☐	☐	☐	☐
Other _____	☐	☐	☐	☐	☐

6. Which topics in the report were the most useful? Why?_____

_____

7. In what ways could the report have been improved? _____

_____

8. Other comments or suggestions: _____

_____

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