

COMMERCIAL SYSTEMS INTEGRATION

WESTERN EUROPE 1988-1999

INPUT

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Formed as a privately held corporation in 1974, INPUT has become a leading international research and consulting firm. Clients include more than 100 of the world's largest and most technically advanced companies.

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Market Analysis Programme—Europe

***Commercial Systems Integration, Western
Europe 1988-1993***

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Abstract

Commercial systems integration services have emerged as an area of increasing focus and interest for many organisations, particularly professional services vendors and hardware manufacturers. This report is a new evaluation of this important and fast-growing market opportunity in Western Europe.

The report provides an assessment of the current size of this market and a forecast of its growth through to 1993. The market is analysed both by individual country size and by major vertical market sector. Also included are commentaries on the competitive environment, including identification of the leading vendors in this market and the major developmental forces that are driving market growth. User attitudes, bidding and risk containment are also discussed, together with recommendations to vendors seeking to target this opportunity.

The report contains 120 pages, including 78 exhibits.



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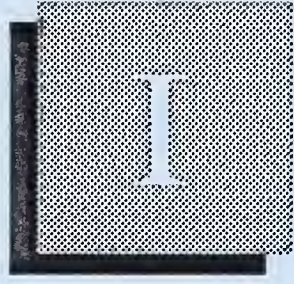
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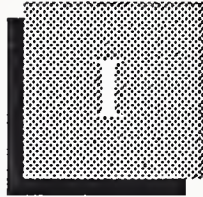
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Introduction





Introduction

A

Scope and Objectives

During the last few years there has been growing use, and consequently vendor interest, in the term 'systems integration'. In the United States INPUT has watched and reported on systems integration since 1984. Within Western Europe INPUT published its first assessment of this market in 1987. This study, produced as part of INPUT's Software and Services Programme, is a new evaluation of this important and fast-growing market opportunity, specifically of the commercial systems integration market.

The primary objectives of this report are to:

- Provide an assessment of the size and growth rate of the market for commercial system integration within Western Europe.
- Analyze the vertical components of the commercial systems integration market.
- Identify the major vendors participating in the market and their relative positions within that market.
- Describe the origins, developmental forces and market environment for commercial systems integration.

The report covers the whole of Western Europe and is restricted to an evaluation of the opportunities for systems integration services within the commercial sector. This definition naturally excludes all central government and defense-related expenditures, but includes the local government sector.

INPUT defines systems integration as the provision of an integrated solution to a multidisciplinary information systems requirement. INPUT's market assessment is for the expenditures made by users for those services that are provided by an independent third-party organisation.

The provision of such complete services comprises not only professional services and software products but also the provision of the hardware, both computer and telecommunications, that is required as the platform for the system. Consequently INPUT's market assessment includes all these elements. In broad terms a systems integration contract can be considered to be formed of the four principal classifications of hardware and services, namely:

- Computer and communications equipment
- Software products
- Professional services
- Processing services

B

Methodology

The research that contributed to this study was derived from four main sources:

- Thirty-one in-depth interviews conducted either face-to-face or by telephone with leading vendors active in the commercial systems integration business
- One hundred scripted telephone interviews with senior management responsible for information services within user organisations
- One hundred scripted telephone interviews with senior management with other responsibilities, e.g. finance, production, marketing, etc., within user organisations.
- Trade-press, newspapers, magazines and vendor press releases.

An analysis of the field research sample, both vendor and user, is provided as Appendix A.

C

Report Structure

The remaining chapters of this report are organised as follows:

- Chapter II is an Executive Overview that provides a summary of the cardinal points of the entire report.
- Chapter III provides INPUT's analysis and five-year forecast for the commercial systems integration business within Western Europe. This chapter includes INPUT's definition of the market, an overall assessment of the competitive environment and a comparison with the equivalent market in the United States.
- Chapter IV describes the overall environment for commercial systems integration including a description of its origins, the drivers and inhibitors identified in the marketplace, the overall competitive environment and a discussion of the separate vertical market opportunities.
- Chapter V provides an analysis of the market on an individual country market basis.
- Chapter VI draws together the principal conclusions and recommendations that emerge from this research study.
- The appendices provide an analysis of the field research sample and a copy of the user questionnaire.

D

Related INPUT Services

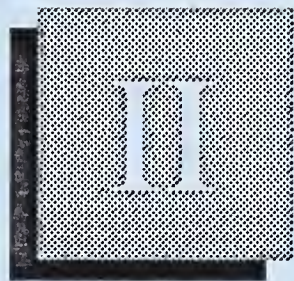
INPUT provides a number of supportive services in the area of systems integration. In the United States the Systems Integration Program provides vendors with market analysis reports, project profiles of systems integration contracts and a number of other client support activities which include conferences, an executive enquiry service and a regular newsletter.

INPUT's Federal Information Systems and Services Program supports vendors actively marketing in the U.S. Federal Government arena. Of particular relevance is the report:

- *Federal Systems Integration Market, 1988-1993*

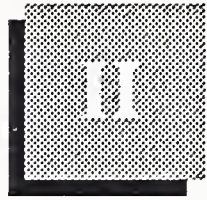
The implications of systems integration on professional services firms in the United States are addressed in another INPUT report:

- *Impact of Systems Integration on Professional Services*



Executive Overview





Executive Overview

A

Commercial Systems Integration— Definitions

Commercial systems integration services provided by third-party contractors, although not a new concept as such, have achieved sufficient critical mass in terms of market size and vendor attention to warrant separate identification. It is no longer largely a phenomenon restricted to the defense sector but an approach that is becoming increasingly accepted within the commercial arena.

INPUT's basic definition of these services shown in Exhibit II-1 is 'the provision of an integrated solution to a multidisciplinary information systems requirement'. As such, the services provided include not only the actual integration or interfacing of the components of the solution but also:

- The detailed systems analysis of the problem
- Design of the solution
- Selection, development, and implementation of the hardware and software
- Post-implementation support such as testing, client staff training, documentation, and in some instances, operation and maintenance of the developed system for a specified period of time

EXHIBIT II-1

**COMMERCIAL SYSTEMS INTEGRATION—
STRATEGIC MARKET OPPORTUNITY**

- 'Integrated Solutions to Multidisciplinary Information Systems Requirements'
- Responsibility/Risk
- Technology—The Driving Force

Critical to the approach from both the clients' and the vendors' standpoints is the sharing or total transfer of responsibility (and risk) for the successful development of the system to the systems integration vendor.

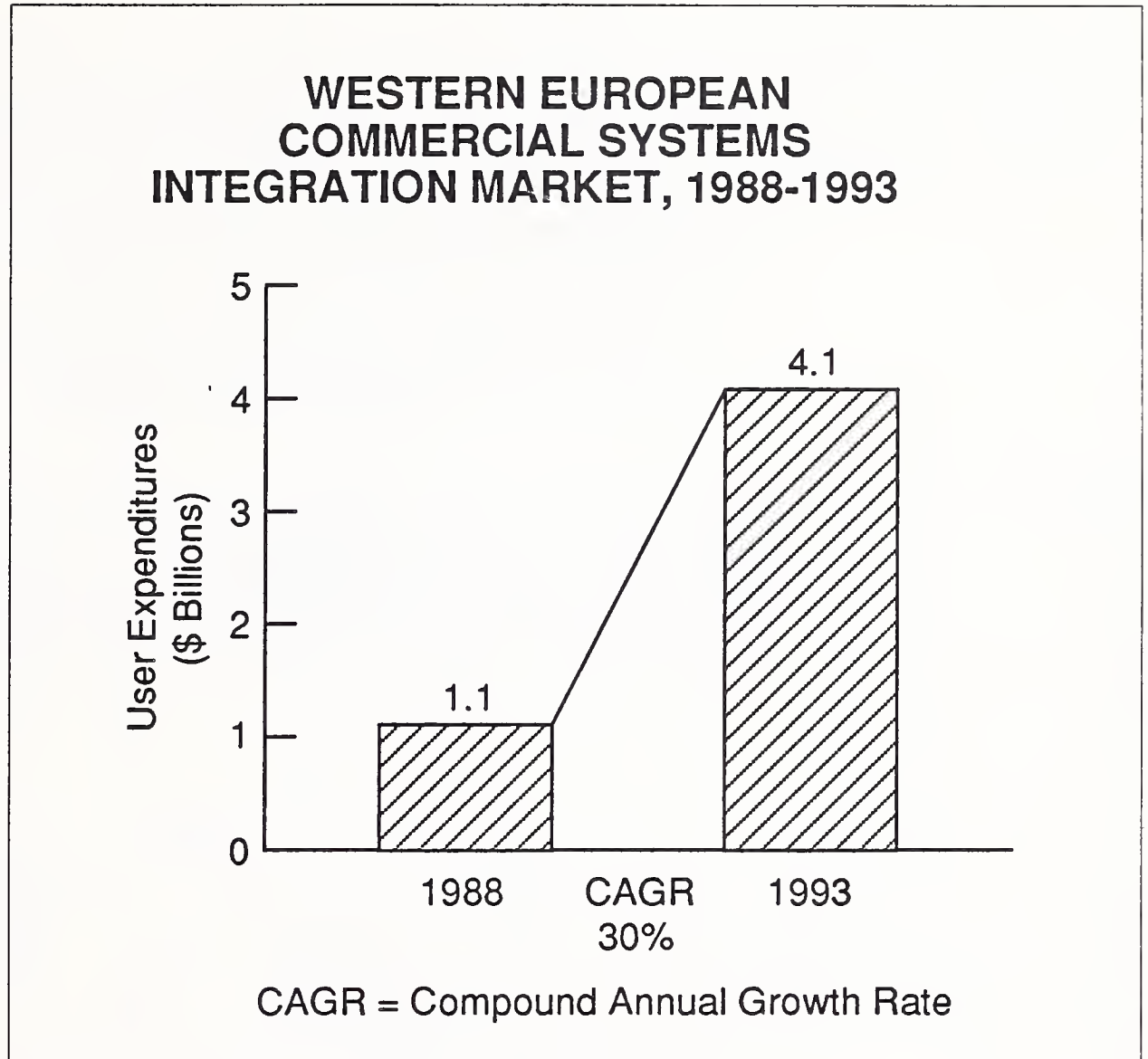
In exchange for assuming the risk of contracting delivery of the derived solution on time and within budget, the systems integrator receives not only project management fees from the client but also markups from subcontractors.

Technology is the key driving force for this market. Not only is it impelling the growth of the whole services sector, but it is placing particular challenges on users in the commercial sector that are forcing them to award systems integration contracts.

B**Strategic Market
Opportunity for
Systems Integration**

The market for commercial systems integration services within Western Europe is estimated by INPUT to have reached \$1.1 billion in 1988. Further, INPUT is forecasting that this market sector will experience 30% compound annual growth for the five-year period to 1993 to achieve a market size in excess of \$4 billion. (Reference Exhibit II-2.)

EXHIBIT II-2



This market assessment and forecast comprises four principal component areas:

- Computer and communications hardware
- Professional services
- Software products
- Other services, e.g. processing services

The commercial sector is defined by INPUT to exclude all central government and defense-related expenditures and thus comprises revenues generated from the following sectors:

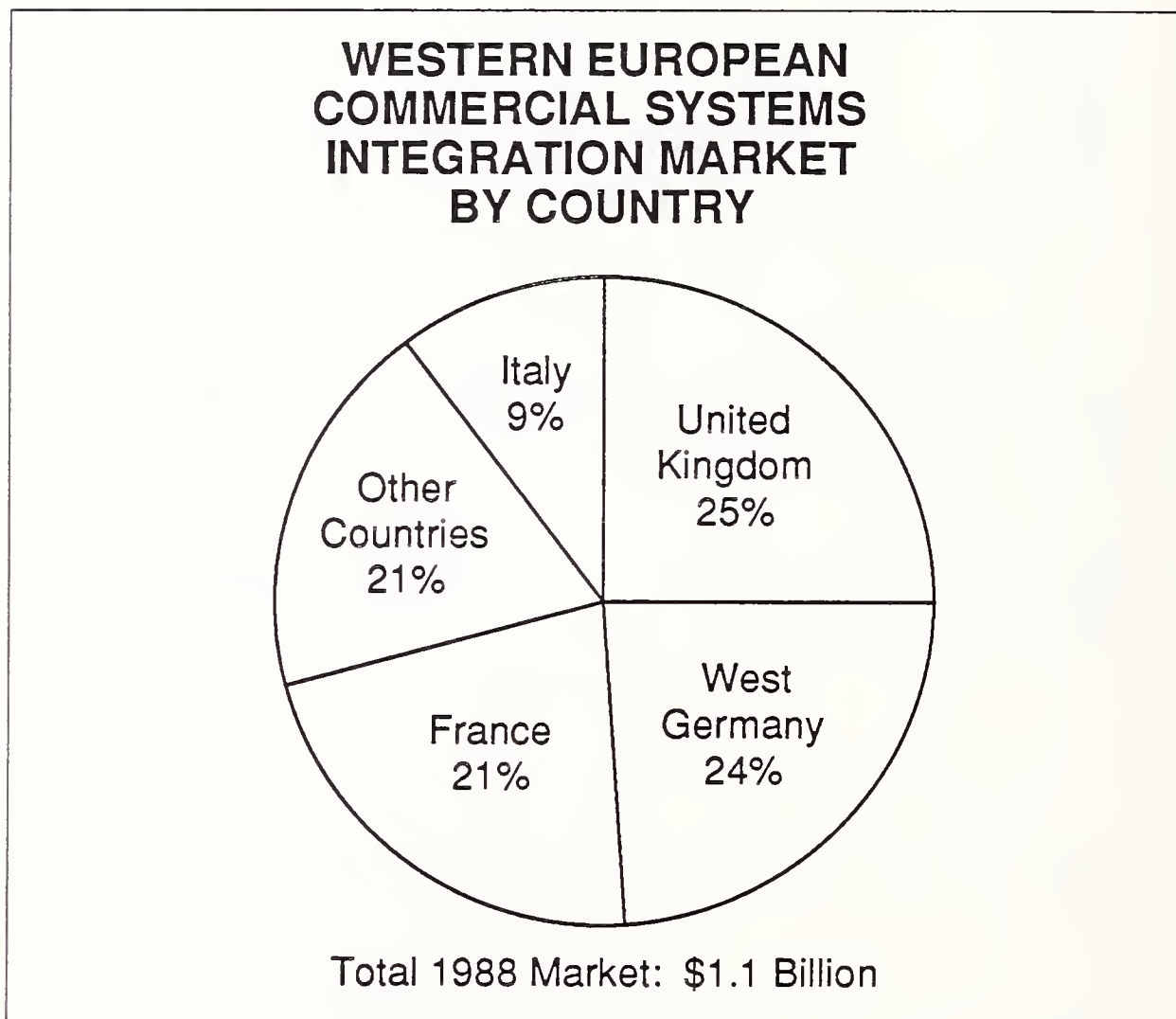
- Manufacturing
- Banking and finance
- Telecommunications
- Utilities
- Transportation
- Local government
- All other commercial sectors

C

Principal Country Markets

Exhibit II-3 shows the country market analysis of the commercial systems integration sector in Western Europe in 1988. Eighty percent of the market is accounted for by the four largest individual country economies in Europe: West Germany, France, the United Kingdom and Italy. Interestingly it is the third-largest economy, the United Kingdom, that currently has the largest commercial systems integration market. This disparity is largely attributed to the dominant size of the banking and finance sector within the United Kingdom.

EXHIBIT II-3



Other country market shares are as follows:

- Netherlands 4%
- Belgium 4%
- Switzerland 3%
- Sweden 2%
- Spain 3%
- All other countries 5%

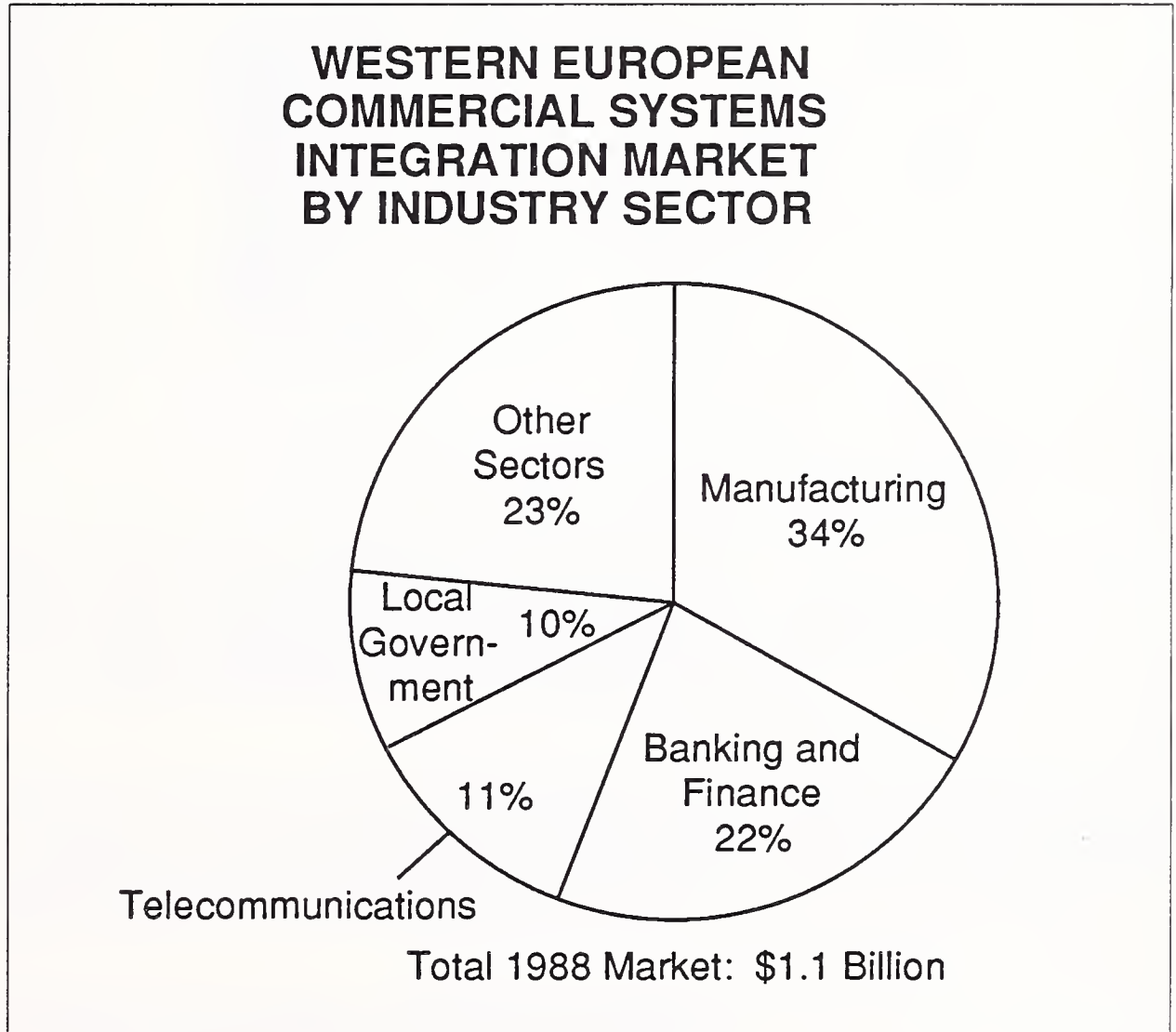
D

Principal Industry Sector Markets

Exhibit II-4 shows the principal vertical sectors that constitute the commercial systems integration market in Western Europe. The manufacturing sector is by far the largest, accounting for about one-third of the total market. The other vertical sector market shares are:

- Utilities (excluding telecommunications) 6%
- Transportation 5%
- All other sectors 13%

EXHIBIT II-4



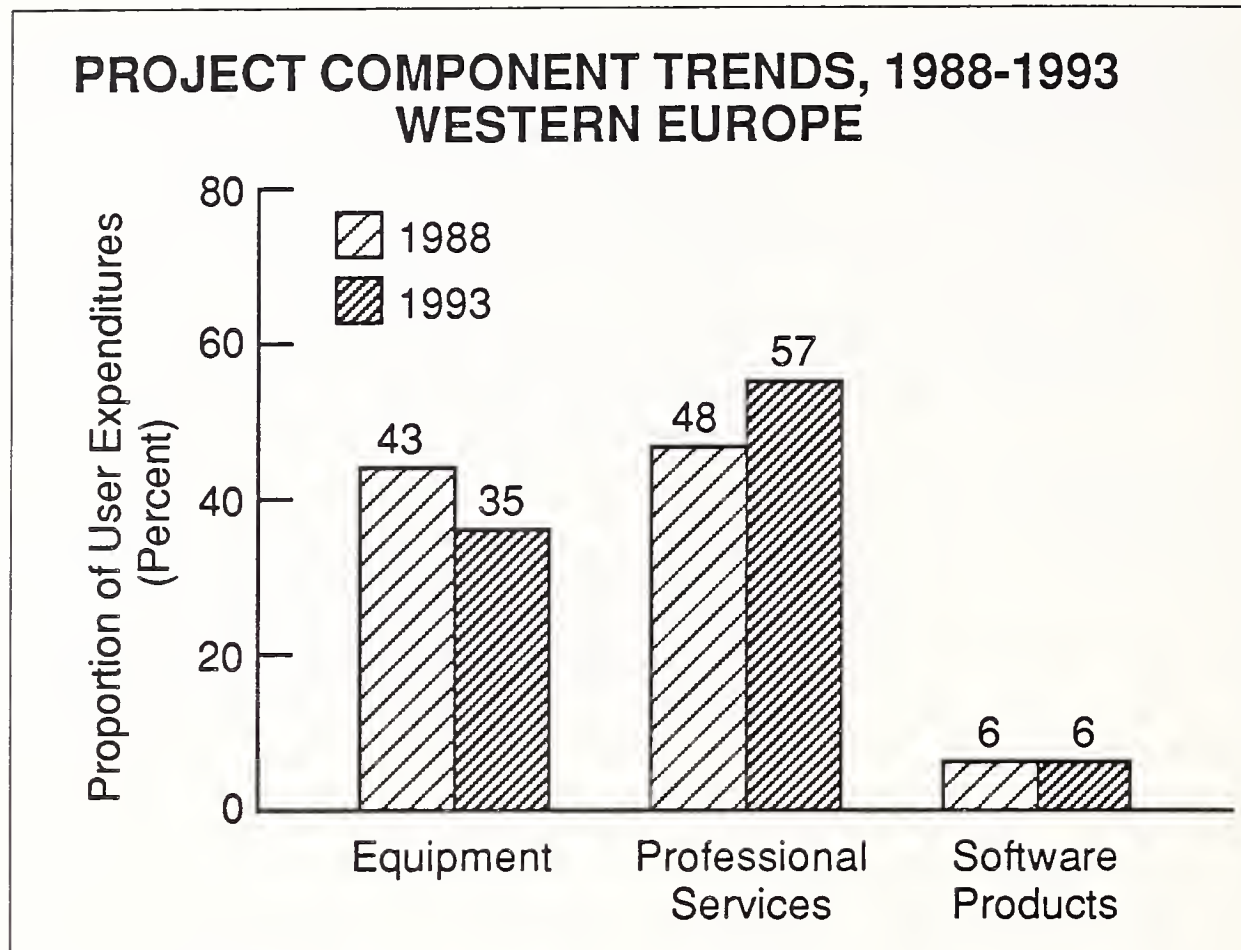
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Project Component Trends

Against an overall expected sector growth rate of 30% per annum, different rates of growth are anticipated for the different major component groups that constitute the total systems integration sector.

Below average sector growth of 25% per annum for the hardware element will lead to the reduction in its overall share of commercial systems integration revenues to 36% of the total market by 1993 as shown in Exhibit II-5. In contrast the professional services element is expected to experience above-average growth of 35% per annum.

EXHIBIT II-5



These overall project component trends should not be applied as a model of a 'standard' or average commercial systems integration project. Considerable disparity exists between the projects undertaken in different sectors and by different types of vendors.

F

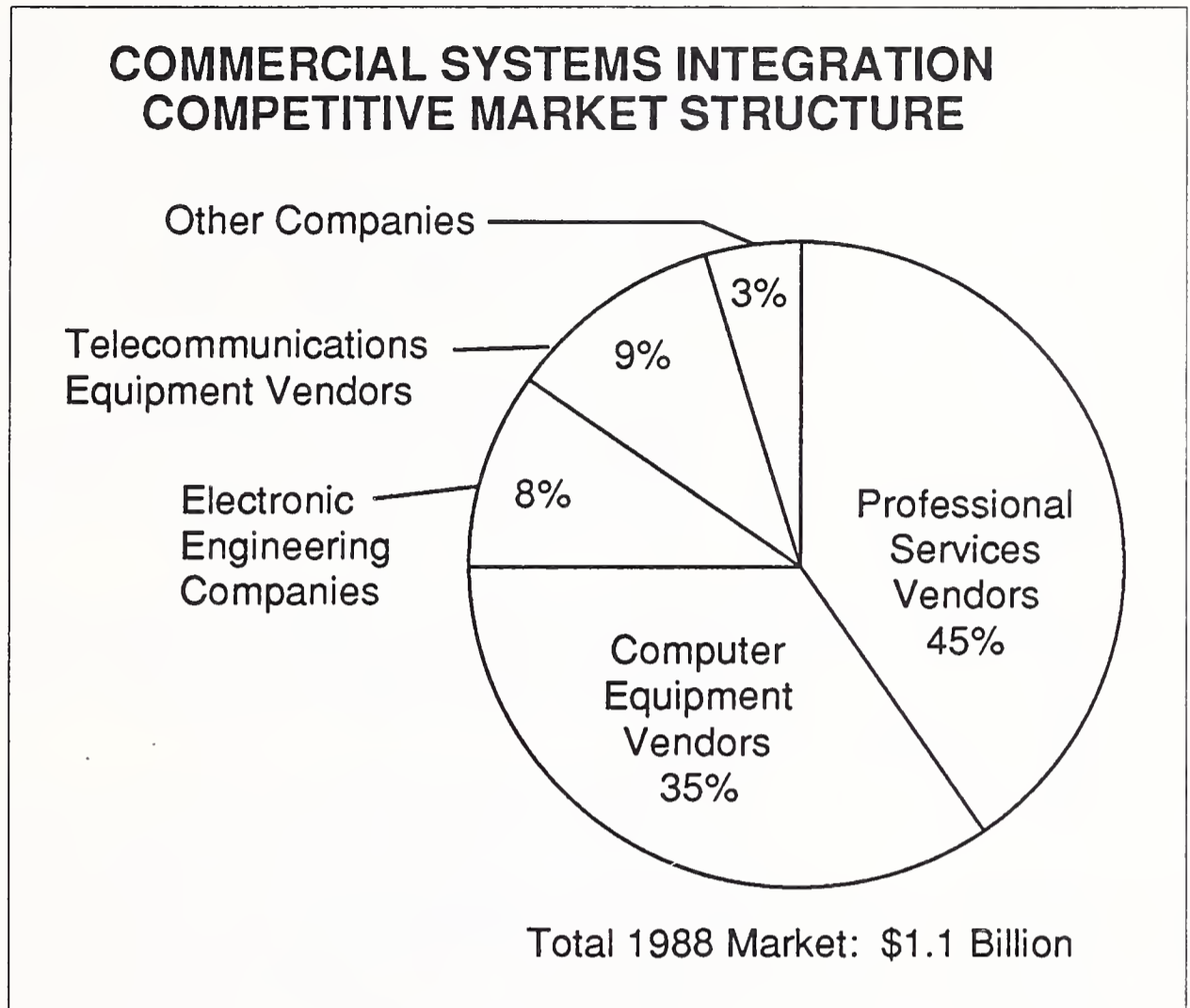
Competitive Market Structure

The Western European commercial systems integration market is currently led by two principal types of vendor: professional services companies and computer hardware vendors, as shown in Exhibit II-6.

Leading professional services vendors are CGS/SESA (Cap Gemini Sogeti and its subsidiary SESA), the newly formed SD-Scicon, LOGICA and the SEMA Group, recently formed from the merger of Sema-Metra in France and CAP Group PLC in the U.K. Not surprisingly, IBM is the largest hardware vendor with Unisys, Digital, ICL and Olivetti completing the top five in this segment.

The remaining portion of the market is largely accounted for by electronic engineering companies (Siemens, Ferranti, Mannesman, Philips and Thompson) and telecommunications equipment vendors (again Siemens, together with Racal, GPT (GEC Plessey Telecommunications), Alcatel and Philips).

EXHIBIT II-6



The 'other' category includes organisations from a relatively wide range of business backgrounds, for example, aerospace, public telephone service providers and software product companies.

G

Driving Forces of Systems Integration

The fundamental driving force of the information services industry is the advance of technology and its applications. Key areas of technology advance are:

- Integrated circuits
- Data storage devices, e.g. CD-ROM
- Telecommunications technology
- Natural input/output interfaces for information systems

These primary technology advances, together with such developments as relational data structures and open systems standards, are continuously spawning new products. As soon as leading-edge users have gained specific benefits or competitive advantages through their use, then imitators will emerge and competitors will be compelled in many instances to follow. Thus technology advance acts as a driving force to systems development in general and systems integration in particular.

The application of new information system products is becoming increasingly complex as systems become increasingly heterogeneous within the user environment. As they do so, organisations become more and more reliant on their information systems infrastructure—in some cases they can be truly described as ‘mission critical’ systems. The consequence of this is an increasing challenge to the managers responsible for information systems. The challenge to:

- Adopt new technology successfully
- Integrate different technologies or different computer systems
- Maintain the existing information systems workload as new systems are developed

Systems integration business is being generated as management faces up to the challenges and the lack of internal resources to meet them adequately.

In addition to these technology- and system-oriented driving forces, there also exists many business, commercial or administrative pressures that are leading organisations towards systems integration solutions. Increasing globalisation of business and the promise of a unified European market is increasing competitive pressure and thus the need to control costs and margins—‘bottom line’ management. Faster communication and wider consumer choice imply the need for a rapid response and deployment of resources to meet fast-changing customer needs. Organisational change to meet these increasingly competitive conditions creates the further challenge of integrating different proprietary architecture systems and building new computer/communications systems. The driving forces and challenges of systems integration are summarised in Exhibit II-7.

EXHIBIT II-7

**DRIVING FORCES OF
SYSTEMS INTEGRATION**

- Technology
 - ICs
 - Data Storage
 - Telecommunications
 - Natural I/O
- System Management Challenges
 - Adopt New Technology
 - Integrate Different Technologies and Computer Systems
 - Maintain Existing Systems
- Business/Commercial Challenges
 - 'Bottom Line' Management
 - Rapid Response/Deployment
 - Organisational Change

H**Opportunity Areas**

Exhibit II-8 provides a schematic that indicates the current areas of opportunity observed in the market in Western Europe. The dominant role of communications as a key technology is clearly seen in this diagram.

As the market develops, INPUT believes that systems integration projects will evolve towards a tendency to be dominated by one of three principal elements:

- The application
- The technology
- The data

EXHIBIT II-8

**OPPORTUNITY AREAS
(Commercial Systems Integration)**

	Communications Networks	Process Control	Materials Control	CAM
Manufacturing		X	X	X
Banking & Finance	X			
Telecommunications	X			
Utilities	X	X		
Transportation and Distribution	X		X	
Government	X			

Currently it is technology that is the key driving force for commercial systems integration growth in Western Europe, and developments in communications technology are most significant.

I

Vendor Challenges

Vendors entering the commercial systems integration market must address a number of key challenges, as shown in Exhibit II-9.

The cost of bidding for systems integration contracts is usually substantial, perhaps as much as 5-6% of the contract value. Consequently achieving a high success rate (possibly as high as 80%) in the contracts bid for is a key priority, which can only be achieved through drastic pruning of the prospect list. This ruthless weeding out of the lower probability situations is highly-related to an assessment of the vendors' industry and application skill set matched against the target projects. (It is important to note that the most significant cause of project failure is probably a lack of understanding of the technologies involved.)

EXHIBIT II-9

VENDOR CHALLENGES

- System Integration Bidding
 - Costs
 - Skill Set
- Project Management
 - Managing the User
- Risk Containment
 - Cost Premium
 - Company-Wide Responsibility
 - User Benefit

Project management requirements are critical to the successful implementation of systems integration projects. Not only must the project be planned and organised like any other complex construction project, but due note must be made of the need for constant liaison with the client. The user must be managed as well as the project. The user must be kept informed of the technical decisions that are being made whilst at the same time the user's desire for changes to the specification must be reconciled with the project's time and budget schedules.

Very real commercial risks are encountered in the systems integration market; risks to both a vendor's financial position and reputation when projects fail. However, commensurate with this risk is a premium that the vendor needs to apply to the overall project costs. Users have to be amenable to this premium, since it is the integrator that assumes the risk in the development of these large, complex systems.

Clearly the size of the risk will vary with the project size and its level of complexity. The risk element derives from such factors as the accuracy and stability of the systems requirements specification, the investment required to develop systems integration bids and the involvement of subcontractors.

Risk management should become an ongoing and company-wide concern; it is not the sole prerogative of the individual project manager. Vendors should also recognise that 'risk management' is a potential marketing tool, since as mentioned above, it bestows very real benefits on the user.

J

Organising for the Opportunity

It is clear in the marketplace that some vendors are or have already organised themselves to effectively address the commercial systems integration opportunity. This positioning is taking place at both the market and the technical level. However well a vendor establishes a market posture, it must eventually demonstrate the technical capability to fulfill its contracts.

Vendors must carefully evaluate their goals and their target markets and organise themselves appropriately. Matrix management approaches are usually needed to combine economically the necessary blend of legal, contractual and project management skills with the application, industry and technological expertise required.

The critical success factors for vendors in the commercial systems integration market can be summarised as follows; they are also listed in Exhibit II-10:

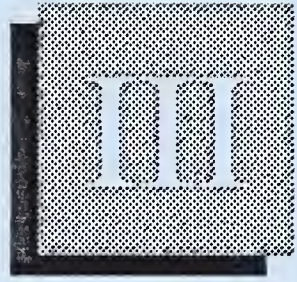
- Publicly acknowledged expertise in an industry and application area
- Demonstrated experience with a variety of technologies
- Quality third-party relationships and marketing strength
- Ability to assess, contain and manage risk
- Willingness to accept risk
- Disciplined bid preparation
- Complex-project management and risk management skills

EXHIBIT II-10

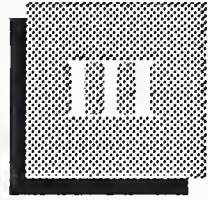
ORGANISING FOR THE OPPORTUNITY

Positioning (Market/Technical)
Critical Success Factors:

- Industry/Application Expertise
- Technology Experience
- Third-Party Relationships
- Risk Management
- Disciplined Bid Preparation
- Complex Project Skills



Market Analysis and Forecast



Market Analysis and Forecast

A

Market Definition

The term 'systems integration' has become widely used over the last few years and remains the subject of some debate within the computer industry. The purpose of this section is to define clearly what INPUT means when employing this term to focus in on what is considered to be one of the fastest-growing computer services opportunities.

Within one sentence 'systems integration' can be defined as:

- 'The provision of an integrated solution to a multi-disciplinary information systems requirement.'

This basic definition can be expanded upon by emphasising that the integrated solution is a total or complete solution to the clients' defined development need. The management role that the vendor performs in the execution of the task should also be emphasised.

Whilst the term 'systems integration' can be used generically, it should be emphasised that INPUT's market definition comprises only those systems integration services provided by a third-party organisation on a fee basis. The market size is an assessment of the user expenditures for these systems integration services.

Systems integration is an approach to the development of new, upgraded or expanded information systems for client organisations. In this approach, a vendor or team of vendors assumes responsibility for providing the information products and services that result in a comprehensive solution to the client's information systems problem.

The approach is most applicable to major project efforts that involve the development of complex, multi-disciplinary systems. The typical size of these projects, the fact that large portions of the software must be custom-developed, and/or the substantial network requirements usually means that the total project effort is multi-year.

These projects involve not only the actual integration or interfacing of the components of the solution, but also:

- The detailed systems analysis of the problem
- Design of the solution
- Selection, development, and implementation of the hardware and software
- Such post-implementation support as testing, client staff training, documentation, and, in some instances, operation and maintenance of the developed system for a specified period of time.

Generally, these projects are bound at the start by the selection of the successful bidder and at the end by the acceptance of the new system by the client. The close relationship established between the vendor and the contractor can lead to sales of additional products or services unrelated to the project, but these opportunities have been explicitly excluded by INPUT in the development of the forecast.

Critical to the approach from both the client's and the vendor's perspectives is the sharing or total transfer of responsibility (and risk) for the successful development of the system from the client organisation to the vendor(s). In exchange for assuming the risk of contracting to deliver the desired solution on time and within budget, the integrator receives not only project management fees from the client but also markups from subcontractors.

Exhibit III-1 enumerates the component products and services that may be a part of a systems integration project and from which the vendor can expect to receive revenue. Each project's unique requirements dictate which of these components are applicable to the project and the proportion of the total project expenditures to be made for each component involved.

EXHIBIT III-1

PRODUCTS/SERVICES IN SI PROJECTS

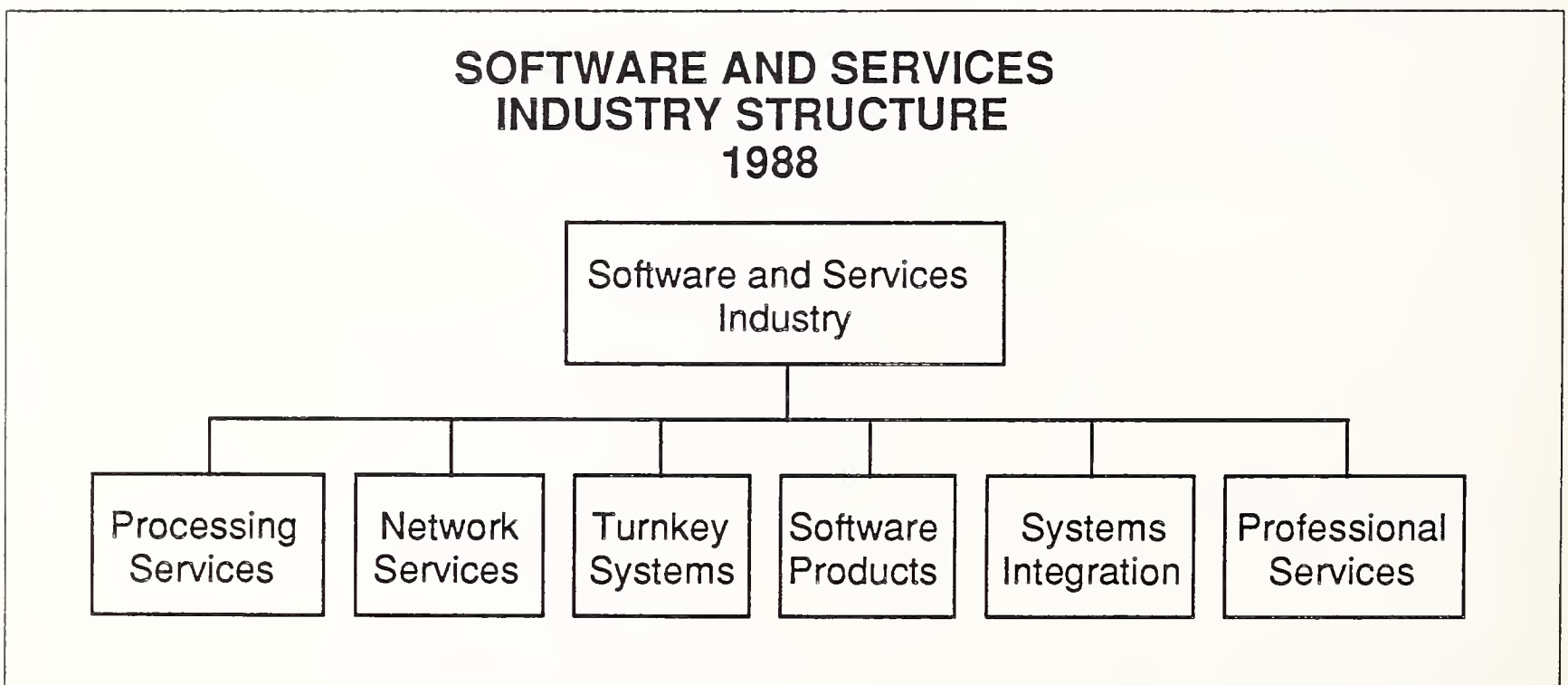
- Equipment/Hardware
 - Information Systems
 - Communications
- Software Products
 - Systems Software
 - Applications Software
- Professional Services
 - Consulting
 - . Feasibility and Tradeoff Studies
 - . Selection of Hardware, Network, and Software
 - Project Management
 - Design/Integration
 - . Systems Design
 - . Installation of Hardware, Network, and Software
 - . Demonstration and Testing
 - Software Development
 - . Modification of Software Packages
 - . Modification of Existing Software
 - . Custom Development of Software
 - Education/Training and Documentation
 - Operation and Maintenance
- Other Miscellaneous Products/Services
 - Data Processing Supplies
 - Processing/Network Services
 - Data/Voice Communication Services

The concept of systems integration as described here is not new; it is one that has been used for some years when large computer systems have been applied to application areas requiring the integration of other technologies, most notably communications. In particular it has been widely applied as an approach for developing and implementing defense-related projects.

The significance and importance of systems integration in today's computer software and services industry is that it has now achieved sufficient critical mass in terms of market size and vendor attention to warrant separate identification. It is no longer largely a phenomenon restricted to the defense sector but an approach becoming widely accepted within the commercial arena.

Consequently, INPUT now defines systems integration as a totally separate sector within its overall assessment of the computer software and services market, as can be seen in Exhibit III-2 which shows the overall market structure.

EXHIBIT III-2



The commercial systems integration market is defined by INPUT to exclude all central government and defense-related expenditures. The market for commercial systems integration has been defined in this report as comprising the following sectors:

- Manufacturing
- Banking and finance
- Telecommunications
- Utilities
- Transportation
- Local government
- All other commercial sectors

B

Forecast Definition

The market assessment and forecast given below for the commercial systems integration market in Western Europe was developed from an evaluation and analysis of both current and projected activity.

The market assessment is provided for the base year 1987 and forecast over the five-year period 1988-1993. INPUT's market assessment is of end-user expenditures. Forecasts are made in local currency for individual country markets and converted into U.S. dollars for aggregation and comparative purposes.

The U.S. dollar rates used are shown in Exhibit III-3. These rates were the average exchange rates extant on July 1988. The forecasts are expressed in current rates: consequently allowance must be made for the rate of inflation. The inflation assumptions made by INPUT are also shown in Exhibit III-3.

EXHIBIT III-3

U.S. DOLLAR CONVERSION AND INFLATION RATES

Country	Currency	Dollar Conversion Rate	Inflation
Belgium	BF	38.10	+1.0
Denmark	DK	6.90	+5.0
Finland	FM	4.34	+5.5
France	FF	6.13	+2.6
Italy	Lira	1,351.00	+4.9
Netherlands	Dfl	2.05	+0.7
Norway	NK	6.66	+7.5
Spain	Pta.	121.40	+4.3
Sweden	SK	6.29	+6.9
Switzerland	SF	1,51	+2.1
United Kingdom	£	0.59	+4.6
West Germany	DM	1.82	+1.0

Source: Swiss Bank Corporation and
National Westminster Bank

C

Western European Market

The total market for all systems integration services provided by third-party organisations within Western Europe is estimated by INPUT to have reached a level of \$1.6 billion during 1988 as shown in Exhibit III-4, having grown by 25% since 1987. This market estimate includes defense and central government generated revenues as well as those for the commercial sector. However within this overall systems integration market it is the commercial sector, the focus of this report, that is showing the highest growth characteristics and this can be clearly seen from Exhibit III-5.

EXHIBIT III-4

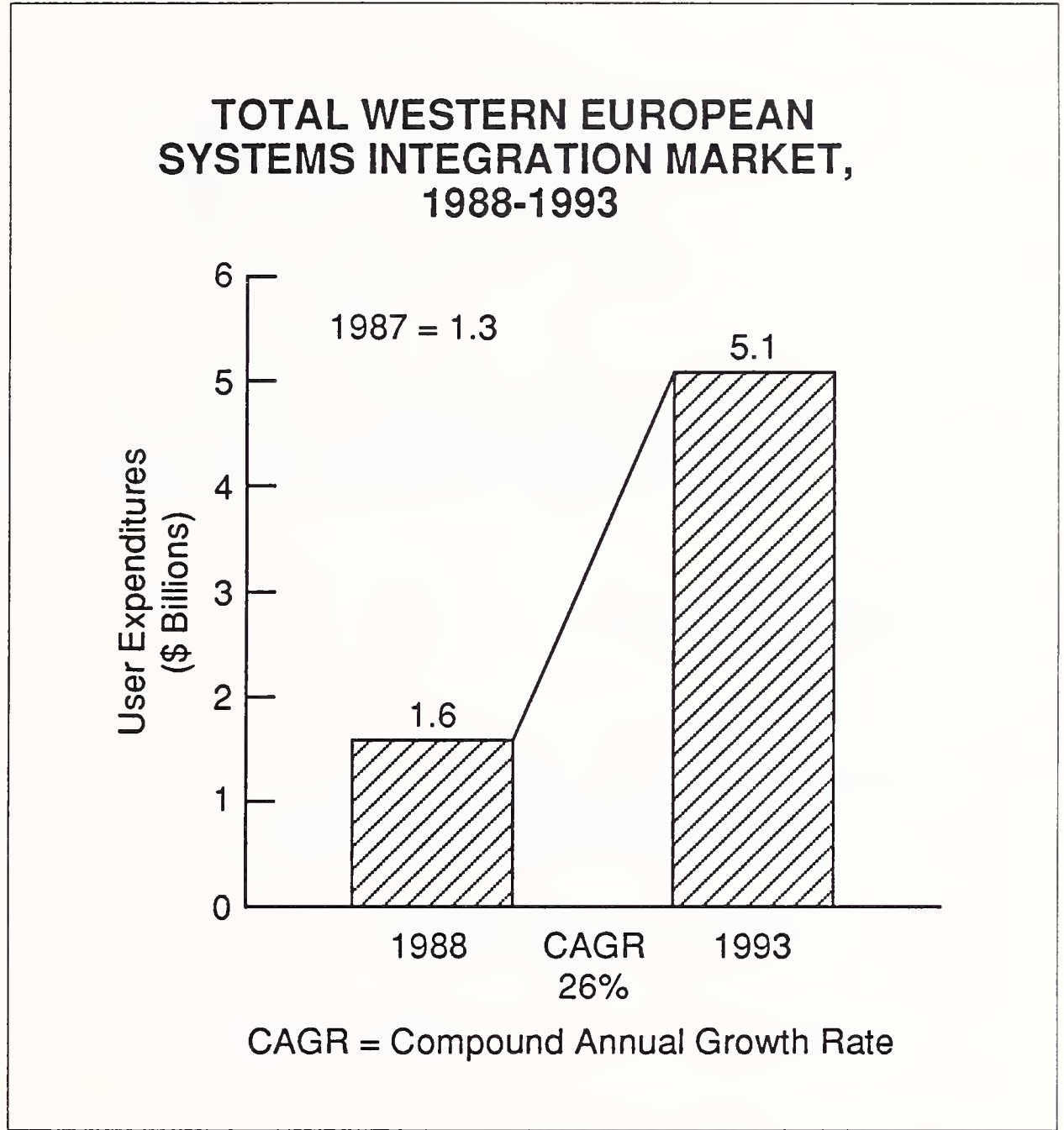


EXHIBIT III-5

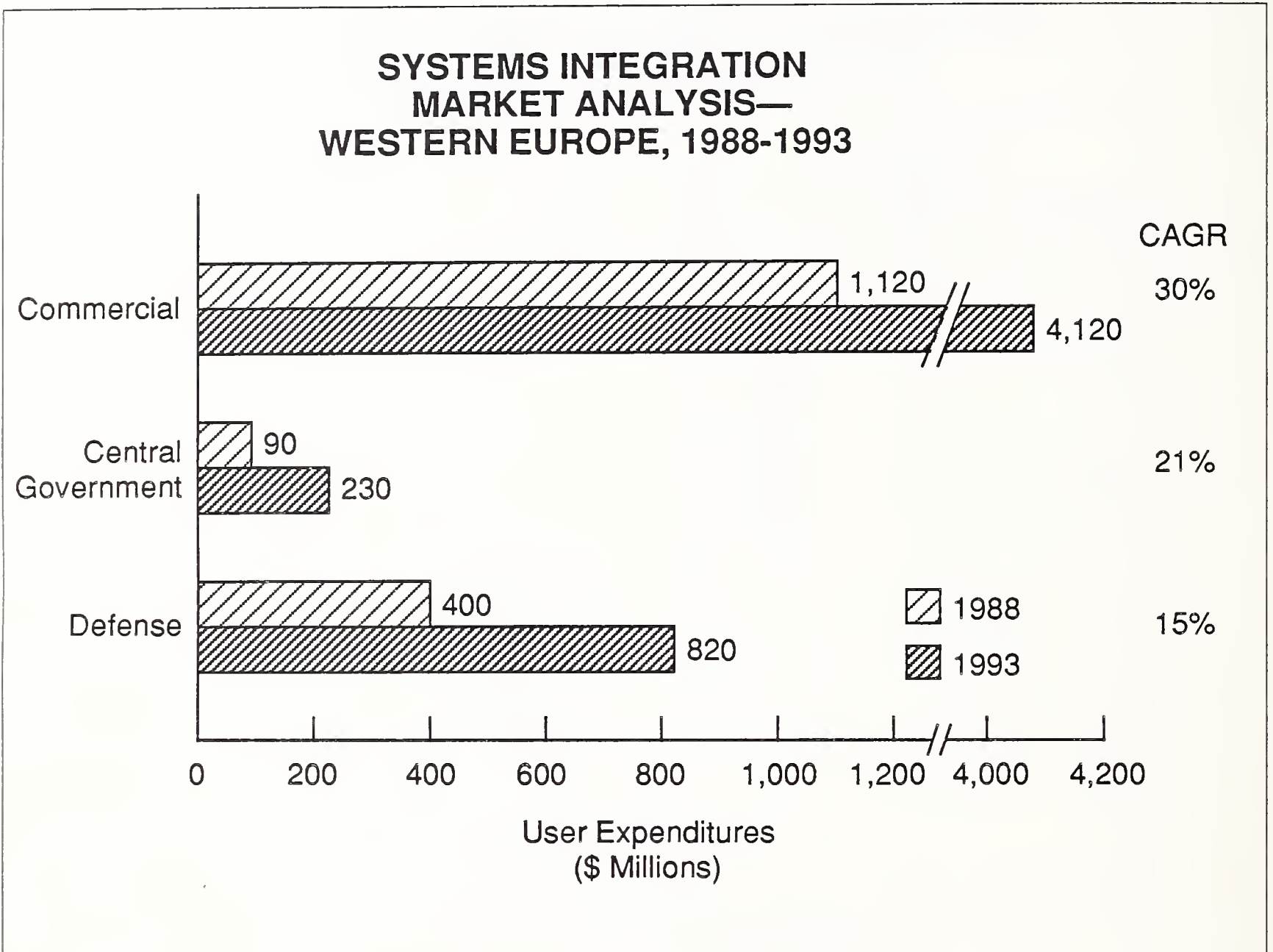


Exhibit III-6 shows the overall analysis of the commercial systems integration market by the individual country markets. A more detailed discussion of these individual country markets is provided in Chapter V of this report. The three largest economies in Western Europe, West Germany, France and the United Kingdom, dominate the formation of this market. In total these three countries account for 71% of the total market in 1988.

EXHIBIT III-6

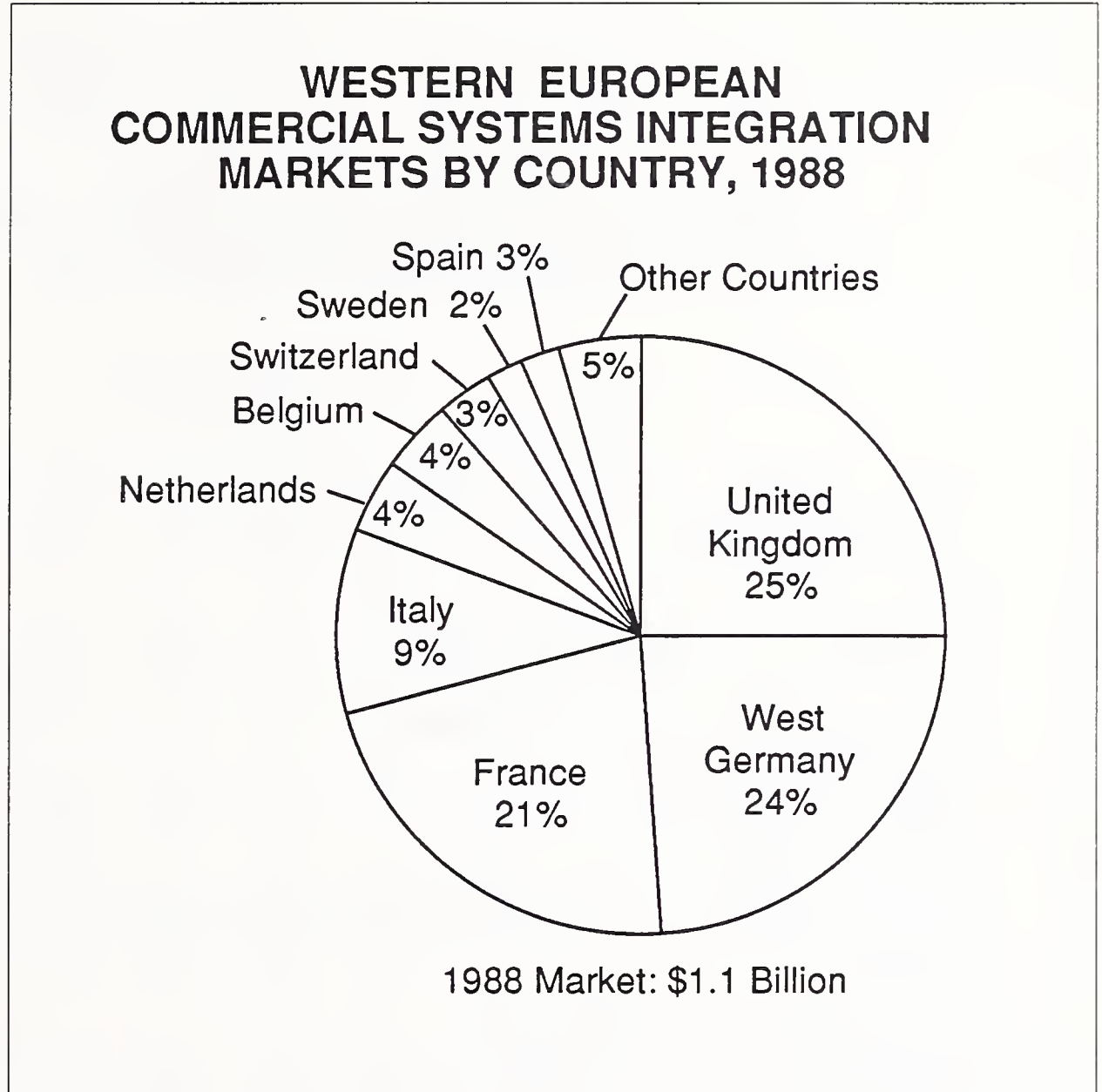


Exhibit III-7 provides the detailed breakdown by individual country market for 1988 and shown the expected five-year growth pattern through to 1993.

EXHIBIT III-7

**WESTERN EUROPEAN
COMMERCIAL SYSTEMS INTEGRATION—
COUNTRY MARKETS, 1988-1993**

Country	User Expenditures (\$ Millions)						CAGR (Percent)
	1988	1989	1990	1991	1992	1993	
West Germany	265	350	460	600	780	1,000	30
France	240	315	410	550	730	950	32
United Kingdom	275	350	455	590	760	980	29
Italy	105	140	190	255	335	420	32
Netherlands	45	60	74	95	120	150	27
Belgium	40	55	70	90	110	130	27
Sweden	25	30	34	45	65	85	28
Norway	12	16	19	23	27	30	20
Denmark	15	20	25	32	38	45	25
Finland	9	12	16	20	26	30	27
Austria	15	20	25	32	40	45	25
Switzerland	30	40	55	70	85	100	27
Spain	33	43	60	75	90	120	29
Other	7	10	13	18	25	30	34
Total (rounded)	1,120	1,460	1,900	2,490	3,230	4,120	30

The comparative vertical market sector analysis is shown in Exhibit III-8. Exhibit III-9 shows the detailed breakdown for the market in 1988 and a forecast through to 1993.

EXHIBIT III-8

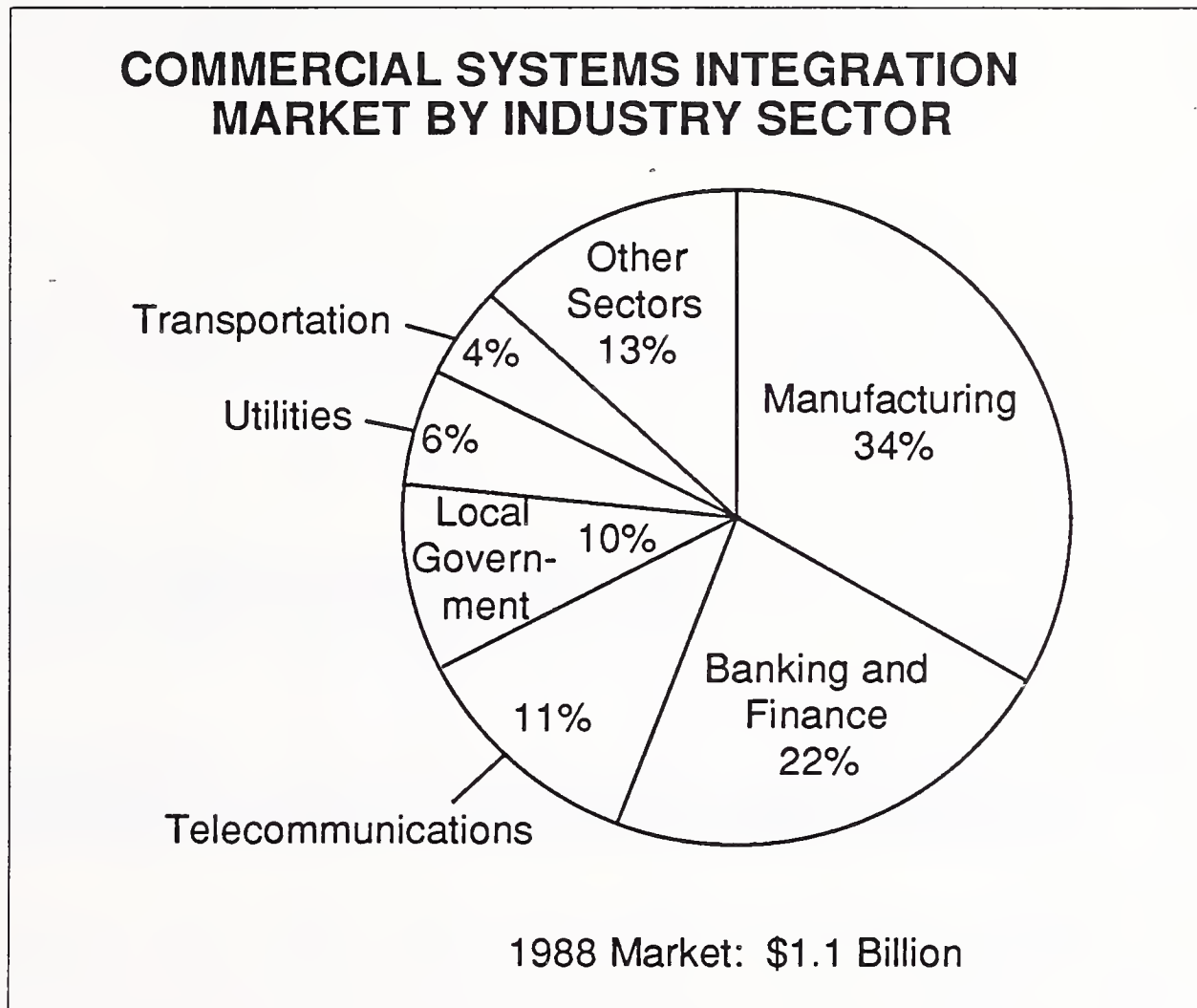


EXHIBIT III-9

**WESTERN EUROPEAN
COMMERCIAL SYSTEMS INTEGRATION—
MARKET BY INDUSTRY SECTOR, 1988-1993**

Vertical Sector	User Expenditures (\$ Millions)						CAGR (Percent)
	1988	1989	1990	1991	1992	1993	
Manufacturing	380	495	645	865	1,105	1,430	30
Banking & Finance	245	325	430	555	715	900	30
Telecommunications	125	165	220	300	400	500	32
Utilities	65	80	100	130	170	215	27
Transportation	50	60	75	95	120	150	25
Local Government	110	135	170	215	270	335	25
Other	145	200	260	340	450	580	32
Total	1,120	1,460	1,900	2,500	3,230	4,120	30

INPUT forecasts that the highest growth rate will be experienced in the telecommunications sector spurred by investment by the European telecommunications authorities to provide new voice and data network services. The manufacturing sector is also forecast to experience strong growth as industry invests to contain production costs in the face of enhanced European and global competition.

As has already been pointed out a systems integration contract involves the delivery of a number of different components which together provide a solution to the users' information systems needs. Exhibit III-10 shows INPUT's analysis of the market structure and growth across the four major component categories of:

- Equipment, both computer and data communications

- Professional services including the provision of custom software development services and project management services
- Software products, both systems and applications products
- Other services, for example processing services

EXHIBIT III-10

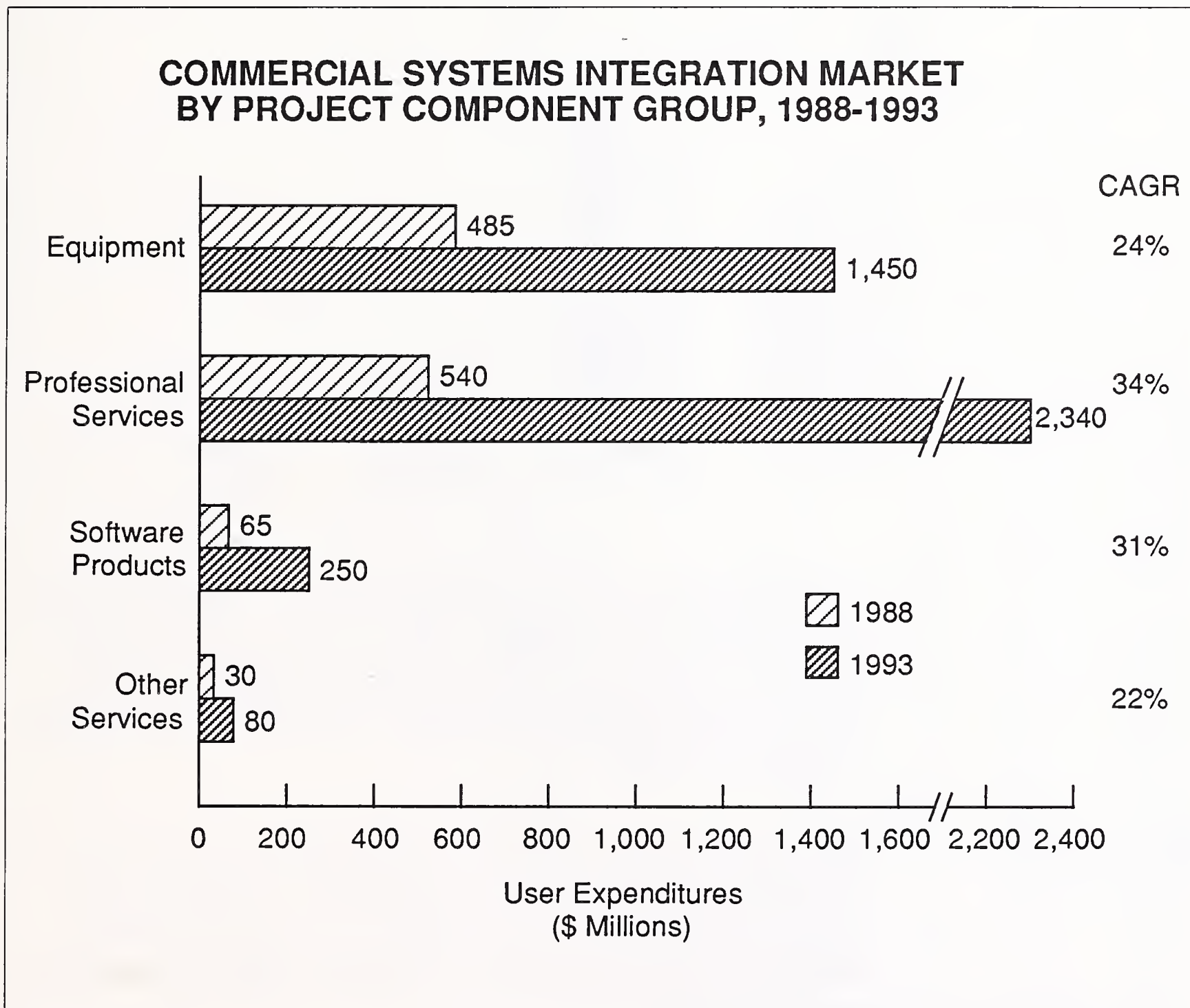
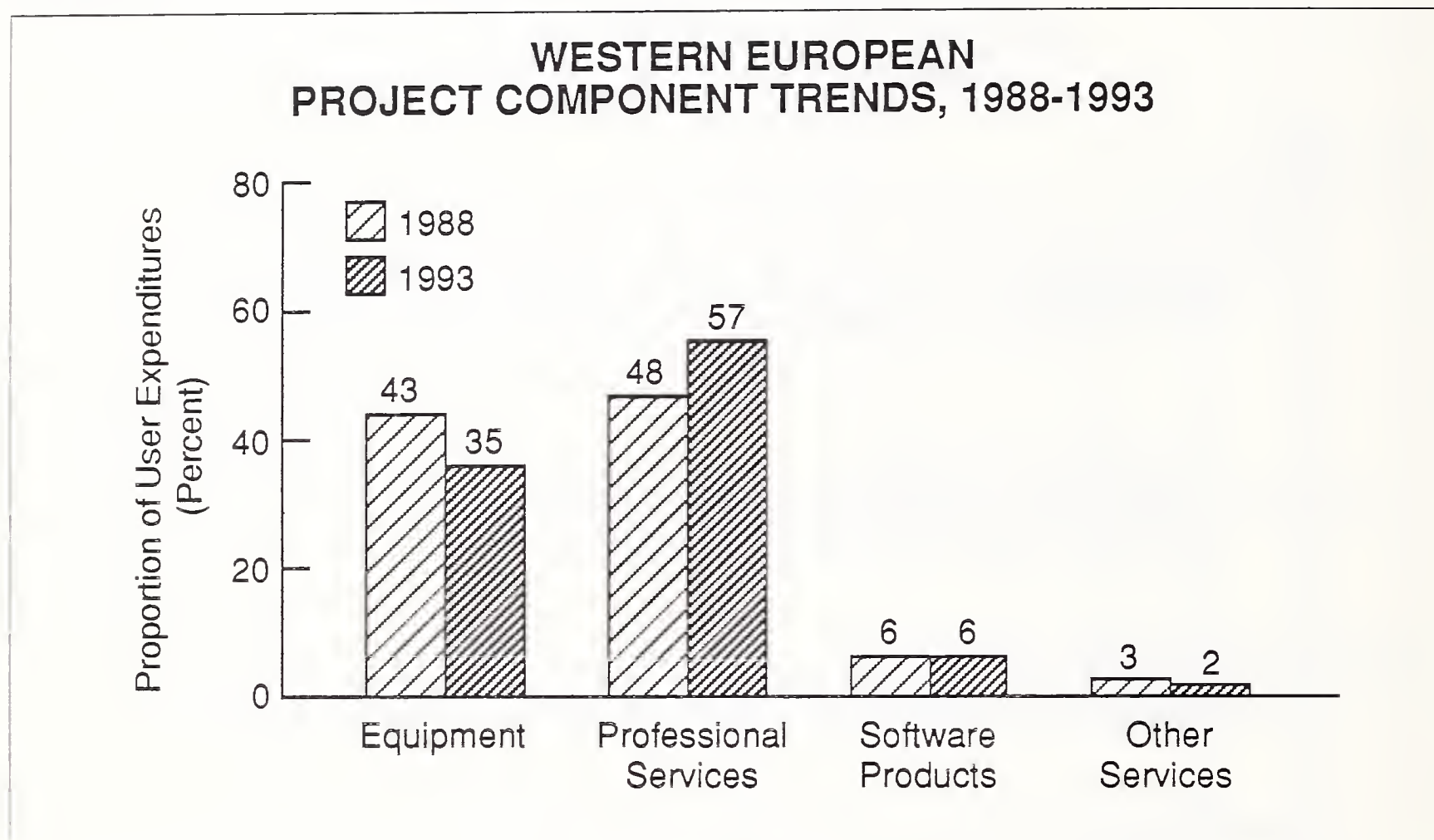


Exhibit III-11 shows the expected change in the relative proportions of these sectors over the five-year forecast period.

EXHIBIT III-11



In considering these overall market proportions it is important to understand that they do not necessarily apply as a model of the proportional breakdown of an average project. In commercial systems integration there is no such thing as an average project. Considerable disparity exists between the projects undertaken in different sectors and by different types of vendors.

D

Competition

The leading vendors in the Western European commercial systems integration market are listed in Exhibit III-12. A classification of the vendors according to type of organisation—for example, computer hardware manufacturer or professional services vendor—is provided in section C of Chapter IV.

EXHIBIT III-12

**LEADING VENDORS—WESTERN EUROPEAN
COMMERCIAL SYSTEMS INTEGRATION MARKET**

Rank	Vendor	1988 Estimated CSI Revenues (\$ Millions)	Market Share (Percent)
1	IBM	190	17
2	Andersen Consulting	155	14
3	CGS/SESA	135	12
4	Siemens	65	6
5	SD-Scicon	60	5
6	Unisys	55	5
7	Logica	50	5
8	Sema Group	45	4
9	Ferranti	35	3
10	Digital	30	3
11	SSL*	25	2
12	ICL/STC	25	2
13	Olivetti	20	2
14	EDS	20	2
15	Tandem	17	2
16	Mannesman	15	1
17	Philips	12	1
18	GDS**	12	1
19	Racal	11	1
20	GPT†	10	1
	Others	133	11
	Total	1,120	100

*Software Sciences Ltd.

**Grumman Data Systems

†GEC Plessey Telecommunications

Exhibit III-12 shows INPUT's estimates of the user revenues derived by vendors in this market during 1988 and their consequent expected market share. IBM, Andersen Consulting, and CGS/SESA (Cap Gemini Sogeti and its subsidiary SESA) emerge as the clear market leaders. Care should be taken in the evaluation of these vendor rankings since, apart from the largest companies, positioning is highly dependent on the current contract situation. The relatively limited number of large contracts involved is thus likely to lead to considerable volatility, particularly at the lower end of this table.

E
Comparison with the United States Market

Exhibit III-13 provides a comparison of the total size of the systems integration business, both commercial and government sectors, for Western Europe and the United States. It can be seen that in overall terms the U.S. market is about three times the size of the Western Euro-

EXHIBIT III-13

SYSTEMS INTEGRATION— WESTERN EUROPE/U.S.A. COMPARISON			
Market	User Expenditures		
	1988 (\$ Billions)	1993 (\$ Billions)	CAGR (Percent)
Commercial			
Western Europe	1.1	4.1	30
U.S.A.	2.3	8.9	31
Government			
Western Europe	0.5	1.0	15
U.S.A.	2.5	5.7	18
Total			
Western Europe	1.6	5.1	26
U.S.A.	4.8	14.6	25

pean market and both are expected to grow at about the same rate over the five-year period to 1993.

However the split between the commercial and central government expenditures does show a different pattern with the Western European government sector being considerably smaller proportionally than that in the United States. In the commercial sector the Western European market is almost half the size of that in the United States.

Exhibit III-14 lists leading vendors identified by INPUT as participating in the U.S. systems integration business.

EXHIBIT III-14

**LEADING VENDORS—
UNITED STATES
SYSTEMS INTEGRATION MARKET
(Government and Commercial)**

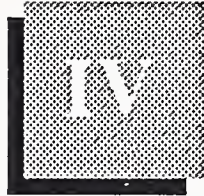
Vendor	1987 Estimated Market Share (Percent)
IBM	15
EDS	13
Arthur Andersen	8
CSC	6
CDC	4
SHL Systemhouse	3
Unisys	3
Grumman Data Systems	3
SAIC*	2

*Science Applications International Corporation.



Market Environment





Market Environment

A The Emergence of Commercial Systems Integration

The need to integrate different hardware and software elements to form a system is not a new requirement. The market for commercial systems integration has grown out of the need to employ outside contractors to undertake this task as the size and complexity of the integration process has grown. The need for these services has reached such size and significance that it justifies its identification as a separate market sector.

The practice of handing over complete responsibility for a systems integration task has been most actively applied in the defense sector, notably so in the United States. In this environment it has been acceptable and necessary to employ contractors. Further, the projects have been capable of definition, a *conditio sine qua non* for contracting the task to a third party.

In the commercial sector the difficulty of defining the task has been an impediment to the development of this form of service. However, increasing technology convergence needs, typically in the area of data communications, have subsequently opened up numerous opportunities for systems integration contracting.

The emergence of commercial systems integration as a substantial and identifiable sector has come about as a result of the complementary nature of:

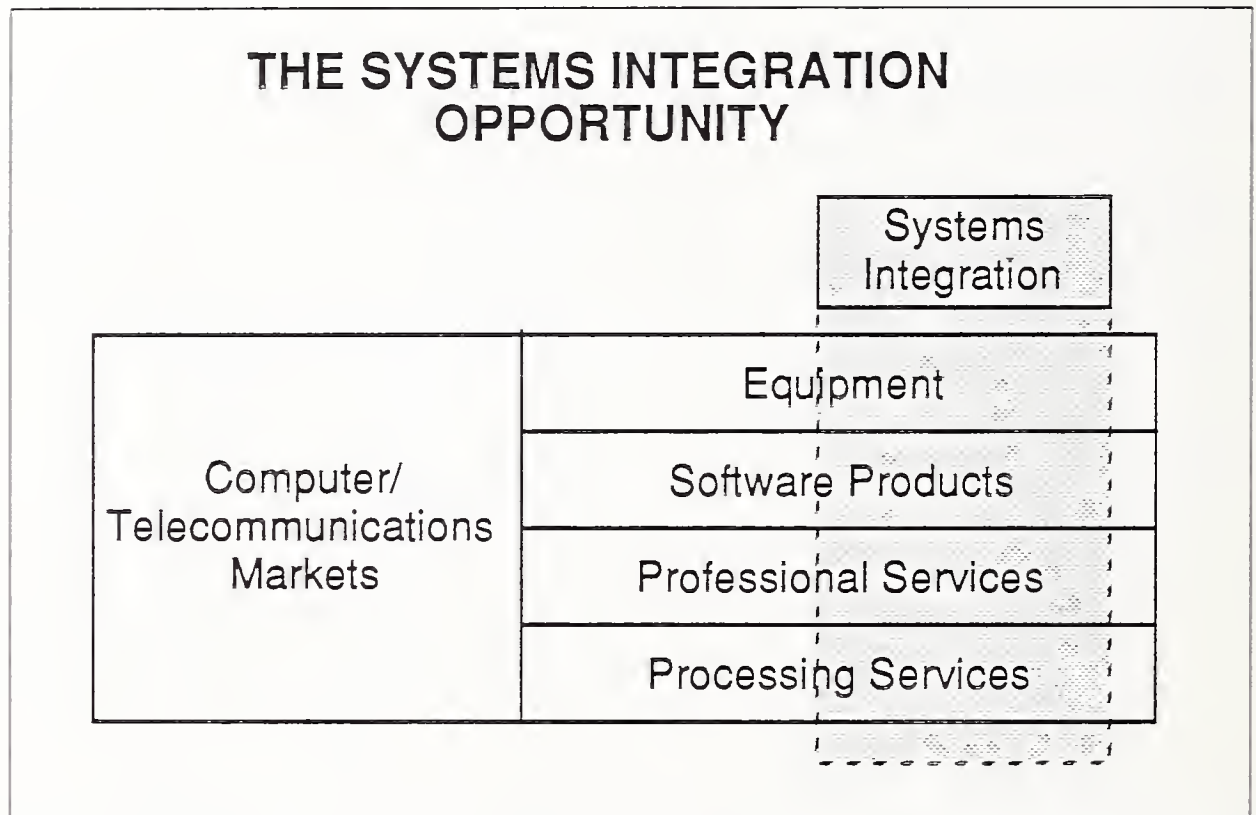
- Users facing more difficult and complex technical and system development challenges with limitations on the in-house resources to fulfill them

- Vendors willing to take responsibility for and having the technical and managerial capability to undertake these systems integration tasks

The market position of systems integration within the information industry is defined diagrammatically in Exhibit IV-1. Fundamentally all activity in this industry can be classified as falling into one of four major segments:

- Computers and communications equipment
- Software products
- Professional services
- Processing services

EXHIBIT IV-1



A systems integration contract implies the delivery of a combination of all of these elements, but the two most significant ones are hardware and professional services. As was seen in Chapter III (reference Exhibit III-11) INPUT estimates that on average these two elements account for around 90% of the total contract value. Not surprisingly, users have thus entrusted their systems integration tasks to two classes of vendors:

- Equipment vendors that have been requested by the user to assume more and more responsibility for the total system task
- The professional services vendors that typically have been (and sought to be) highly involved in the system development task.

Essentially, vendors now participating in the commercial systems integration business became involved through the commercial logic of pursuing their principal business missions.

The high growth being experienced in this sector and in the associated sector of professional services, has, not surprisingly, drawn the interest and attention of many organisations as a potential business opportunity. A discussion of the competitive environment is provided in section C of this chapter.

B

Development Forces

The commercial systems integration market is, in INPUT's estimation, one of the fastest growing opportunities in the computer industry—second only in the rate of growth to that of network services (see INPUT's report *Network Services—Western European Market Opportunities, 1988-1993*). This rapid growth (30%) is being driven by a variety of factors that can principally be classified as:

- Technological drivers
- System management drivers
- Business/commercial drivers

1. Technological Drivers

The fundamental driving force of the information services industry is the rapid development of the technology and the continuous advance of its application. The key areas of technology advance can be grouped as:

- Integrated circuit technology development
- Data storage device advances, e.g. CD-ROM
- Advances in telecommunications technology
- The development of sophisticated natural interfaces for information systems input/output

These primary technology advances are creating new systems drivers, the most significant of which are listed in Exhibit IV-2. Relational data structures offer new possibilities for organising and accessing data. Open systems standards and multiplatform software create opportunities to achieve far greater flexibility in the design of information systems and in the approach to the management of an organisation's information systems investment.

EXHIBIT IV-2

INFORMATION SYSTEMS DRIVERS

- Relational Data Structures
- Open Systems Standards
- Multiplatform Software
- Microcomputer Sophistication
- Communications Product Range

The level of microcomputer sophistication that is being achieved in terms of both size and cost is impelling digital control over an ever-widening set of applications. The advances in the availability of communications products is also a key factor in widening the application of information systems.

These technology advances act as a driving force, to systems development in general and to systems integration in particular, through the following process. At the leading edge, innovative users will adopt new advanced products to the particular needs of their organisation. For example, the innovative and pioneering use by airlines of computer/telecommunication systems for real-time reservation systems. Once some users have clearly established a competitive advantage through such a process, their competitors are compelled to follow, and imitators will emerge from other industries. It should however be noted that they do not always achieve the same success as the originators. It is also true that in some cases innovative uses of new technology fail and it is the second-wave user that succeeds by learning from the mistakes of the pioneers.

2. System Management Drivers

The application of new technological developments is becoming increasingly complex. Computer systems are no longer confined to the 'back office' and applied to discrete, isolated areas of the business. Computer/communications systems have become heterogeneous within organisa-

tions in both technology and application. They increasingly affect nearly every, if not all, aspects of an organisation's operations. The information systems of today can be described in many cases as being 'mission critical'. The systems are tightly integrated with the operations of the business or the organisation, and in some instances are the agents that change the way the organisation conducts its business.

Consequently the application of new technology confronts managers and administrators with considerable challenges in the management of their information systems investment:

- The challenge of adopting new technology successfully
- The challenge of integrating different technologies or different computer systems
- The challenge of maintaining the existing information systems handling the workload as new systems are being developed

These challenges place heavy demands for key technical skills and project management capabilities that, in many cases, are just not available within the organisation. Consequently some users are seeking contractors that will provide a solution to their problems. To date this activity has been aimed at generating, building and integrating new systems.

In the future it can be expected that users may turn to outside contractors to help them 'modernise' their existing data processing systems. Many existing systems remain isolated, not integrated with other systems, inaccessible, out of date and difficult to maintain.

Currently the placement of systems integration contracts is relatively low in comparison to the overall levels of system development both carried out in-house and contracted with professional services firms. INPUT has assessed the overall size of the systems integration business in Europe at \$1.6 billion in 1988 (see Exhibit III-4) compared to its assessment of the professional services market of nearly \$13 billion.

The profile of use of outside contractors for systems development work derived from INPUT's user survey is shown in Exhibit IV-3. A considerable proportion of both groups (between 33% and 45%) claimed to do all development in-house with no use of any kind of subcontractor. However the majority of respondents do subcontract some proportion of the work; not surprisingly a higher proportion of general management re-

ported this than for the IS management group. There was some evidence of the project management function being subcontracted but very little recorded incidence of total responsibility for a major project being placed with a contractor.

EXHIBIT IV-3

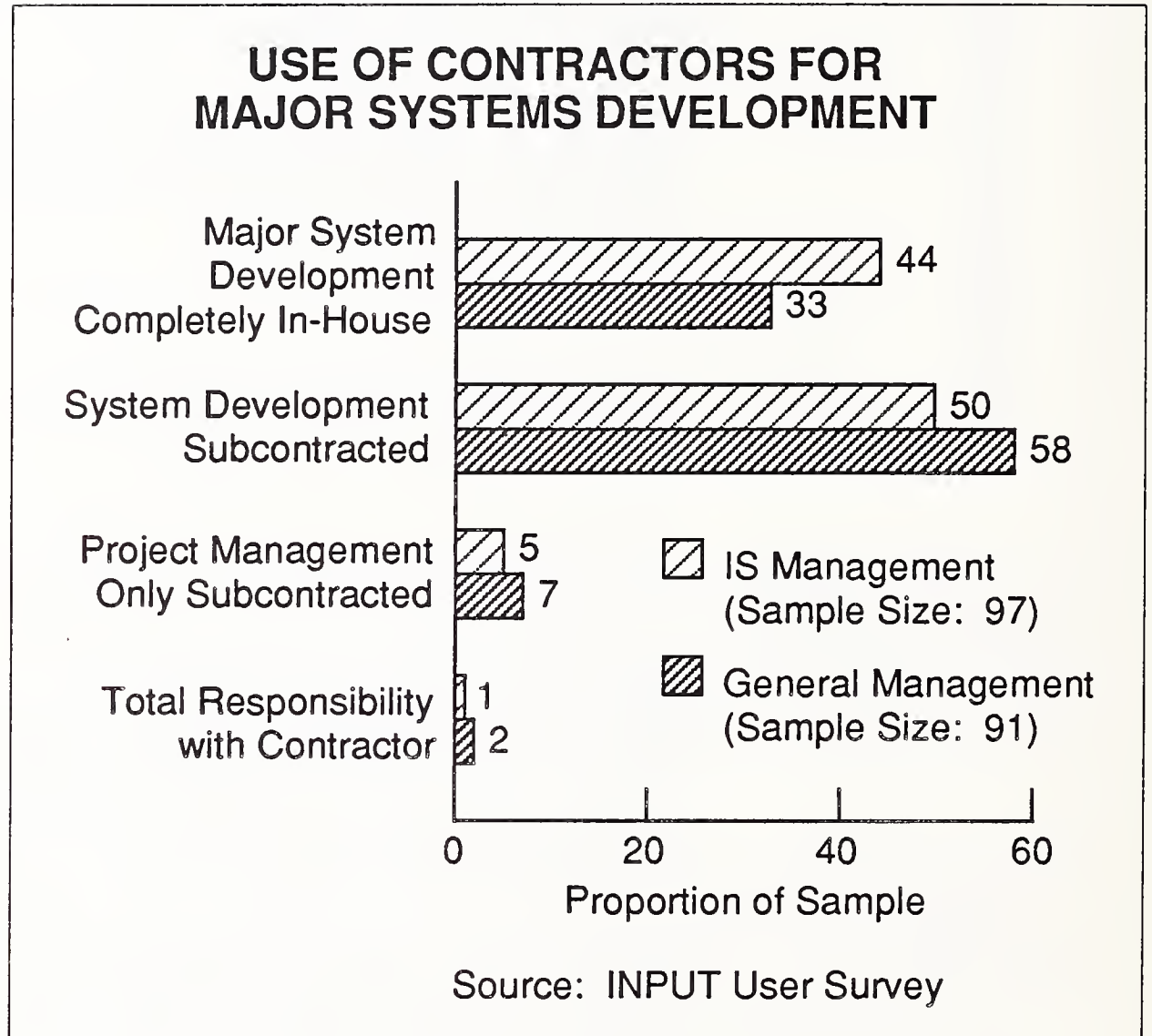


Exhibit IV-4 shows the country group analysis of these statistics. This reveals that the greatest recorded preference for the in-house approach was in the Benelux and West Germany for the IS management group. Interestingly the Benelux sample showed the opposite tendency for the general management group, where 85% of the respondents indicated use of subcontractors. The small sample size should however be borne in mind.

EXHIBIT IV-4

USE OF CONTRACTORS—COUNTRY ANALYSIS

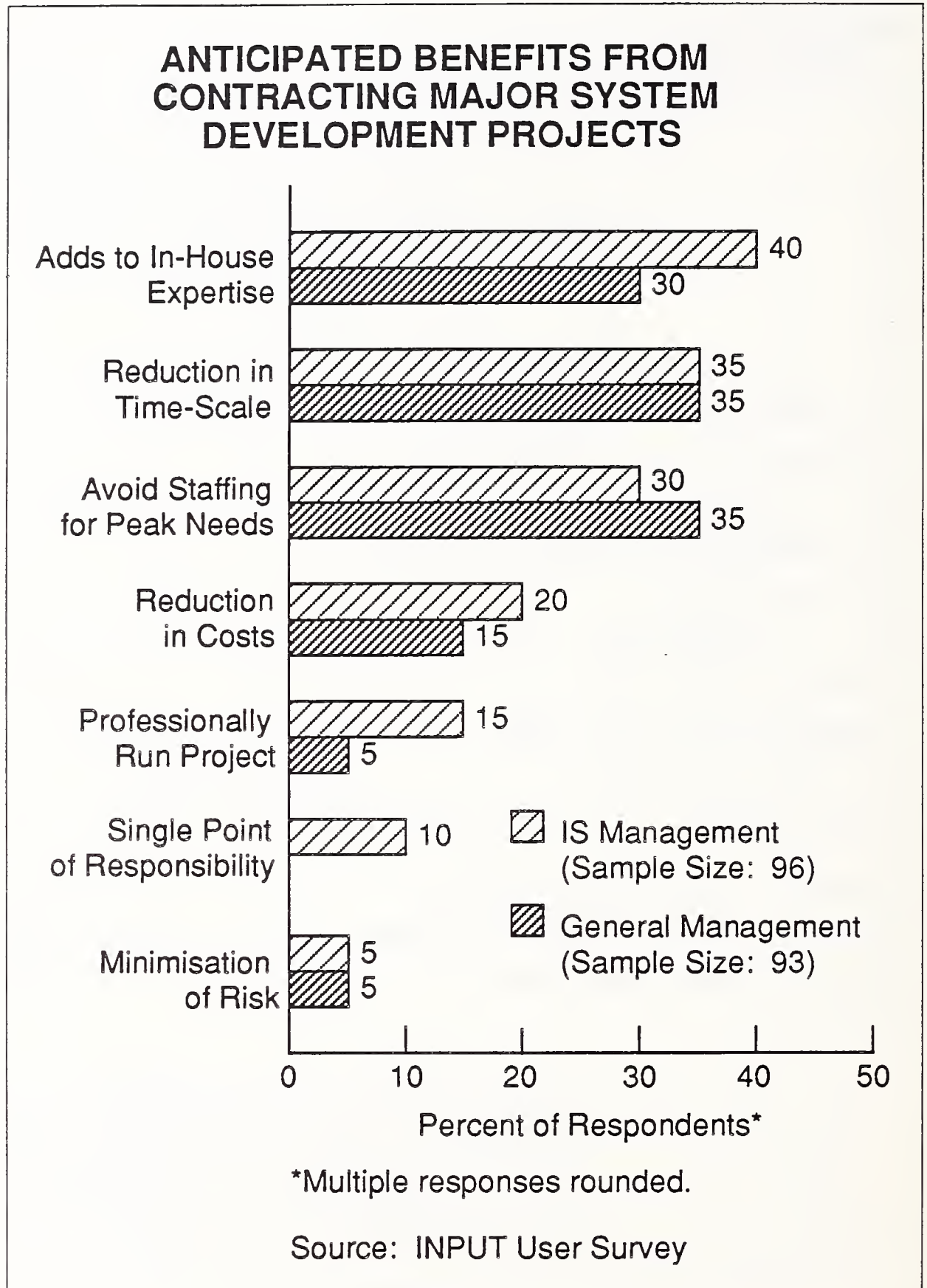
Country/Group	Use of Contractors (Percent of Respondents)					
	IS Management			General Management		
	Sample Size	Percent		Sample Size	Percent	
		Only In-House	Use Subcontractor		Only In-House	Use Subcontractor
West Germany	18	55	45	15	35	65
France	20	45	55	20	15	85
United Kingdom	20	30	70	20	35	65
Italy	9	45	55	7	45	55
Benelux	10	60	40	9	15	85
Scandinavia	10	50	50	10	30	70
Spain	10	30	70	10	30	50

Source: INPUT User Survey

Users perceive a number of possible benefits from the use of outside contractors. Exhibit IV-5 shows the tabulated results of INPUT's user analysis on this question for both groups of respondents. No great disparity of view emerges between the two groups, the most frequently cited anticipated benefits for each user group being:

- The augmentation of the available in-house skills
- Reduction in the overall time scale for the project
- The avoidance of staffing for peak headcount needs only to have to dispense with excess capacity subsequently

EXHIBIT IV-5

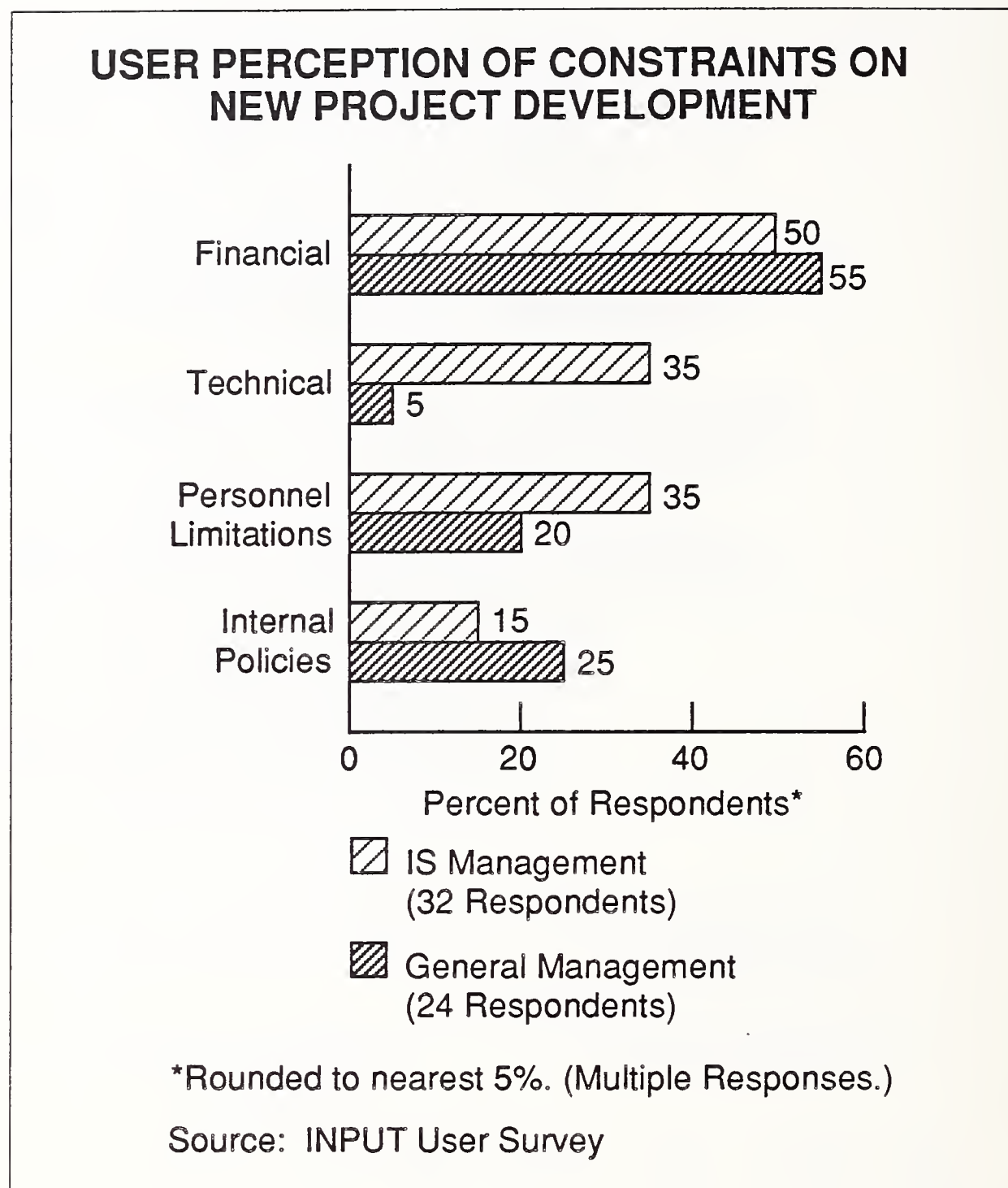


The only other item mentioned significantly was the achievement in the overall reduction in costs for the project. Additionally amongst the IS management group of respondents some indication was given of the expected benefits of a professionally run project and of the presence of a single point of responsibility.

It must also be borne in mind that there exists considerable resistance to outside contractors being given high levels of responsibility for the development of information systems. Whilst the pressures on senior management are severe, many organisations will still prefer to 'do nothing' rather than seek outside help when their own internal resources are lacking. Two key reasons may underpin this: their inability to be able to define precisely enough their new information systems needs and a lack of financial resources to undertake the commitment.

This is reflected in the views of users regarding constraints on new project development, shown in Exhibit IV-6. Financial constraints show up as the most frequently given reason by far. Technical or personnel limitations are of course addressable by external vendors services. Internal priorities will reflect the individual importance of a project vis-a-vis other projects, demands or priorities within the organisation. It should of course be recognised that this represents the views of less than one-third of the respondents. It could be interpreted that the majority of users do not feel that they are facing constraints on new project development, and this is supported by the analysis shown in Exhibit IV-7.

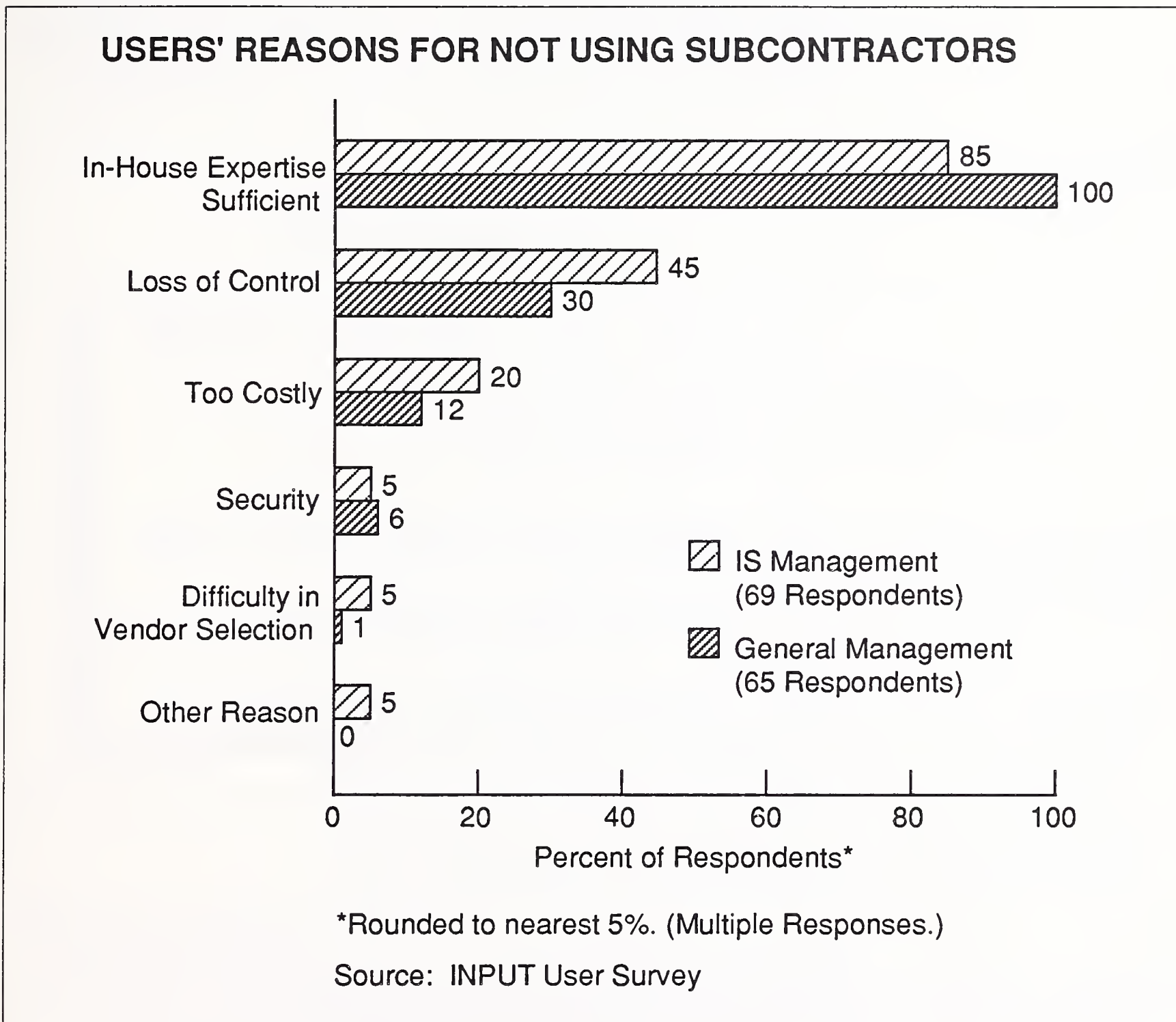
EXHIBIT IV-6



User's reasons for not using subcontractors are analysed in Exhibit IV-7. Clearly, only three are given any real weight:

- The in-house expertise is sufficient and, there is no need for outside resources.
- The user is fearful of losing control of what is considered to be a vital aspect of his operation.
- Using outside contractors is too costly.

EXHIBIT IV-7



Clearly if the resources are available in-house then there is no need to seek an outside service solution. However, the issue of loss of control is considered by INPUT to be essentially an emotional reaction except in those instances where an innovative organisation has created a truly unique system and fears its transference to competitors. Citing 'loss of control' is more typically a failure to appreciate that subcontracting work can actually increase managerial control. The systems objectives become enshrined in a contractual obligation on the part of a third party. The purchaser is in a position to impose penalties and ultimately to cancel the contract for reasons of failure or non-performance. These options largely do not exist internally.

Vendors providing systems integration services also cited certain factors that act as inhibitors to the development of the market and these are listed in Exhibit IV-8. It is clear that in the commercial sector the users' inability to define adequately his system needs is a major inhibitor for applications development by means of a systems integration contract.

EXHIBIT IV-8

MARKET INHIBITORS— THE VENDOR'S VIEW

- Client Inability to Appreciate the 'Cost of Risk'
- Overambitious System Expectations
- Client Preference to Run the Project
- Conflict with the Internal Information Services Department
- Inability to Specify System Requirements
- Standards (but Not for a Long Time)

3. Business/Commercial Drivers

In addition to the basic technological drivers and their consequent system management problems, it must also be realised that the business, commercial and administrative environment is changing too. Liberalisation in banking and finance and telecommunications, the '1992 European Single Market' initiative and world business conditions are all placing considerable pressures on the way organisations operate.

These factors are all considered to be potential drivers for the systems integration business; they create the conditions for major changes in the way that information systems are used. The principal business and commercial drivers in respect of systems integration are summarised in Exhibit IV-9.

EXHIBIT IV-9

**BUSINESS/COMMERCIAL
DRIVING FORCES**

- International Competition
- "Bottom Line" Management
- Rapid Response and Deployment
- Unstable Organisational Environment

Increasing globalisation of business, with faster communication, opens up access to more economic sources of labour and international competition. Consequently 'bottom line' management, the need to control costs and maintain margins, is high on the agenda of many companies.

Faster communication and greater competition foster the need for more rapid response to consumer opinion (and consumer's actions) and the consequent deployment of resources to achieve that objective. These business needs are driving demand for automatic warehousing systems, communication networks to sales outlets and subcontractors, EDI (electronic data interchange) initiatives and advanced management information systems.

The greater level of international competition and in Europe the particular challenge of '1992' are causing considerable levels of merger and acquisition activity. This unstable organisational environment is creating the need to integrate or replace different proprietary architecture systems and to build new computer/communications networks that meet the needs of these 'new' organisations. All of these business and commercial driving forces, and their parallel effects on administrative organisations create a potential need for systems integration contracts.

C**Competitive
Environment**

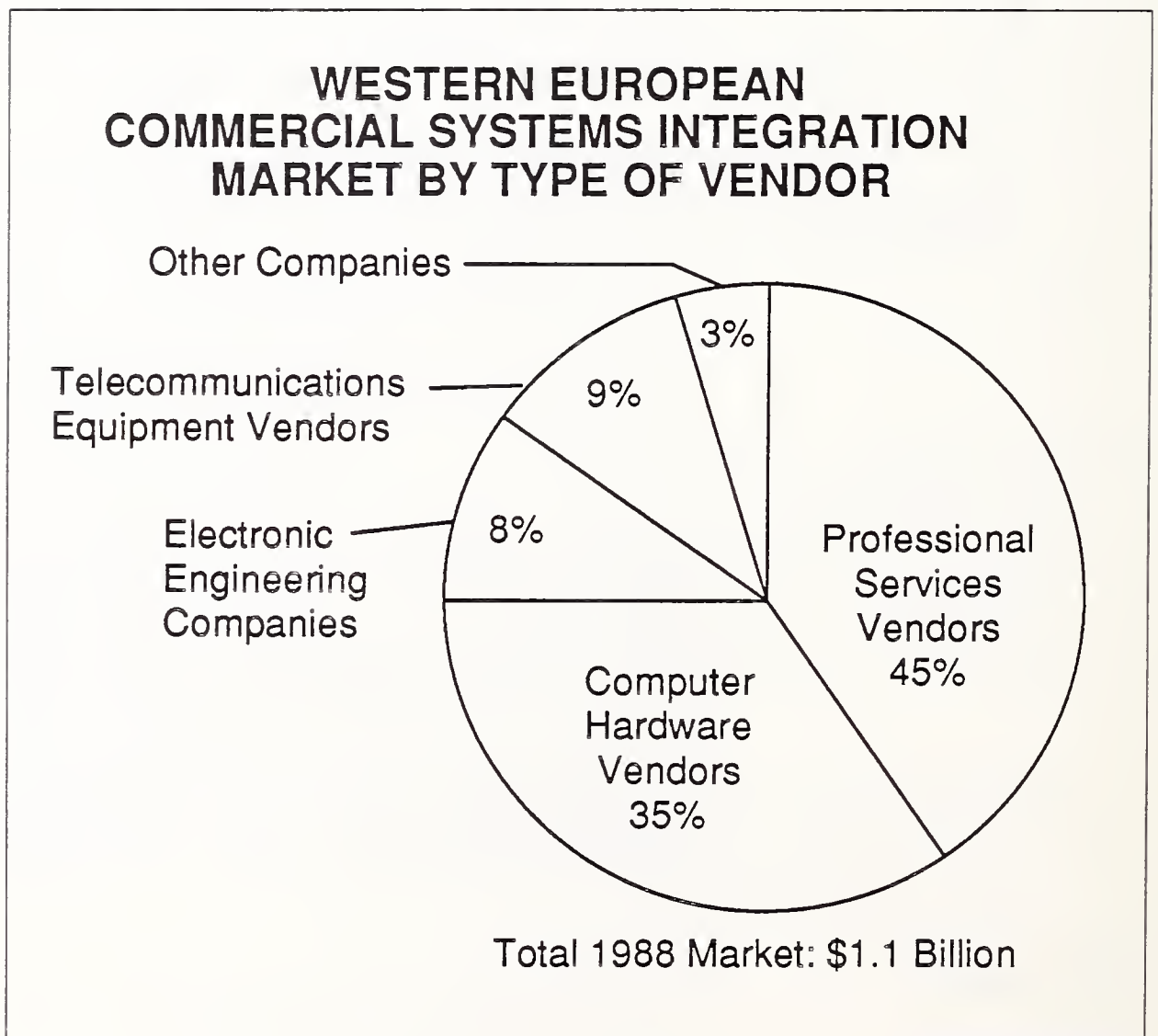
The development of the commercial systems integration market has attracted a wide variety of vendors. In addition to those vendors that are addressing this market through the logical pursuance of their principal business activity (the sale of computer or communications hardware, the

provision of professional services), there also exist vendors that have specifically identified commercial systems integration as an area of strategic focus. Perot Systems in the United States and the ICG Group (Information Consulting Group), funded by Saatchi and Saatchi, are examples of organisations specifically set up to address the commercial systems integration opportunity.

Exhibit IV-10 shows the proportions of the market currently held by the main types of vendors, as estimated by INPUT. It can clearly be seen that the professional services vendors and the computer hardware vendors dominate the market as it is constituted today. In total the vendor types involved in commercial integration can be classified as:

- Professional services vendors
- Computer vendors
- Electronic engineering companies
- Telecommunications equipment vendors
- Other vendors

EXHIBIT IV-10



The two principal types of vendors, professional services vendors and computer hardware vendors are discussed separately in the subsections below. The most important electronics engineering companies active in this sector are:

- Siemens
- Ferranti
- Mannesman
- Philips
- Thompson

In the telecommunications equipment vendor group, the most significant companies identified are:

- Siemens
- Racal
- GPT (GEC-Plessey Telecommunications)
- Alcatel
- Philips

Companies, like Siemens and Philips, that are involved in a wide variety of business activities are represented in both lists. The other vendors sector includes organisations from a relatively wide range of business backgrounds:

- Aerospace
- Public telephone service providers
- Software products companies

One of the key criteria for success in the systems integration area is to have a very thorough understanding of the technologies being integrated. Project management skills, however finely honed, cannot accommodate the failure to foresee and resolve the technical challenges as they occur. Lack of technological understanding is considered to be the single most important reason for projects failing. As well as functional failure, there exists the condition of relative failure (from the users' viewpoint) where a project overruns its budget, its timescale or both.

This factor was clearly identified by users as one of the most important vendor selection criteria, as seen in Exhibit IV-11. Proven delivery capability within time and budget was the highest-rated vendor selection criteria for the information systems management group and the second-highest-rated (by only a very small margin) for the general management

group. High priority is also given to such factors as the quality of the technical staff, having a contract with legally binding performance guarantees and evidence that the vendor has specialist knowledge of the particular industry in question.

EXHIBIT IV-11

VENDOR SELECTION CRITERIA		
	User Ratings*	
	IS Management (Sample Size: 84)	General Management (Sample Size: 87)
Proven Delivery Capability within Time and Budget	8.6	8.7
Quality of Technical Staff	8.4	8.8
Legally Binding Performance Guarantee	8.2	8.1
Specialist Industry Knowledge	8.0	8.0
System Support Capability	7.4	7.8
Price	6.9	6.6
Ability to Assume Total Project Responsibility	6.2	6.9

*Scale of 0 to 10, where 10 = critical importance and 0 = totally irrelevant.

Average Standard Error 0.05.

Source: INPUT User Survey.

The importance of legally binding performance guarantees to users is mirrored by the vendors' concern to recognise the risk element involved particularly when bidding for fixed price contracts. Although rated relatively highly (6.9 and 6.6 for the two user groups), price only came sixth in priority to users. From the vendor perspective this is healthy since most understand that low pricing leads not only to problems for the vendor in terms of loss on the contract but represents a very real danger for the user of not obtaining the full commitment of his supplier.

The attractiveness of a vendor to a prospective client is dependent upon a number of factors. Perhaps one of the most interesting issues is that of the degree of hardware independence shown by the vendor. Professional services vendors would claim that their independent position guarantees their impartiality in selecting the equipment most suited to the users' needs. Although a number of equipment manufacturers are attempting to position themselves as having a strong degree of hardware independence for this aspect of their business, in general their commercial systems integration business is more likely to stem from those situations where implementation concerns are secondary to the choice of equipment.

1. Professional Services Vendors

As was seen in Exhibit IV-10 the professional services vendor group is estimated to account for around 45% of the commercial systems integration market in 1988. Exhibit IV-12 lists the leading vendors in this group.

It is not surprising that the leading professional services companies have a very significant competitive position in this market. For the most part, the skills that they have developed in taking on responsibility for larger and larger projects have prepared their entry into the systems integration arena. Andersen Consulting has emerged as the market leader in this sector and has experienced very rapid growth.

Cap Gemini Sogeti (CGS) took a majority holding in SESA at the end of 1987 and plans to integrate the company fully at the beginning of 1989. They are considered as one unit for the purposes of this study. SESA has developed its business out of highly technical defense-oriented assignments and has gained an enviable reputation for its expertise in telecommunications and networking. SESA obtains nearly three-quarters of its revenues from systems integration contracts, with the remainder from consultancy, some product sales and smaller system development contracts. Cap Gemini Sogeti, its parent organisation, is the largest professional services company in Europe; combined with SESA it is the largest

independent systems integration vendor in the Western European commercial market, generating over twice the level of revenue than the second-ranked company, SD-Scicon.

EXHIBIT IV-12

**LEADING WESTERN EUROPEAN
PROFESSIONAL SERVICES
COMMERCIAL SYSTEMS
INTEGRATION VENDORS**

Vendor	1988 Estimated CSI Revenues (\$ Millions)
Andersen Consulting	155
CGS/SESA	135
SD-Scicon	60
Logica	50
Sema	45

Other prominent professional services companies are Logica and the Sema Group (formerly Sema Metra and CAP Group PLC). Andersen Consulting and EDS are marketing the systems integration concept very aggressively in Europe, driven to some extent by the success achieved by the U.S.-based parent organisations. It is interesting to note that four of the five leading professional services firms identified in this sector are European-owned.

2. Computer Equipment Vendors

The computer equipment vendors also represent a very significant share of the market (35%), the leading companies in this group are listed in Exhibit IV-13. The equipment manufacturers have developed their systems integration business as a result of customer demand for system solutions rather than just equipment needs. This has forced them to take

on increasing levels of responsibility for software provision and for the supply of professional services. Of course hardware vendors have for many years had systems integration responsibility for certain very large-scale projects, long before the separate identification of the systems integration market. It has recently become an opportunity that is of sufficient size to warrant specific marketing initiatives. The leading hardware vendors have all made specific statements about this business sector aimed at positioning themselves more effectively. For example, Unisys has set up a specific organisation, the Complex Systems Organisation, to address the commercial systems integration opportunity. Unisys is positioning itself as having distinct skills in integrating different proprietary architectures—a claim derived from its formation out of the Burroughs and Sperry merger. IBM has also set up a formal organisation to address systems integration and Digital has made public statements that underline its recognition of this business opportunity.

EXHIBIT IV-13

**LEADING WESTERN EUROPEAN
COMPUTER EQUIPMENT COMMERCIAL
SYSTEMS INTEGRATION VENDORS**

Vendor	1988 Estimated CSI Revenues (\$ Millions)
IBM	190
Unisys	55
Digital	30
ICL	25
Olivetti	25

D**Project Classification**

Another important market environment issue is that of project classification. Exhibit III-9 in Chapter III showed the vertical market analysis and Exhibit IV-14 shows in schematic form the areas in which commercial systems integration activity is currently occurring in Western Europe. This exhibit shows a project classification between vertical markets and

project type. In this analysis projects have been classified into five main groups:

- Administrative/communications network projects
- Communications network projects
- Process control projects
- Materials control projects
- Computer-aided manufacturing projects (CAM)

EXHIBIT IV-14

COMMERCIAL SYSTEMS INTEGRATION— OPPORTUNITY AREAS (Western Europe)

Vertical Market Sector	Project Type				
	Administrative/Communications Network	Communications Network	Process Control	Materials Control	CAM
Manufacturing			**	*	*
Banking and Finance	*	**			
Telecommunications		**			
Utilities			**		
Transportation		**		*	
Local Government	**				
Other Sectors		*		*	

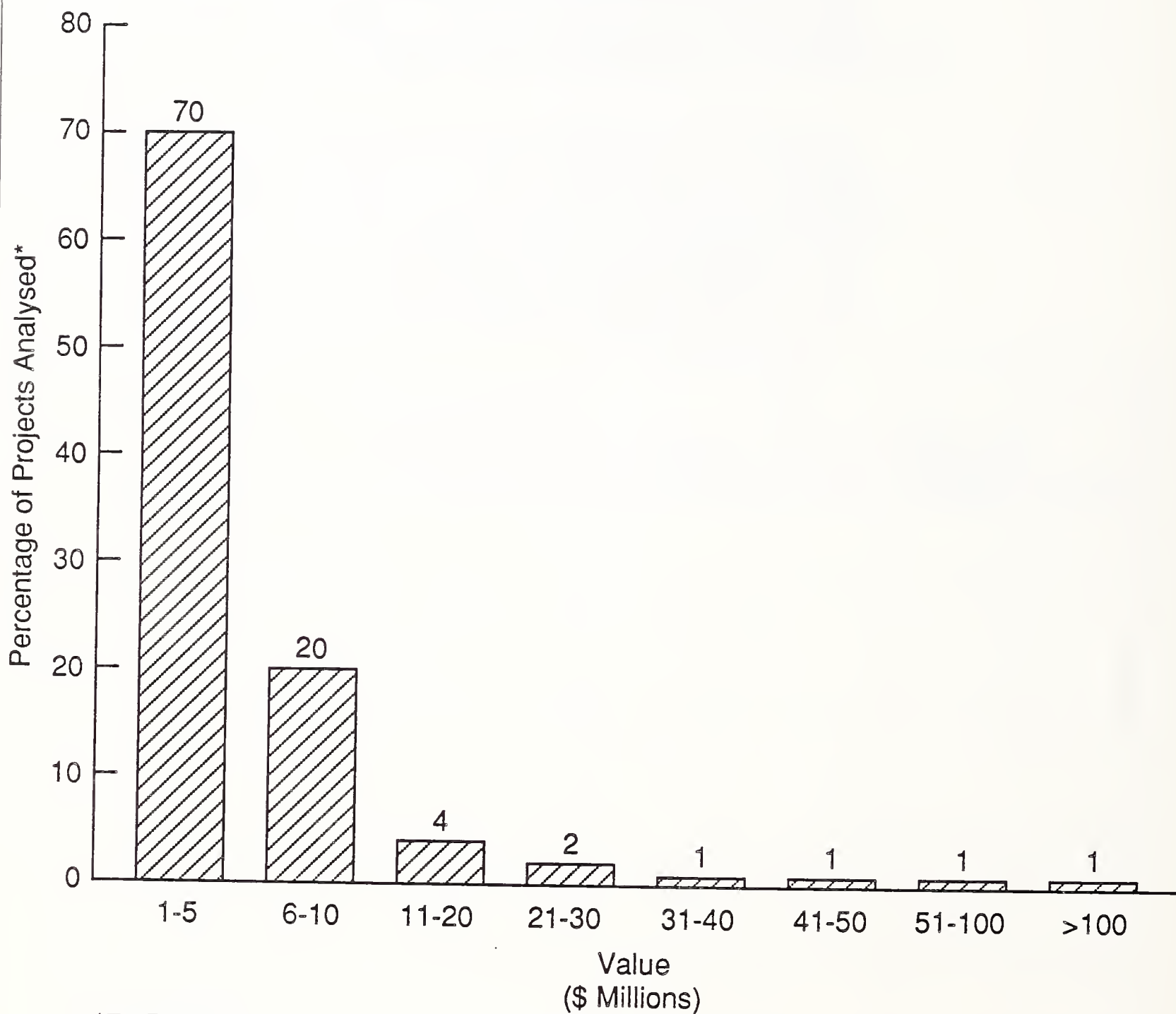
Key: *Indicates Some Activity
 **Significant Activity

This exhibit indicates the importance of communications network skills within the Western European sector and the higher level of observed activity in process rather than discrete manufacturing. Within the local government sector the key area, classified as joint application and network projects, is command and control systems for the emergency services: fire, police, etc. Within the 'all other' sector the most significant opportunity seems to lie in the retail area where considerable activity is involved with such developments as EFTPOS.

A further project classification for the Western European commercial systems integration market is shown in Exhibit IV-15. In this exhibit an estimate is provided, based on the commercial systems integration projects identified and analysed by INPUT, of the distribution by project value. The bias is clearly shown in this diagram, with the vast majority of projects (some 70%) falling into the \$1 to \$5 million category.

EXHIBIT IV-15

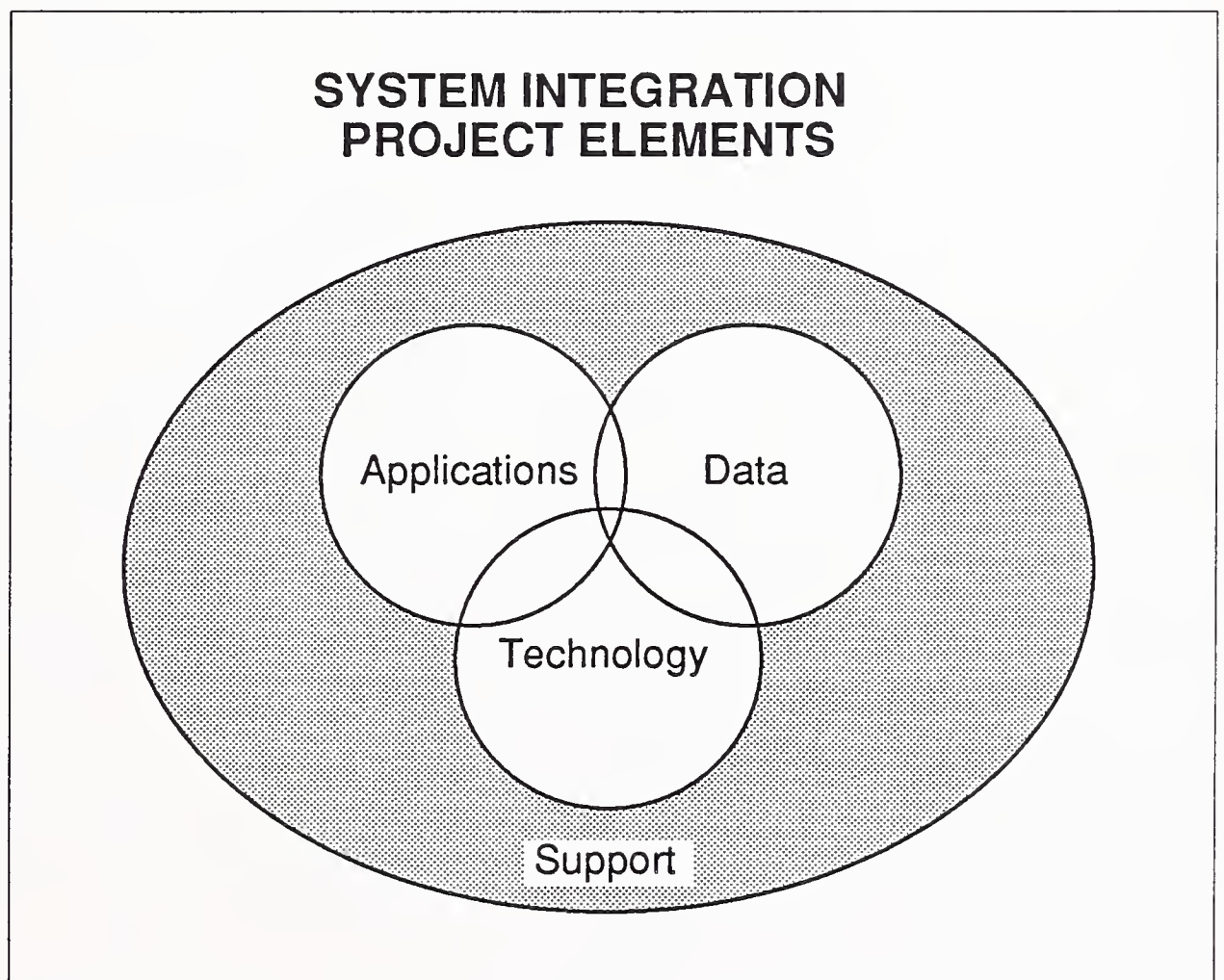
DISTRIBUTION OF WESTERN EUROPEAN COMMERCIAL SYSTEMS INTEGRATION PROJECTS BY VALUE

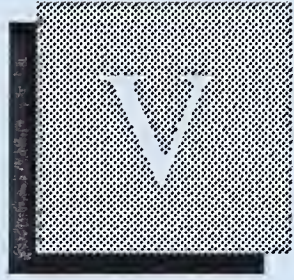


*75 Projects

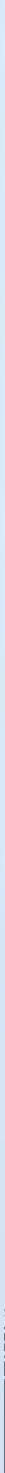
INPUT believes that commercial systems integration projects will eventually tend to be dominated by one of three principal elements: the application, the technology or the organisation of data (see Exhibit IV-16). This analysis is discussed further in Chapter VI, Section A. Currently, little evidence of systems integration projects dominated by the data element has emerged. The importance of the application element is also fairly weak in the commercial systems integration sector—defining projects precisely enough to be able to submit them to outside contractors is still a limiting factor on this market. Fundamentally, in Western Europe today, it is the technology element that is the key driving force for commercial systems integration project growth.

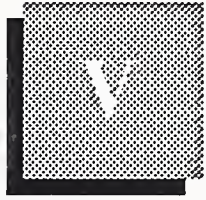
EXHIBIT IV-16





Country Markets





Country Markets

A

West Germany

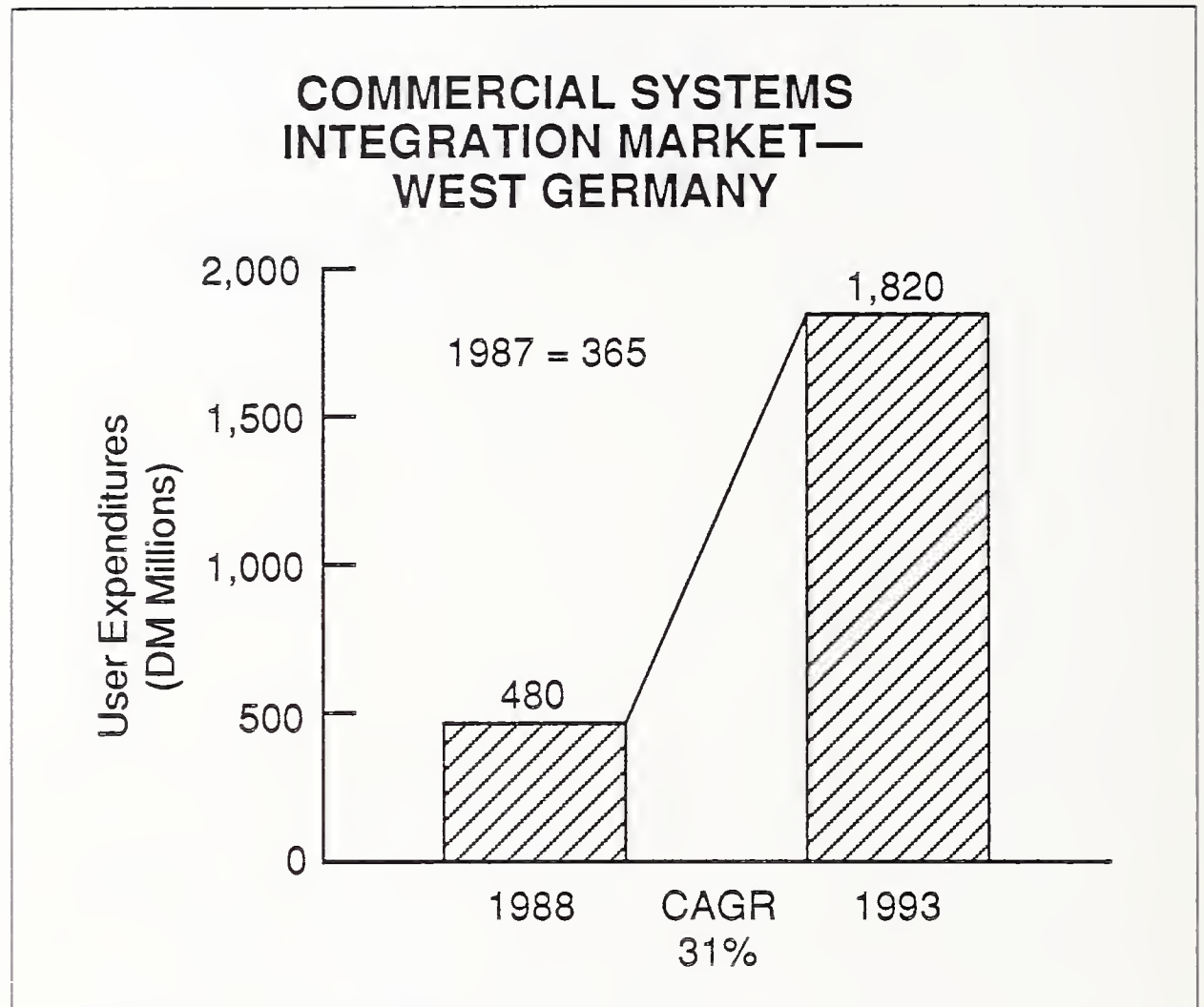
The West German market for commercial systems integration has been assessed by INPUT at DM 480 million for 1988. It can be seen from Exhibit V-1 that the market is expected to increase at a compound annual rate of 31% to exceed DM 1,800 by 1993. A number of vendors interviewed by INPUT shared a very positive view of the commercial systems integration opportunity in West Germany. Some examples of the comments made by vendors that support this view were:

- 'Increasingly managers in Germany are demanding good information—systems integration projects are an important tool to obtain it.'
- 'The systems integration market is just beginning to develop in Germany with opportunities being seen as excellent.'

However this very positive scenario was not shared by all vendors as the following vendor comments indicate:

- 'The market for systems integration will depend on the maturity of the user base; systems integration projects are not yet seen as being a large market in Germany.'
- 'The current volume of systems integration projects should not be overestimated—only a few very large projects have been or are being undertaken.'
- 'Communications standards need to be agreed upon and implemented before systems integration projects will be widely undertaken.'

EXHIBIT V-1



Nevertheless the vendors interviewed generally support the view that there is a very reasonable expectation of growth in West Germany over the next few years. The last vendor comment quoted above does however indicate that not all vendors have fully appreciated the real nature of the systems integration business.

An analysis of the West German market by vertical sector is shown in Exhibit V-2. Clearly indicated is the importance of the manufacturing sector, which accounts for around 45% of the total market. In contrast to some other countries, the banking and finance sector is considered to be fairly small within the current market.

West Germany has by far the largest manufacturing base of any country in Western Europe and is the one market where the discrete manufacturing sector, as opposed to process manufacturing, appears to be a fairly strong market for systems integration projects. This is attributed to the observation that considerable investment is being made in German discrete industry as German manufacturers struggle with global competition and their own high wage rates.

EXHIBIT V-2

SECTOR ANALYSIS—COMMERCIAL SYSTEMS INTEGRATION MARKET WEST GERMANY

Market Sector	1988 Market Size (DM Millions)
Manufacturing	220
Banking and Finance	55
Telecommunications	55
Utilities	18
Transportation	33
Local Government	27
Other	72
Total	480

Some examples of systems integration projects identified within the West German manufacturing sector are:

- The implementation of a number of projects by Porsche, involving an automated parts store and a major CAD/CAM design system. Both SCS and EDS have obtained contracts from Porsche.
- The installation of a flexible manufacturing system for Robert Bosch with a project valued at around \$7 million.
- A plant modernisation contract valued at about \$8 million awarded by SHELL Deutschland to Siemens.

The banking and finance sector is relatively small in West Germany, with probably considerable reluctance on the part of bankers (as is generally the case in Europe) to commit to using outside contractors for what is

becoming a very intimate part of their operations. However it is in the area of communications networks where systems integration activity has been observed. For example:

- Some contracts awarded to SCS by regional banks for the installation of network systems
- A contract awarded by the COMMERZBANK to SESA Deutschland for the implementation of a foreign subsidiary branch communications network.

In the telecommunications sector itself, considerable activity is expected as the telecommunications authority (soon to be identified as TEL-EKOM) makes considerable investment in new services, notably ISDN. Although Siemens is likely to reap the vast majority of this business other vendors have benefited. For example Racal of the U.K. was recently awarded a contract valued at around \$17 million for the installation of a TEMEX system. Interestingly, and this is a phenomenon that systems integrators in Europe should be well aware of, Racal was obliged to subcontract the required specialist software development to a local vendor, the Dr. Neuhaus Group.

Of particular significance within the West German transportation sector is IBM's systems integration project for AMADEUS, a major international travel distribution system for a consortium of four airlines, Air France, Iberia, Lufthansa and SAS. A very considerable proportion of the investment, in total in excess of \$100 million to IBM, will be recorded within West Germany.

The competitive scenario for commercial systems integration within West Germany is indicated in Exhibit V-3, which shows the ten leading vendors. IBM, as in Western Europe as a whole, has the largest market share (23%). SCS and Siemens have 14% and 12% respectively and the CGS/SESA group 7%.

EXHIBIT V-3

**LEADING COMMERCIAL
SYSTEMS INTEGRATION VENDORS, 1988
WEST GERMANY**

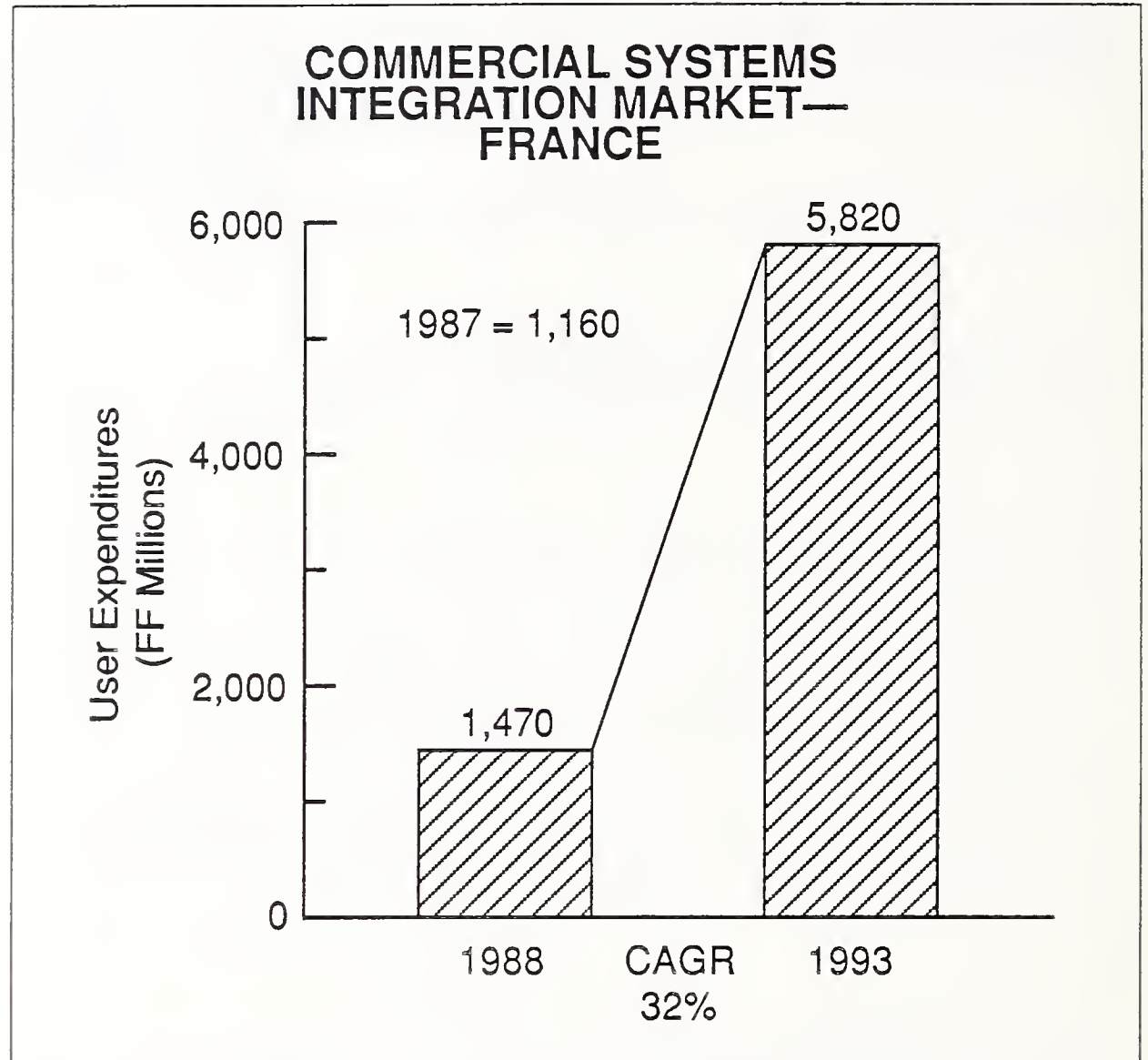
Rank	Vendor	1988 Estimated Revenues (DM Millions)	Market Share (Percent)
1	IBM	110	23
2	SCS	65	14
3	Siemens	60	12
4	CGS/SESA	35	7
5	Andersen Consulting	28	6
6	Mannesman	25	5
7	Ferranti	18	4
8	Digital	12	3
9	Logica	10	2
10	Unisys	10	2
	Others	107	22
	Total	480	100

B

France

Exhibit V-4 shows the expected development of the French commercial systems integration market over the period 1988 to 1993. France is expected to grow at above the average European rate of 30%, from nearly FF 1.5 billion in 1988 to nearly FF 6 billion by 1993.

EXHIBIT V-4



Commercial systems integration is a relatively new concept in France except in the area of telecommunications where both CGS and SESA have benefited from very substantial contracts placed by the DGT (Direction Generale de Telecommunications) for the development of its TRANSPAC packet switched network and the electronic telephone directory (annuaire electronique). EDS became responsible for bringing heightened awareness of the systems integration concept to a wider circle when it purchased SPI (Systemes pour l'Informatique) from the Pechiney group as its entry vehicle into the French market in 1986.

Consequently INPUT has found varied levels of understanding and optimism for systems integration as an identifiable and attractive business sector for potential participants. The following vendor comments indicate some of the views of vendors regarding the commercial systems integration business in France:

- 'France is seen as a growth market with a huge potential for systems integration project-based solutions.'

- 'Markets, excepting those of banking, transportation, insurance, manufacturing and distribution, will seek system integration projects once they have effectively defined their system integration needs.'
- 'Being seen as a powerful foreign company with a strong skills base helps overcome the innate chauvinism of a French market still weak in home-grown skills.'
- 'The sheer size of projects will act to limit the number of players.'
- 'Newcomers from other business areas—i.e. aerospace—will form the real competition.'
- 'Hardware manufacturers will over time come to be the market leaders, as they ultimately control the channels of distribution.'

Exhibit V-5 shows the vertical market analysis of the French market. Unlike West Germany, the manufacturing sector only accounts for about 30% of the total market but the banking and finance sector is considerably more significant, accounting for nearly 20% of the market. Within the manufacturing sector most of the systems integration projects identified by INPUT fell into the process rather than the discrete category. Thus examples of major projects in the French manufacturing sector included:

- A materials handling system for Michelin for which STERIA had project responsibility
- A system for automatic computer plant control for a Vittel bottling plant implemented by SESA
- An automatic filling and packaging system implemented for Rhone-Poulenc, the leading French chemical company

Within the banking and finance sector it is again the need for and reliance on telecommunications networks that is driving the growth of systems integration. Examples of projects identified included:

- The development of two compatible management information systems for the UNIMAT and UNIFERGIE subsidiaries of CREDIT-AGRI-COLE. It is estimated that these contracts have been worth \$4 million to CGS in total.

- Communications networks developed by SESA for both the CREDIT LYONNAIS and SOCIETE GENERALE banks.
- The contract for the development of the interbank clearing system (Systeme Interbancaize de Telecompensation) for the BANK OF FRANCE. SESA was prime contractor for this \$25 million project.

EXHIBIT V-5

SECTOR ANALYSIS—COMMERCIAL SYSTEMS INTEGRATION MARKET FRANCE

Market Sector	1988 Market Size (FF Millions)
Manufacturing	460
Banking and Finance	275
Telecommunications	185
Utilities	90
Transportation	105
Local Government	155
Other	200
Total	1,470

Additionally in this sector the revitalisation of the Paris Bourse has generated systems integration project; the largest of these is for SICO-VAM, the body with responsibility for settlement amongst the brokers on the exchange. Andersen Consulting in France has recently obtained a very substantial contract concerned with the design and implementation of this system.

As already mentioned, for some years the telecommunications sector has represented a very strong area for systems integration in France. Con-

tracts continue to be awarded to upgrade the TRANSPAC network and the electronic telephone directory as well as to develop new service areas: for example a contract placed with SESA in conjunction with the telephone equipment manufacturing company CROUZET for the development of credit card service systems.

In the utilities sector the French organisation responsible for electricity generation and distribution EDF (Electricite de France) has awarded a number of systems integration contracts. SESA and the French software vendor and professional services company CGI have benefited from this. CGI was concerned with the development of an energy management system for EDF.

Substantial investments have been made by both the SNCF (French National Railways Authority) and the RATP (the authority responsible for the urban transportation in Paris) that have generated systems integration business in such applications as rolling stock management, ticket control systems and signalling systems. The French transportation sector will also benefit from the AMADEUS contract with IBM.

The competitive scene in the French commercial systems integration sector is currently dominated by the CGS/SESA group with just over 30% of the total in 1988. Exhibit V-6 shows the leading ten vendors identified by INPUT in this market sector. IBM achieves second place with about one-fifth of the market and Andersen Consulting is in third place with a 12 percent share. All the other vendors in the top ten have much smaller individual shares; the newly-formed SEMA Group (formerly Sema-Metra in France) is estimated to have had a 6% market share in 1988 and Unisys, the fourth-ranked vendor, 4%.

EXHIBIT V-6

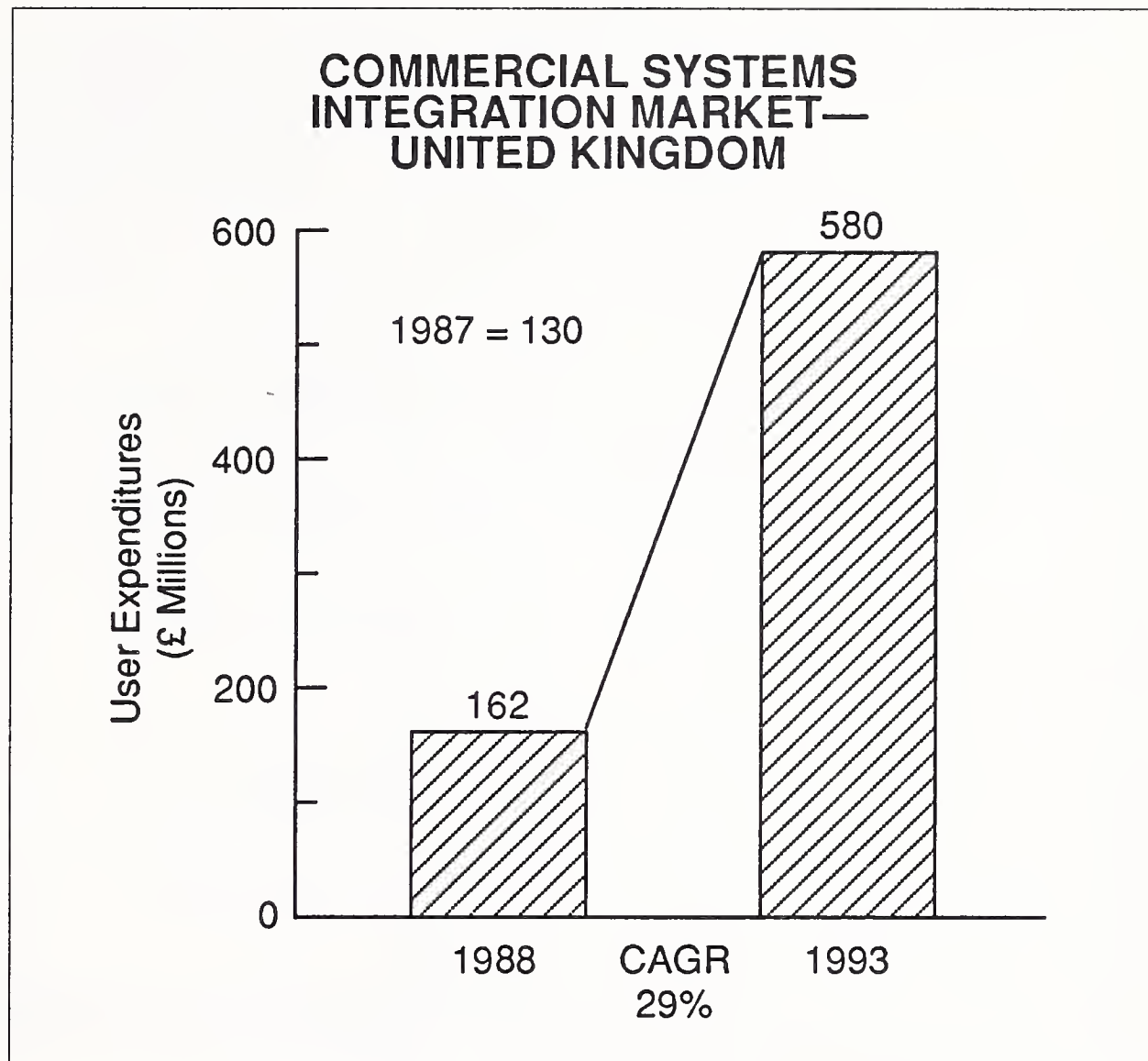
**LEADING COMMERCIAL
SYSTEMS INTEGRATION VENDORS, 1988
FRANCE**

Rank	Vendor	1988 Estimated Revenues (FF Millions)	Market Share (Percent)
1	CGS/SESA	460	31
2	IBM	280	19
3	Andersen Consulting	150	13
4	Sema Group	90	6
5	Unisys	55	4
6	GFI	35	2
7	Thompson	30	2
8	Siemens	30	2
9	Alcatel	30	2
10	Digital	18	1
	Others	262	18
	Total	1,470	100

C
United Kingdom

The largest individual country market for commercial systems integration within Western Europe is the United Kingdom, a position largely attributed to the size of the banking and finance subsector. The estimated size and growth of the U.K. market is shown in Exhibit V-7. A market that reached just over £160 million in 1988 is expected to grow slightly below the European average of 30% per annum to reach £580 million by 1993.

EXHIBIT V-7



Another factor that may have contributed to a relatively more developed systems integration market in the U.K. in comparison with other countries is the influence of U.S.-based systems integration vendors. This applies not only to their own specific marketing activities but to the effect they have had on U.K.-based organisations like Logica and SD-Scicon.

Exhibit V-8 shows the vertical sector analysis for the U.K. market. Here can clearly be seen the dominant position of the banking and finance subsector with its 40% market share, compared to the next largest sector, manufacturing, only accounting for about 20%.

EXHIBIT V-8

SECTOR ANALYSIS—COMMERCIAL SYSTEMS INTEGRATION MARKET UNITED KINGDOM

Market Sector	1988 Market Size (£ Millions)
Manufacturing	35
Banking and Finance	65
Telecommunications	12
Utilities	9
Transportation	3
Local Government	12
Other	26
Total	162

It is ironic, however, that one of the largest commercial systems integration contracts has been in the U.K. manufacturing sector, a \$40 million contract awarded to Grumman Data Systems (GDS) for a sophisticated engine test systems environment by Roll-Royce. SD-Scicon is the U.K.-based subcontractor responsible for considerable elements of the systems development. In general though, the contracts identified have been much smaller and have largely been placed within the process rather than the discrete sector. This reflects the generally weak state of discrete manufacturing activity within the U.K. economy.

As already indicated the banking and finance sector is the most dominant market sector, a situation created by:

- The highly developed nature of London as a financial centre vis-a-vis other European cities

- Deregulation of the London stock exchange in 1986 (the so-called Big-Bang phenomenon) and liberalisation of the banking environment

These factors have contributed to massive development of systems as banks and other financial institutions have attempted to position themselves to take advantage of the new opportunities and to face up to the challenge of globalisation in financial services.

The leading systems integrators in the U.K. commercial market are shown in Exhibit V-9. IBM is the leading vendor with nearly 20% of the total market. Logica is the second largest with a 9% market share and Unisys is in third place with 8%.

EXHIBIT V-9

**LEADING COMMERCIAL
SYSTEMS INTEGRATION VENDORS, 1988
UNITED KINGDOM**

Rank	Vendor	1988 Estimated Revenues (£ Millions)	Market Share (Percent)
1	IBM	29	18
2	Logica	15	9
3	Unisys	13	8
4	Andersen Consulting	12	7
5	Sema Group	10	6
6	ICL	7	4
7	GDS	7	4
8	SD-Scicon	6	4
9	Olivetti	6	4
10	Tandem	6	4
	Others	51	32
	Total	162	100

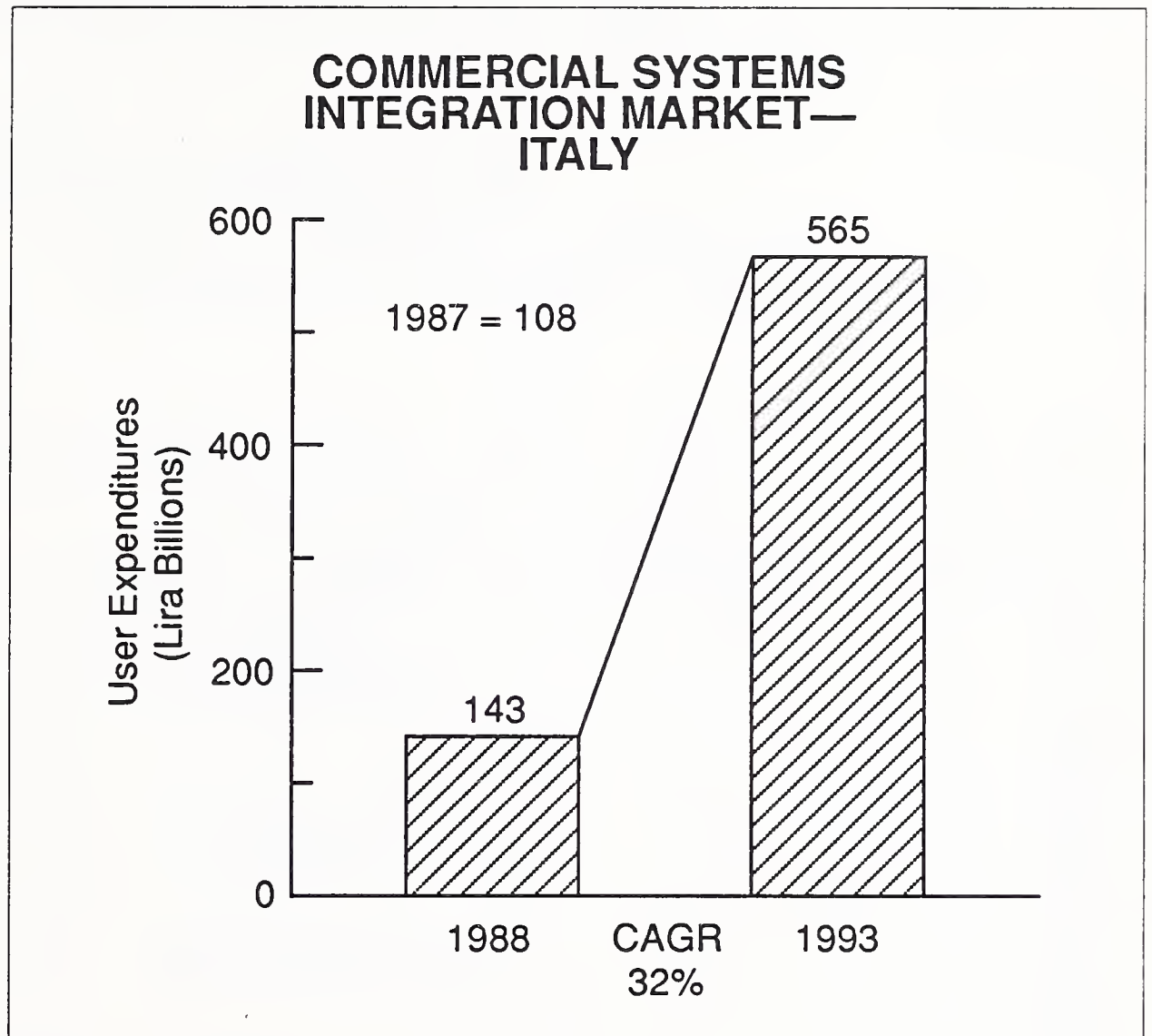
D

Italy

Italy has the fourth largest commercial systems integration country market in Europe. As can be seen from Exhibit V-10, INPUT has estimated a market size of just over lira 140 billion in 1988 growing to lira 565 billion by 1993. This represents an above-average annual compound growth rate of 32%. The systems integration concept is relatively new within the Italian market although the larger companies are organising themselves through strategic alliances to address this area. The relatively

undeveloped nature of the Italian telecommunications environment inhibits users wishing to implement sophisticated network-based systems but places additional pressures on them to seek external assistance.

EXHIBIT V-10



Some vendor comments of the market environment in Italy regarding commercial systems integration are given below:

- ‘The strategic alliances being formed are pushing the market.’
- ‘Sophisticated users see information as an asset, needing high-level, integrated systems to retain a competitive edge.’
- ‘The market generally is not yet used to the systems integration concept—‘islands of automation’ are more common.’
- ‘Network developments are hampered by a lack of deregulated telecommunication systems.’

Exhibit V-11 shows the vertical market analysis for the Italian market. Italy is another example of a country where the manufacturing sector is particularly important—representing nearly 40% of the total market. Banking and finance is the second-largest sector with under 15% of the market.

EXHIBIT V-11

SECTOR ANALYSIS—COMMERCIAL SYSTEMS INTEGRATION MARKET ITALY

Market Sector	1988 Market Size (Lira Billions)
Manufacturing	55
Banking and Finance	20
Telecommunications	14
Utilities	7
Transportation	3
Local Government	14
Other	30
Total	143

SESA, the leading French services company has been active in developing communications-based systems in Italy primarily through the medium of the SESIT consortium. This consortium is constituted of ITALTEL, Telematica and SESA Italia. SESIT has developed and installed networks for Finsider, the Italian interbank organisation SIP/SIA and a major travel agents system.

Unisys has developed in the banking sector a dealing room system for the Savings Bank of Turin and in the manufacturing sector a system valued at \$10 million for FINCANTIERI, the major shipyard.

Exhibit V-12 indicates the top five systems integration vendors in the Italian market. Andersen Consulting is the market leader with IBM and CGS/SESA also having significant shares. Not surprisingly Olivetti on its homeground appears as one of the leading vendors. Clearly the computer hardware vendors dominate the market in Italy at the present time.

EXHIBIT V-12

**LEADING COMMERCIAL
SYSTEMS INTEGRATION VENDORS, 1988
ITALY**

Rank	Vendor	1988 Estimated Revenues (Lira Billions)	Market Share (Percent)
1	Andersen Consulting	35	24
2	IBM	27	19
3	CGS/SESA	18	13
4	Olivetti	14	10
5	Unisys	11	8
	Others	38	27
	Total	143	100

E**Benelux**

The Benelux market, the Belgium and Netherlands markets combined (Luxembourg is very small and is always included within the Belgium total), is estimated to have amounted to around 8% of the total Western European market in 1988. Exhibits V-13 and V-14 show respectively the estimated market sizes and growth rates for the Netherlands and the Belgium markets.

EXHIBIT V-13

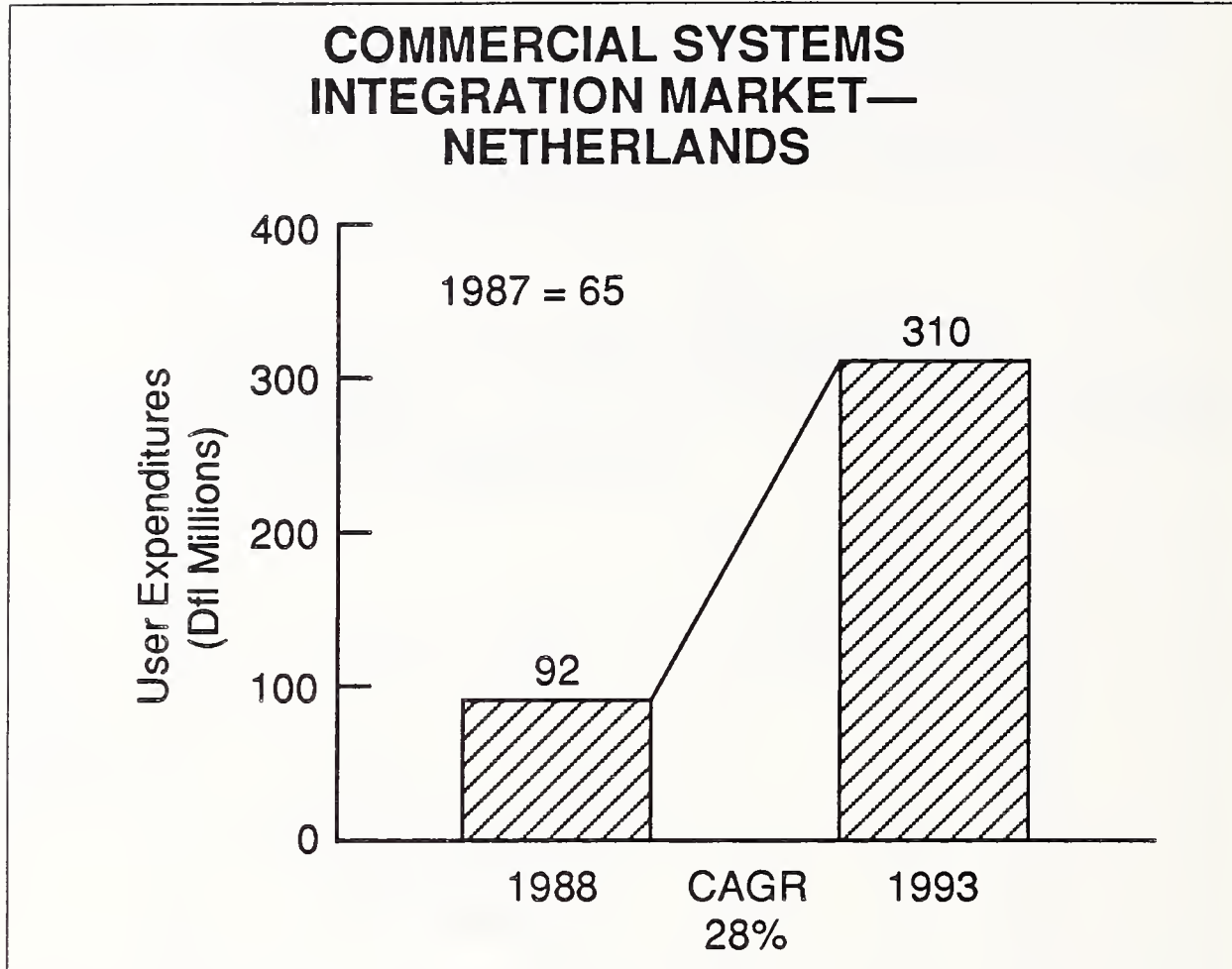
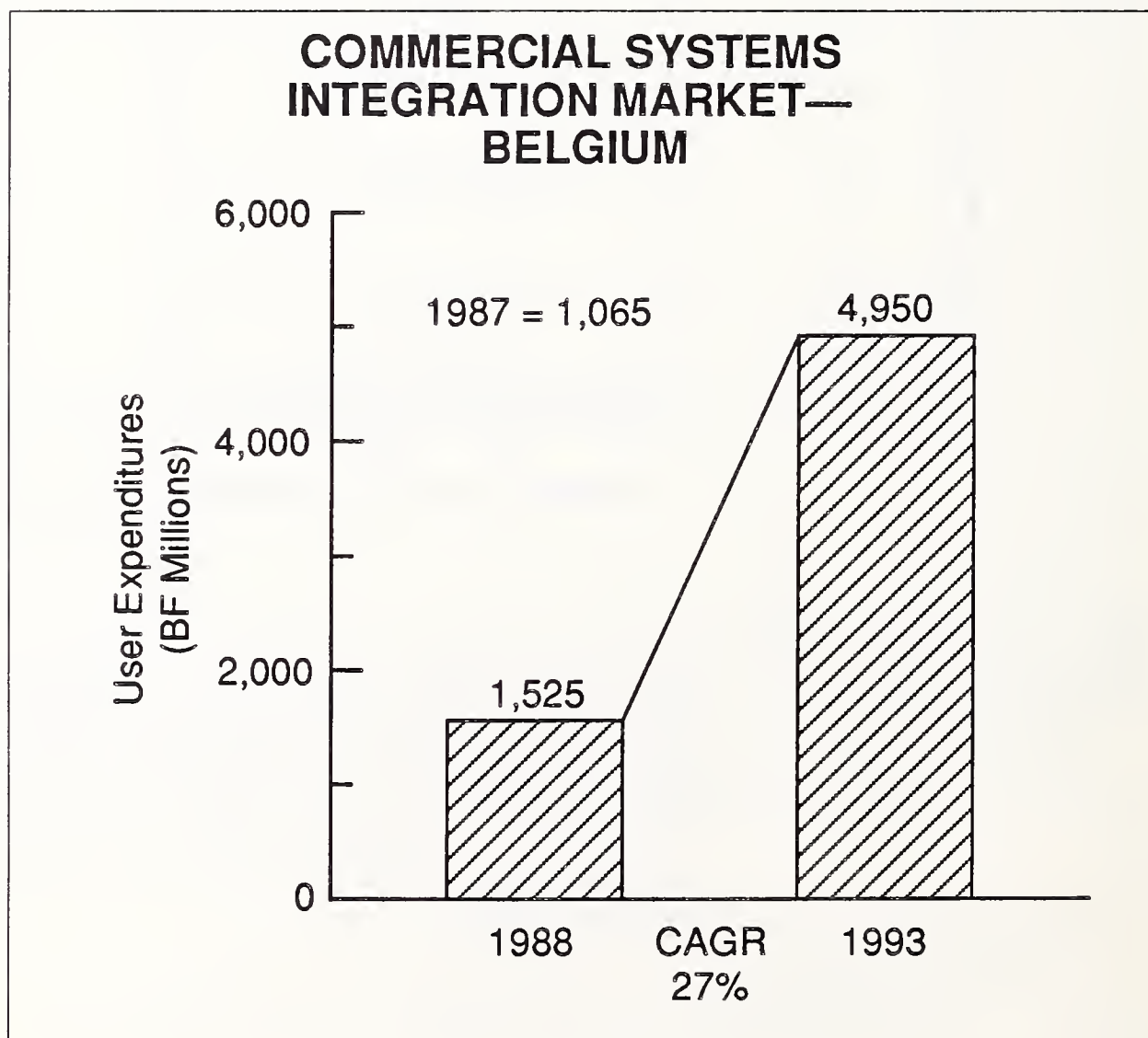


EXHIBIT V-14



The evidence of contracts identified indicates that the Benelux market is relatively well penetrated by the systems integration concept. This market is not only highly influenced by developments in both France and West Germany but also by U.K.-based organisations, notably Logica.

Exhibits V-15 and V-16 show respectively the vertical market sector analysis for the Netherlands and Belgium. Manufacturing is the most important sector in both countries, with nearly 40% of the Dutch market and about 25% of the Belgium market. In this sector Ferranti, the U.K.-based electronics engineering company, has gained a \$4 million contract for an advanced process management system for Shell.

EXHIBIT V-15

**SECTOR ANALYSIS—COMMERCIAL
SYSTEMS INTEGRATION MARKET
NETHERLANDS**

Market Sector	1988 Market Size (Dfl Millions)
Manufacturing	35
Banking and Finance	12
Telecommunications	14
Utilities	10
Transportation	6
Local Government	6
Other	9
Total	92

EXHIBIT V-16

SECTOR ANALYSIS—COMMERCIAL SYSTEMS INTEGRATION MARKET BELGIUM

Market Sector	1988 Market Size (BF Millions)
Manufacturing	380
Banking and Finance	230
Telecommunications	230
Utilities	190
Transportation	115
Local Government	230
Other	150
Total	1,525

In the Netherlands the telecommunications sector is estimated to be the second largest, ahead of banking and finance, whilst in Belgium it is estimated to be around the same size as the banking and finance and the local government sectors. In the telecommunications sector Logica gained a systems integration contract for the development and installation of an X.400-based message handling system, contracted by the Dutch PTT, for dealing with customs declarations.

In the transportation sector, Sabena, the Belgian national airline, awarded Unisys a systems integration contract (valued at \$2.8 million) to upgrade its production and test and development facilities.

Exhibits V-17 and V-18 show respectively the leading systems integration contractors in the Netherlands and in Belgium. In the Netherlands Philips, the national electronic engineering company, emerges as market leader with around a 17% market share with the CGS/SESA group in second place with a similar proportion of the market. In Belgium the

CGS/SESA group is clearly in first place with around one-fifth of the market. Philips is in third place in the Belgium market. It is interesting to note that IBM is only assessed as being in fourth place in the Dutch market and does not appear in the top five list in Belgium. Logica is represented in both these top five listings.

EXHIBIT V-17

**LEADING COMMERCIAL
SYSTEMS INTEGRATION VENDORS, 1988
NETHERLANDS**

Rank	Vendor	1988 Estimated Revenues (Dfl Millions)	Market Share (Percent)
1	Philips	16	17
2	CGS/SESA	16	17
3	Siemens	10	11
4	IBM	8	9
4	Logica	8	9
4	Andersen Consulting	8	9
	Others	26	28
	Total	92	100

EXHIBIT V-18

**LEADING COMMERCIAL
SYSTEMS INTEGRATION VENDORS, 1988
BELGIUM**

Rank	Vendor	1988 Estimated Revenues (BF Millions)	Market Share (Percent)
1	CGS/SESA	300	20
2	Ferranti	230	15
3	Philips	150	10
4	Logica	115	8
5	Sema Group	75	5
5	Andersen Consulting	75	5
	Others	580	37
	Total	1,525	100

F

Scandinavia

INPUT's assessment for the Scandinavian group of countries, Sweden, Norway, Denmark and Finland, is provided in this section of the report. The analysis for each individual country is shown separately in the local currency for each country.

Exhibits V-19 through V-22 respectively show the market size assessment and five-year forecast growth for the commercial systems integration market in Sweden, Norway, Denmark and Finland. Growth rates are expected to vary considerably between these four countries with Sweden the highest with a compound annual growth rate of 28% and Norway with the lowest with a growth rate of only 20% per annum. The problematic state of the Norwegian economy and the decline in the oil industry underpin this assessment of low growth. In contrast Sweden's large internationally-oriented corporations are expected to need to make significant investments that will generate systems integration contracts.

EXHIBIT V-19

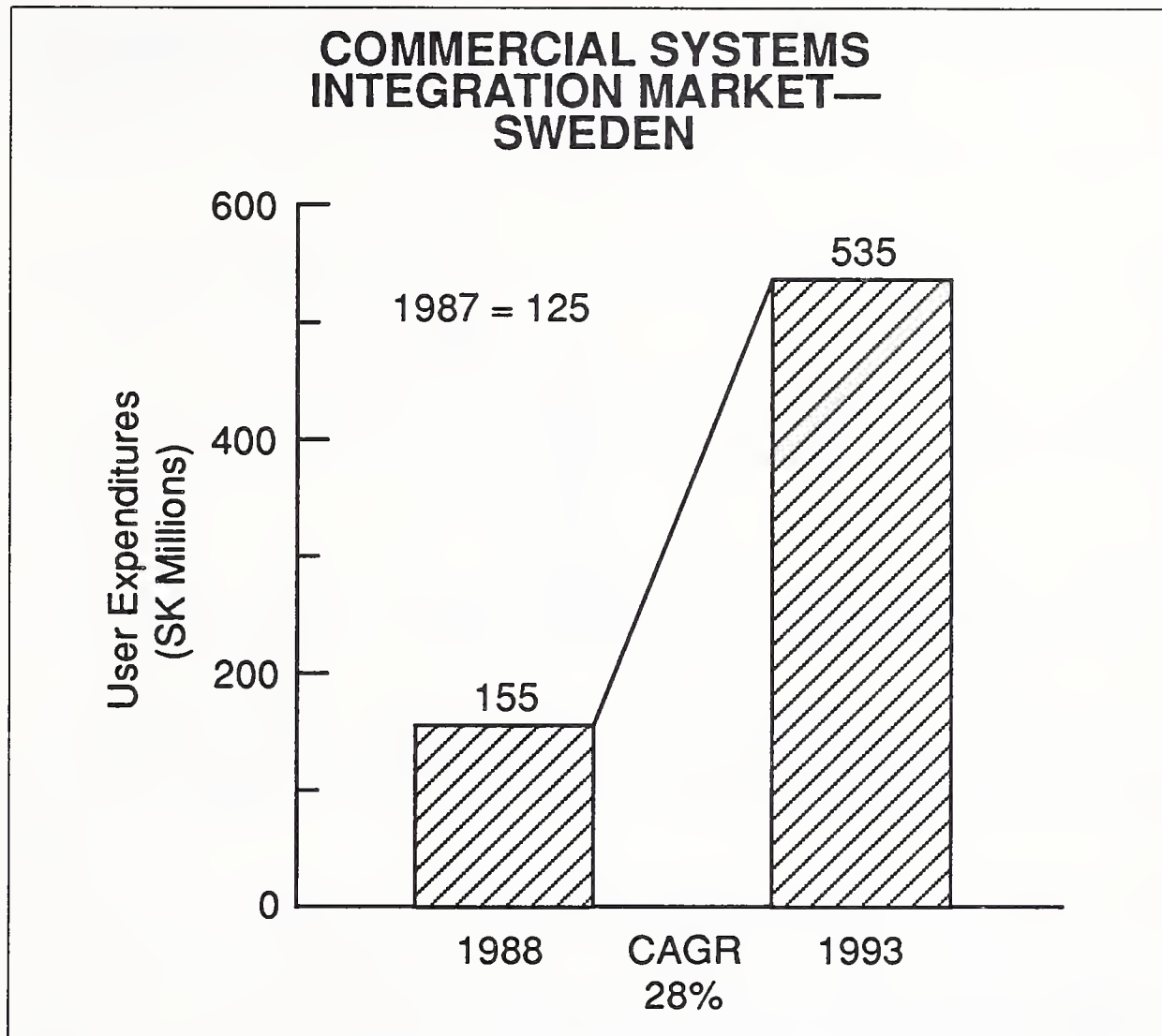


EXHIBIT V-20

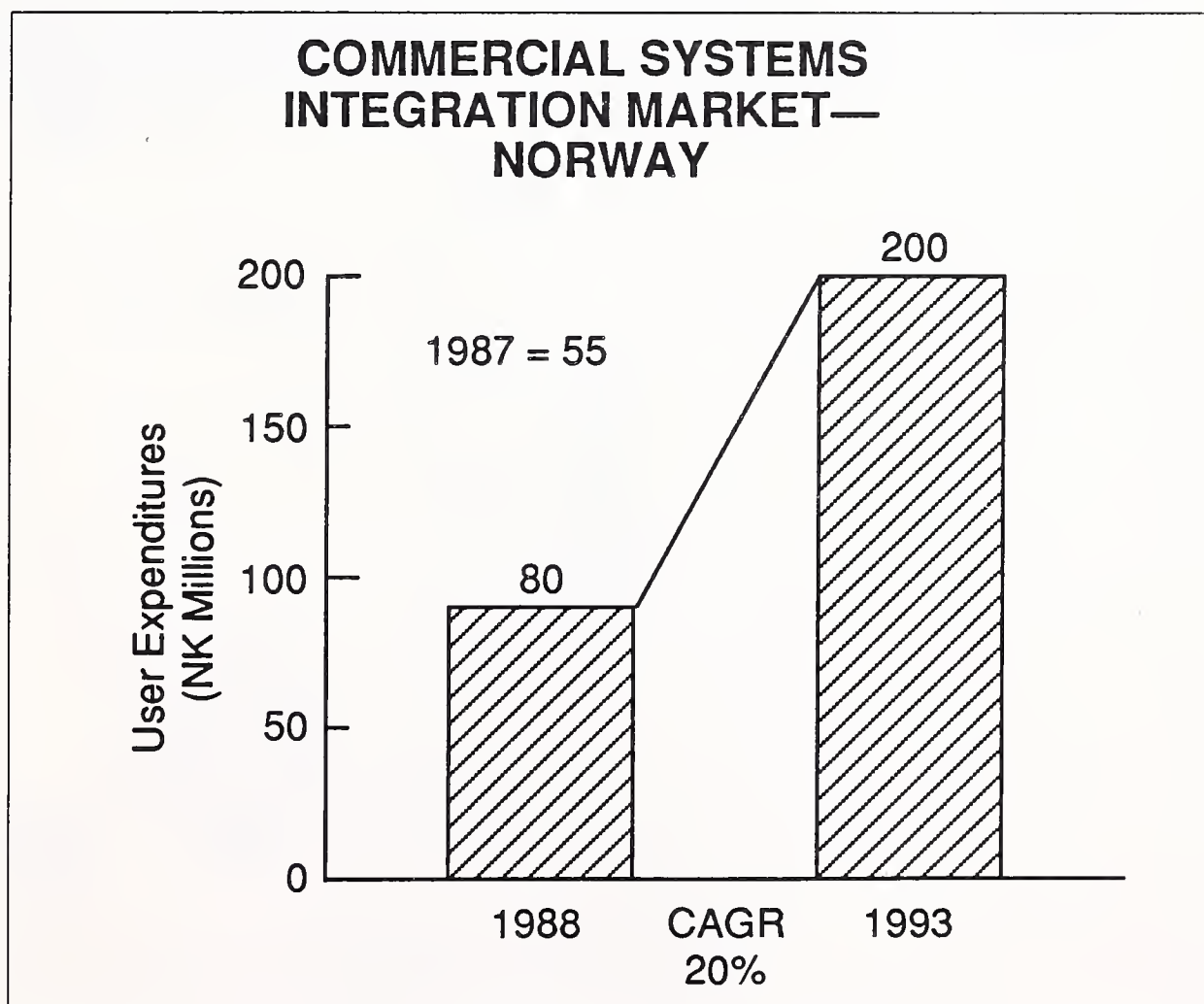


EXHIBIT V-21

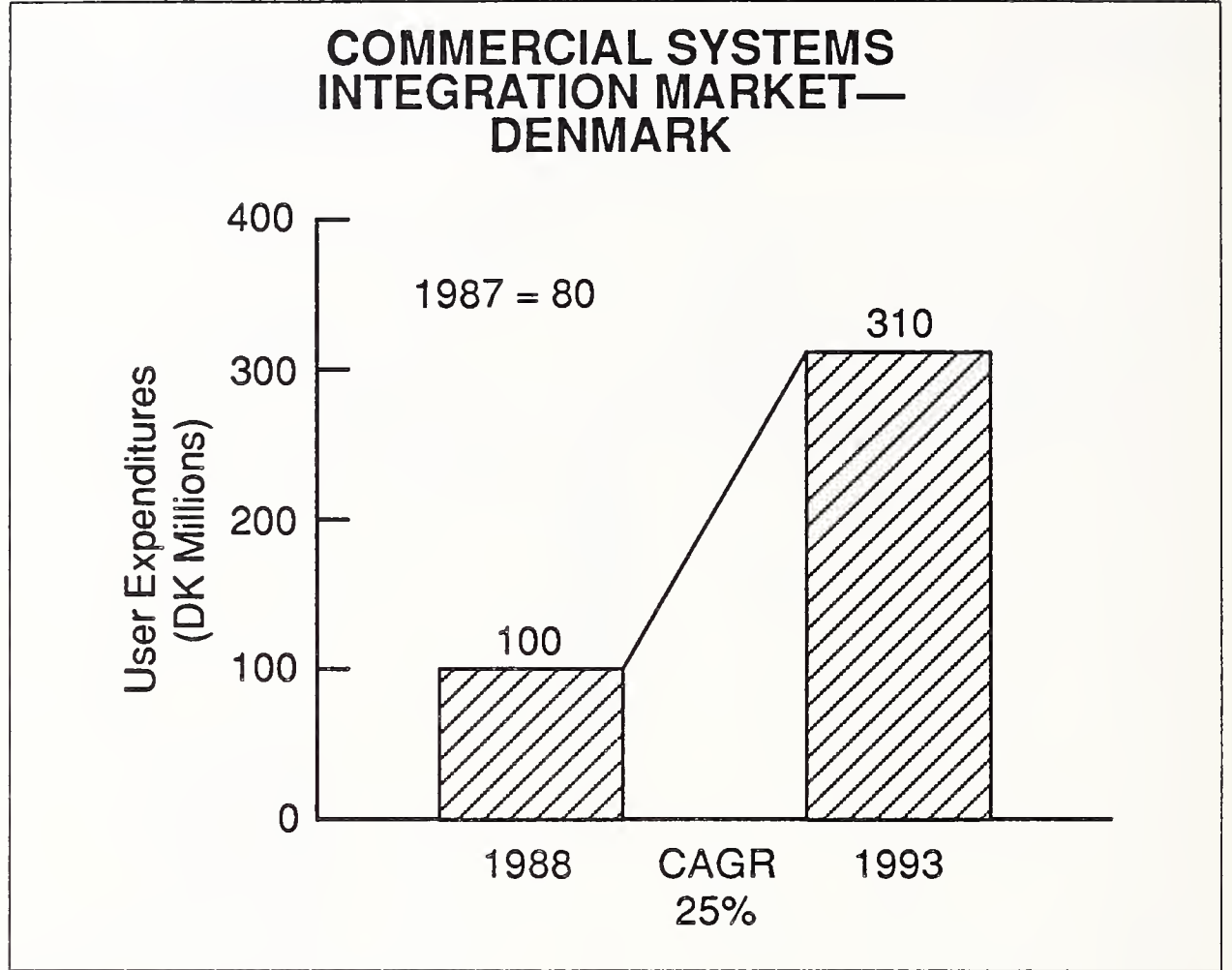
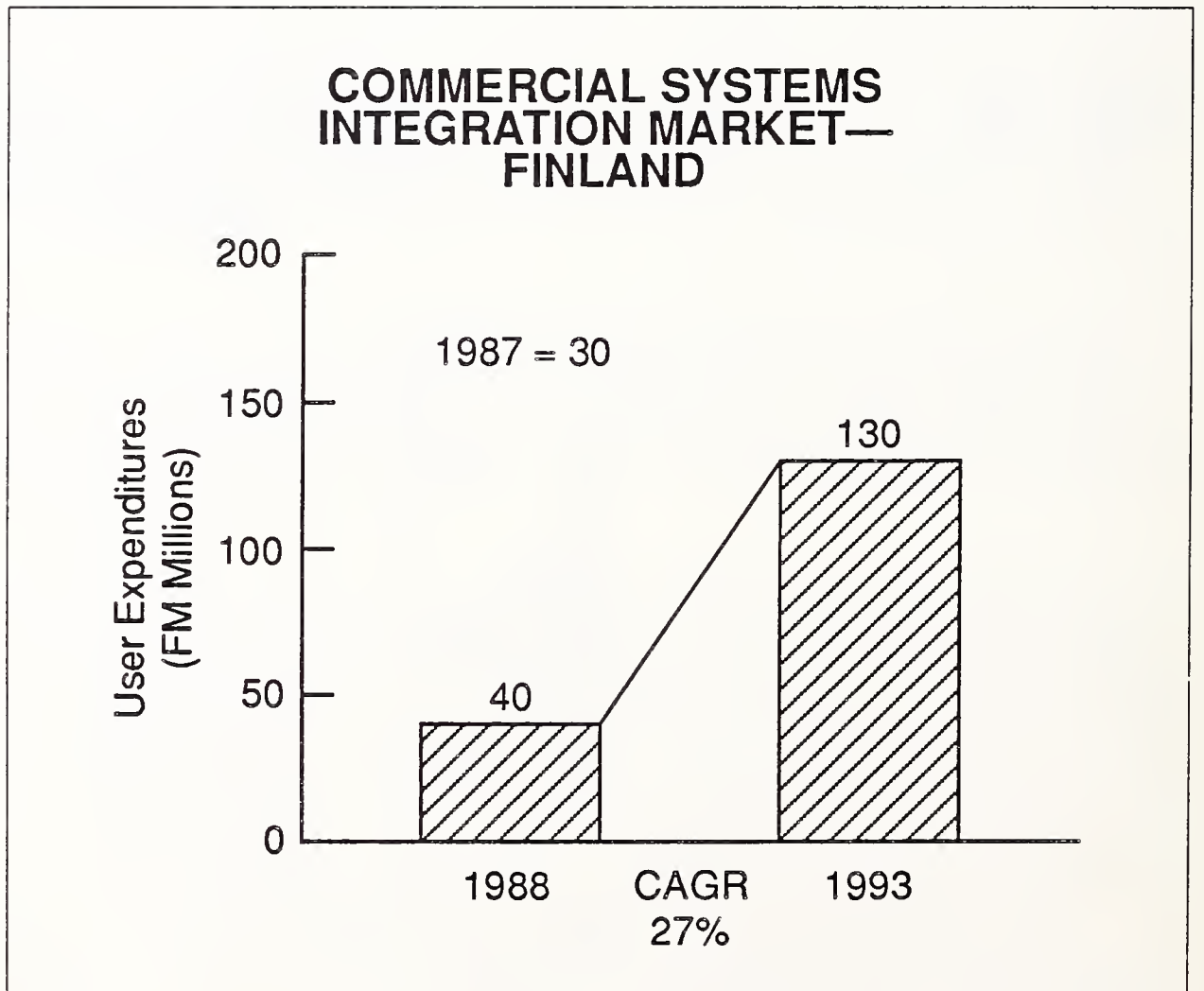


EXHIBIT V-22



Vendors interviewed by INPUT were positive about the systems integration prospects in Scandinavia and felt that the user community was responsive to this approach. This general attitude is reflected in the following comments made by vendors about the Scandinavian market:

- 'Users are taking a more pragmatic approach to the selection and implementation of systems.'
- 'As users become more market than product-orientated, their supporting computer systems need to be increasingly complex and sophisticated to cope.'
- 'In answer to users' desires for a simplified systems approach, market demand for transparent system integration systems is growing.'
- 'In-house data processing departments are increasingly reserved for routine systems administration rather than major system development work.'

Exhibits V-23 through V-26 show the vertical market sector analysis for each of the four Scandinavian countries. Exhibit V-27 shows the five leading commercial systems integration vendors in the Swedish market. CGS and Logica both have strong positions in the small Norwegian market. Additionally Logica is particularly strongly represented in Denmark, where it is estimated to have around 40% of the market currently.

EXHIBIT V-23

**SECTOR ANALYSIS—COMMERCIAL
SYSTEMS INTEGRATION MARKET
SWEDEN**

Market Sector	1988 Market Size (SK Millions)
Manufacturing	75
Banking and Finance	25
Telecommunications	5
Utilities	5
Transportation	-
Local Government	30
Other	15
Total	155

EXHIBIT V-24

**SECTOR ANALYSIS—COMMERCIAL
SYSTEMS INTEGRATION MARKET
NORWAY**

Market Sector	1988 Market Size (NK Millions)
Manufacturing	20
Banking and Finance	15
Telecommunications	15
Utilities	5
Transportation	-
Local Government	20
Other	5
Total	80

EXHIBIT V-25

**SECTOR ANALYSIS—COMMERCIAL
SYSTEMS INTEGRATION MARKET
DENMARK**

Market Sector	1988 Market Size (DK Millions)
Manufacturing	15
Banking and Finance	20
Telecommunications	35
Utilities	5
Transportation	0
Local Government	20
Other	5
Total	100

EXHIBIT V-26

**SECTOR ANALYSIS—COMMERCIAL
SYSTEMS INTEGRATION MARKET
FINLAND**

Market Sector	1988 Market Size (FM Millions)
Manufacturing	9
Banking and Finance	4
Telecommunications	5
Utilities	4
Transportation	-
Local Government	13
Other	5
Total	40

EXHIBIT V-27

**LEADING COMMERCIAL
SYSTEMS INTEGRATION VENDORS, 1988
SWEDEN**

Rank	Vendor	1988 Estimated Revenues (SK Millions)	Market Share (Percent)
1	CGS	19	12
2	IBM	15	10
3	Logica	13	8
4	EDS	12	8
5	Ferranti	12	8
	Others	84	54
	Total	155	100

G

Other European Countries

The three other Western European countries not covered in previous sections of this chapter that have significant commercial systems integration markets are:

- Austria
- Switzerland
- Spain

1. Austria

Exhibit V-28 shows INPUT's estimate of the market and five-year growth prospects for Austria, and Exhibit V-29 shows the vertical market sector analysis. The largest systems integration vendor in Austria is estimated to be Siemens with probably over 20% market share. Logica has also gained some significant business in this market.

EXHIBIT V-28

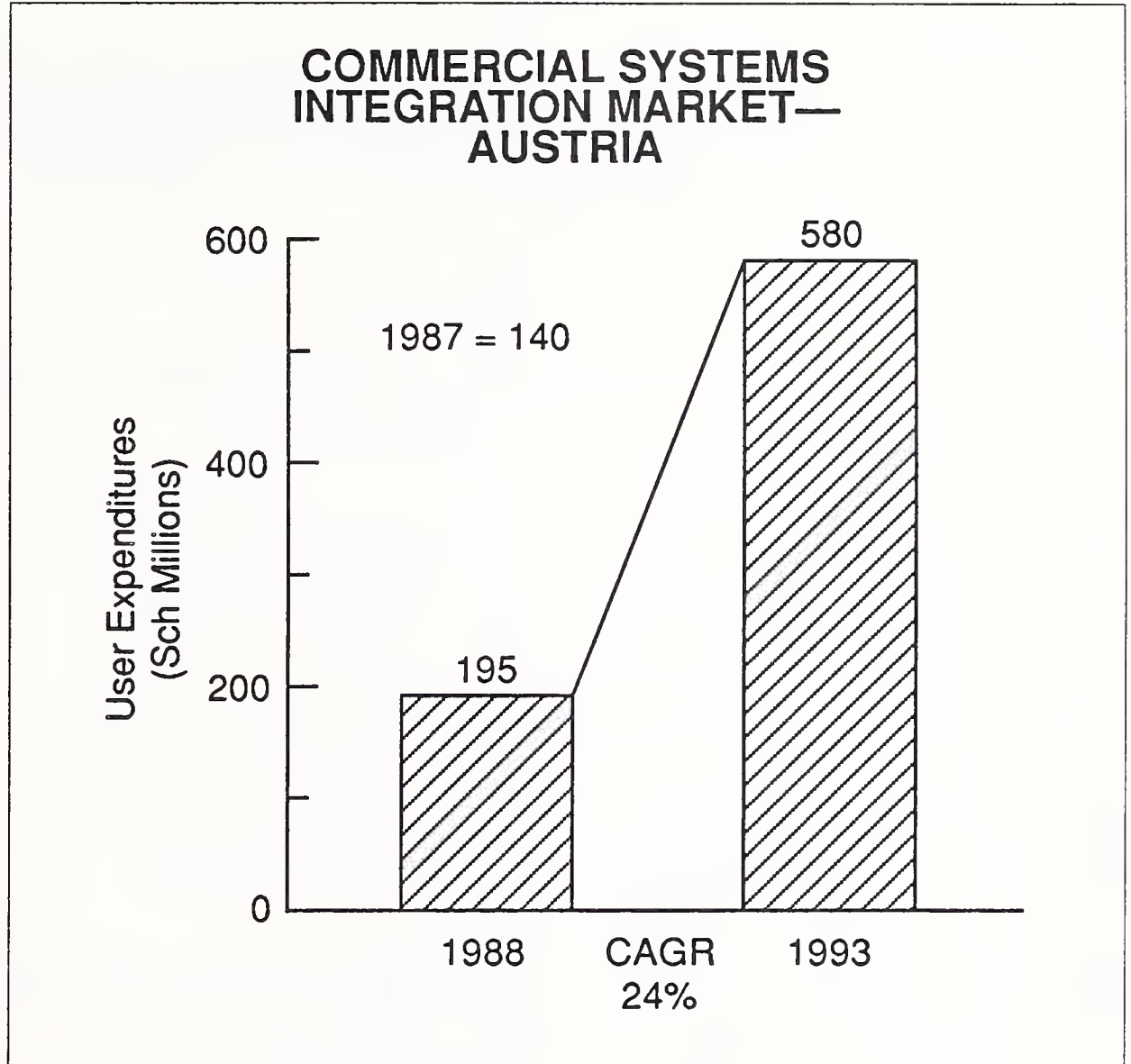


EXHIBIT V-29

**SECTOR ANALYSIS—COMMERCIAL
SYSTEMS INTEGRATION MARKET
AUSTRIA**

Market Sector	1988 Market Size (Sch Millions)
Manufacturing	50
Banking and Finance	40
Telecommunications	15
Utilities	10
Transportation	0
Local Government	65
Other	15
Total	195

2. Switzerland

Exhibit V-30 shows INPUT's view of the commercial systems integration market in Switzerland and Exhibit V-31 the vertical market sector analysis. Andersen Consulting is the market leader in Switzerland with in excess of 20% of the total. The CGS/SESA group is estimated to have about 13% of the market. Both Unisys and IBM have a strong showing due to their positions in the important banking and finance sector.

3. Spain

Exhibit V-32 shows INPUT's assessment of the Spanish commercial systems integration market, and Exhibit V-33 shows the vertical market sector analysis. Leading vendors in the Spanish market are Andersen Consulting, Unisys, CGS, IBM and the SEMA Group.

EXHIBIT V-30

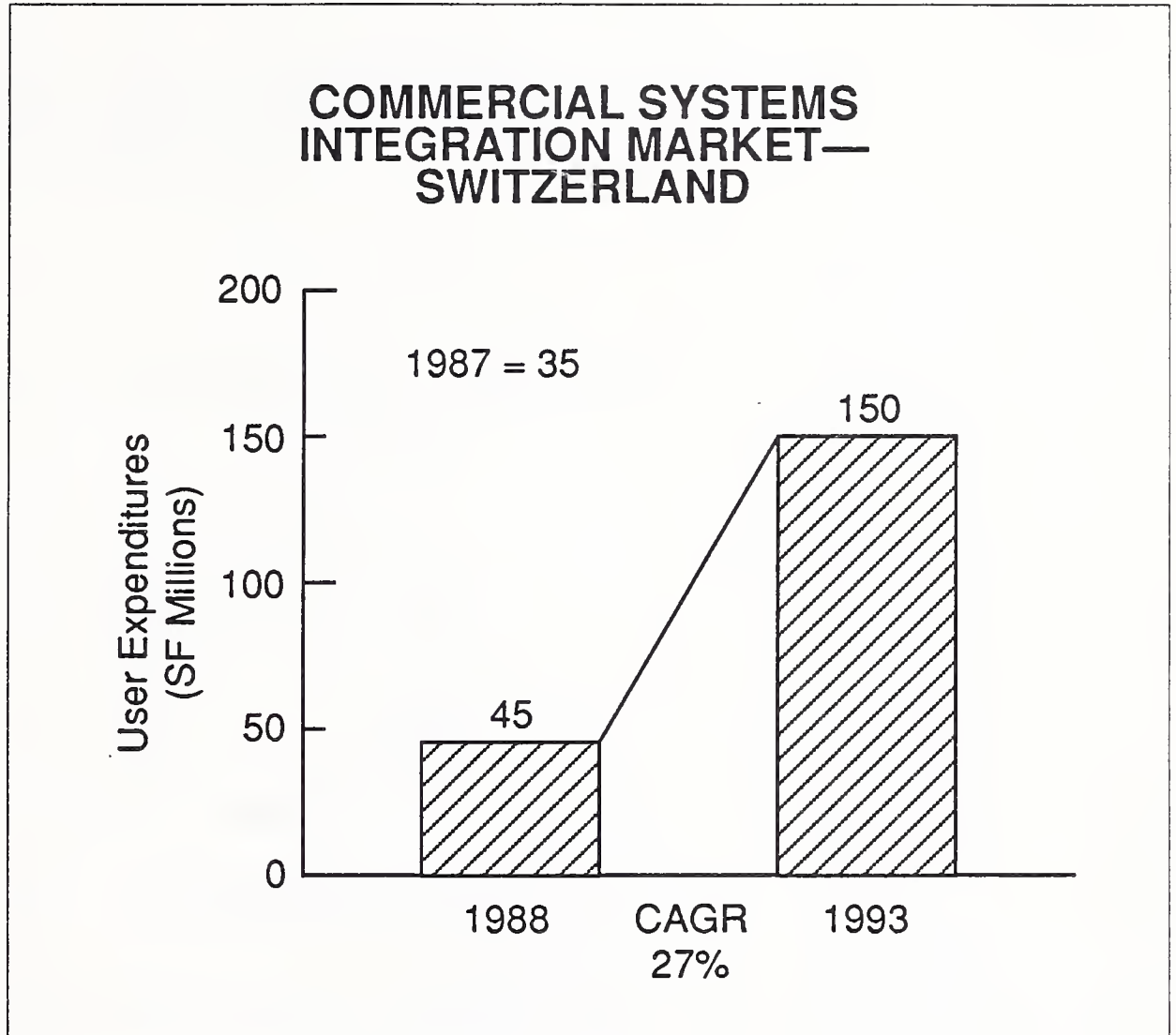


EXHIBIT V-31

**SECTOR ANALYSIS—COMMERCIAL
SYSTEMS INTEGRATION MARKET
SWITZERLAND**

Market Sector	1988 Market Size (SF Millions)
Manufacturing	10
Banking and Finance	15
Telecommunications	8
Utilities	2
Transportation	0
Local Government	7
Other	3
Total	45

EXHIBIT V-32

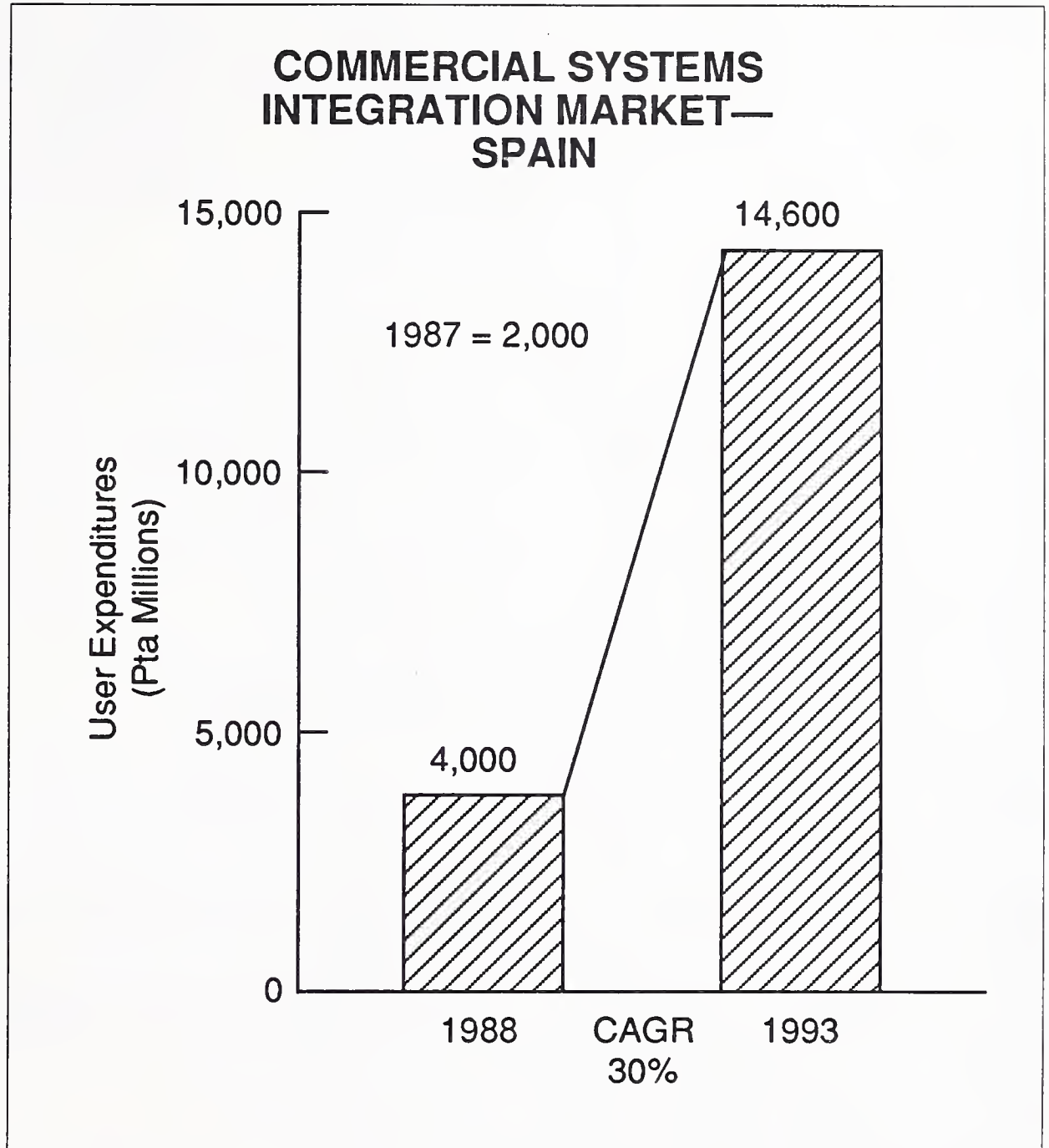


EXHIBIT V-33

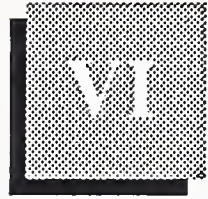
**SECTOR ANALYSIS—COMMERCIAL
SYSTEMS INTEGRATION MARKET
SPAIN**

Market Sector	1988 Market Size (Pta Millions)
Manufacturing	2,100
Banking and Finance	650
Telecommunications	380
Utilities	140
Transportation	-
Local Government	600
Other	130
Total	4,000



The Challenge of Commercial Systems Integration





The Challenge of Commercial Systems Integration

Through its entire history, the computer industry has witnessed rapid development of the fundamental hardware technology that supports it. It has been customary to view software development as an area that, relative to hardware, has lagged in terms of technology development. The so-called 'software crisis', the challenge of applying engineering disciplines to software production through the use of methodologies, CASE tools and related developments are topics discussed in the INPUT report, *Towards the Fifth Generation* (December 1988).

However since the development and implementation of a system implies the inseparability of hardware and software, the industry is facing not so much a software crisis as a systems crisis. The fundamental challenge is to be able to control the planning, design, development, implementation and maintenance of a complete system in a way that delivers a working result, meets the needs of the client and is produced within its planned time schedule. It is this challenge that is fundamentally addressed by systems integration services.

The following sections summarise this study's key conclusions and recommendations about the market opportunity and the challenge of profiting from it.

A**The Commercial
Systems Integration
Opportunity**

In order to assess the potential of the commercial systems integration opportunity it is helpful to classify projects according to the dominant aim of the project. INPUT considers there to be three main project types, each dominated by one of the following considerations:

- Technology
- Applications
- Data

1. Technology

The challenge to integrate computer and communications technologies has been the most potent market factor for the development of commercial systems integration contracting. The analysis of the commercial systems integration projects identified to date (discussed in Chapter IV, Section D) clearly indicated the pivotal role of data communications technology in the market as it currently exists. The integration of digital computer control into factories, warehouses and process plants has also been a significant source of business.

2. Applications

Although there is some evidence of contracts in this category—i.e. where the prime project objective is the development and implementation of a complete application system—to date these projects have tended to be embedded within the greater needs of the technology integration.

The principal reason behind this is, of course, the difficulty that many commercial users have in being able to adequately define their specific application needs. If these cannot be defined, it is impossible, or at least very difficult, to contract with a third party for its delivery. Clearly the definition of technology needs, such as development of a network design, have been much more easily defined in principle.

This area will therefore continue to present some important challenges to systems integrators as requests for proposals and system specifications will be frequently ill-defined or, in some extreme cases, non-existent. This will certainly have some strong risk implications for vendors. User specifications may be off-target for a number of reasons:

- Representatives from a number of functional areas in the client organization may be involved in specifying the project; each will have their own views of the system and each will be able to articulate those views only from their own level of technical and functional understanding.

- Further, each articulates those specifications based on some assumptions of what a contractor can and cannot do. With many different concepts of systems integration and limited experience with this approach existing in each organisation, specifications are likely to be clouded by what is thought will happen as opposed to what 'should' happen. The statement of specifications may be technical, functional, or some combination of both. In any case, these specifications may not match what the client 'really' wants.
- If the specifications are technical in nature this may be reflective of the developer's knowledge of technology rather than of the business requirements.
- Frequently missing from the specifications is a consideration of long-term requirements of the IS organisation. Unless future migration is taken into consideration at some level, it is possible that the developed system, while satisfactory to the client at the end of the project, quickly becomes obsolete as the IS environment changes.

A strategic decision that must be made by the bidder in any of these cases is to establish the congruence between what the client 'wants', 'needs', and is willing to pay for. To avoid the pitfalls of unclear user expectations, vendors may prefer to propose feasibility studies as a first step in a major project. This early participation in a consultancy role has the additional advantage of establishing a level of comfort between contractor and client that may pay off in managing the project and the client later.

At the very least, vendors should develop a detailed checklist of generic tasks associated with systems integration services. This checklist can be used in early conversations with the client to discuss both what the project entails and whether the integrator or the IS staff is to take responsibility for each individual task.

3. Data

The third category of potential projects is that comprised of those in which the key need is the management of data within a complex IS environment. In this category the key project factors are likely to be:

- A focus on the need for the provision of a wide-ranging and comprehensive data infrastructure

- The provision of a platform upon which the organisation's applications will be based

To date there is little evidence of projects of this type. In any event the specification of and need for this type of project must emerge from the information systems department, which is the group most resistant to the concept of systems integration services.

However INPUT believes that there exists a considerable opportunity in this area in the future. Most large organisations have developed their suites of applications in essentially a demand-driven environment which has led to incompatibility of equipment, systems, languages and data structures.

Demand for new applications continues, particularly for access to the data in an inter-related and coordinated fashion. Today much computer-held data is inaccessible to the executives who could most profit from that information. Information systems management will be made more and more aware of this problem and of the considerable level of their resources (variously estimated from 60% and above) that are being tied down in maintenance of these existing systems.

INPUT believes that these conditions will lead to 'data'-oriented systems integration projects aimed at modernising the existing workload. The transference of multiple discrete applications within coordinated database structures will represent some very large challenges. Information systems management, under pressure of staff shortages and lack of availability of key resources, will come to view the systems integration approach as an attractive option.

B

Bidding for Systems Integration Contracts

Vendors entering the commercial systems integration market must be conscious of two major considerations:

- The skill set needed
- The bidding costs

Vendors should not even attempt to bid for contracts unless they have prepared themselves adequately for the technical challenges involved. The most significant cause of project failure is lack of understanding of the technology or technologies involved. In any event a vendor's inability to adequately demonstrate its level of technical expertise would undoubtedly impact its chance of success in being awarded the contract.

Achieving a high success rate in bidding for systems integration contracts is a key commercial concern for contractors because of the bidding costs. Some vendors have mentioned hit rates as high as 80%, achieved through drastic pruning of potential contract situations through highly focussed internal reviews.

The investment required of vendors in developing a bid is substantial, perhaps involving 5-6% of the contract value. Significant amounts of time and money must be spent in understanding the functional requirements, technical specifications, time and financial constraints, business terms and conditions, other salient factors (internal politics, key decision makers, buyer perceptions), and the selection process and evaluation criteria to be used in that process.

Once these specifics are uncovered and understood, additional time and money must be expended on developing the bid. An assessment of in-house capabilities must be made vis-a-vis the requirements; 'What does the bidder bring to the project?' This suggests the need to develop an internal skills inventory that can be leveraged and used to determine what additional skills are needed. (This inventory has the additional benefit of providing the vendor with a sales tool that highlights his skills and a logistics tool for putting internal teams together.)

Some potential projects will be so technically advanced that they invite the question, 'Can it be done?' For these projects an investment in engineering a prototype may be required. If the prototyping requirement is expensive, the buyer may underwrite the cost. The bid itself requires an assessment of the feasibility of delivering the solution using specified criteria.

- Can the desired solution be delivered within the constraints imposed by the customer and the operational environment?
- What subcontractors will be required?
- How much new development is entailed?
- How much is unproven technology?
- What are the alternatives or contingencies: If the proposed solution does not work? If a subcontractor fails to deliver?
- What are the project risks? What do those risks mean in dollars? In damaged reputation?

- How are these risks offset by the potential rewards? Is the revenue worth the risk?
- What level and type of risks should be reflected in the type of contract proposed? That is, to what level of confidence can the risk be contained/managed? At what price?
- What formal risk management procedures will be implemented?

In addition to assessing the project risks, the potential bidder must also assess the competition and determine a probability of winning the award. There are several indicators about classes of possible competitors that the vendor may use as a starting point for the competitive assessment.

- No vendor has a 'franchise' in any industry and none is likely to attain one for competitive reasons. Computer manufacturers do seem to have a slight preferential edge, but this could change quickly as other classes of vendors secure major, notable project awards.
- Buyers tend to lean toward the vendor(s) that are most readily aligned with the major component of the project. For example, in a project that includes a significant expenditure for information systems hardware, the buyer may be inclined toward hardware manufacturers.
- A sound track record in systems integration is important to buyers, as it demonstrates project management skills in complex projects. Vendor financial stability may be important to the extent that some projects will require significant up-front investments.
- Marketing capabilities will be as important as technical skills, as buyers approach the solicitation of bids informally and assume a technically conservative posture in initial projects.

The significant investment for the bidder comes in competitive analysis. Far more than listing the strengths and weaknesses of the competition, this assessment requires the development of an "as if" bid. In this method the bidder's staff actually develops the bid that they think the competitor might submit. The bidder's actual bid must beat this bogus bid in the internal review before being submitted to the buyer. When the size of the award dictates, the internal effort applied to the development of competitive bids can result in a very strong and, hopefully, winning solution.

Beyond the technical content, the bid must also reflect a congruence between the buyer's perception of in-house strengths and weaknesses and the capabilities of the bidder. The bid should leave the buyer with the feeling that the bidder recognizes these capabilities and has plans for covering the weaknesses.

Individual client organizations differ with respect to these strengths and weaknesses but, in general, in-house information systems staff 'perceive' the following:

- The information systems staff understand the industry and the application.
- Information systems staff are technically knowledgeable, especially about hardware and DP techniques.
- Information systems staff are less knowledgeable about network architecture and network design.
- Information systems staff do not have the capabilities required to successfully integrate hardware, communications and software.
- Information systems staff do not have strong project management skills to apply to complex problems. These skills are most lacking in scheduling, developing detailed budgets and overall project management.
- Information systems staff are generally unable to deliver major development efforts on time and within budget.

The bid should also exclude those services that the vendor might like to provide but which have a low requirement—multi-vendor maintenance, maintenance of a network, and maintaining the total system are just three possible examples. The type of contract proposed by the bidder makes a strong statement of the bidder's concern about the risks involved and his confidence in managing and containing this risk.

- A fixed-price with performance guarantees and even strong penalty clauses tells the buyer of the bidder's confidence in successfully completing the project to the buyer's satisfaction.
- Fixed-price contracts with performance guarantees are currently much more acceptable to clients than other types of business terms, including fixed-price without those guarantees.

- The performance guarantee requirement is a risk trade-off from the client's perspective. With diminished control over the developing system, users seek maximum assurance through guarantees. In many situations this 'guarantee' becomes mandatory.
- Cost plus contracts, with their various add-on incentives and award fees, and time and material types of contracts connote varying degrees of lower confidence in dealing with the unknowns of the project. Time and material contracts are generally less acceptable to clients. Cost plus contracts by themselves are usually unacceptable.

Most proposals will contain a number of contract types, reflecting both this sense of confidence and the realities of the business conditions.

- Cost plus-type contracts are generally applicable to the product buy (hardware, communications devices, packages software) where the cost is known and the bidder is looking only for a reasonable payment for the effort required to make the arrangements.
- Where the amount of effort required to develop the software for the system is known, bidders generally propose fixed-price. If the unknowns are extensive, time and material bids seem more appropriate.
- Time and material bids are also frequently used in providing support. In this case, the time required is generally dependent on the client's needs and the materials are incidental.

C

Project Management and the User

Project management requirements have been emphasized. Skill in these associated tasks are critical to managing/containing risks, and vendors need to have a deep understanding of the theory and techniques and strong supportive tools.

Many analogies have been made between systems integration projects and large construction projects. INPUT believes that these parallels are not entirely valid, for whilst the application of standard project management techniques and experience may have some validity, the development and implementation of a computer system does not generally have the discrete nature implied in the construction of a bridge, building or major plant installation.

Computer-controlled systems are typically heterogeneous within the environment, which implies myriad small and adaptive changes as the

system develops. The project management role is thus heavily influenced by the need for frequent client liaison. The project manager must exercise considerable diplomacy as he or she attempts to reconcile the often conflicting demands of the original time and budget schedule against the user's (albeit only marginally) shifting requirements.

The user must be managed just as much as the project. Neither the user or the contractor wants to be second-guessed on decisions. The user must be kept informed of impending decisions and when decisions are made; the user must be informed of the decision and convinced that the decision was the alternative that best met the user's interests. User management also entails avoiding surprises. Both formal and informal status reports must be made to various levels of the client organization on a timely basis.

Vesting the optimum level of authority in the project manager is one aspect of project management frequently overlooked by vendors. Too often it seems that layers of company bureaucracy must be traversed for the simplest of solutions. In time-critical projects, such 'politics' impede the schedule and add unnecessary risks. The results of assigning responsibility to a single manager who can act quickly far outweigh the results of the project delays and cost overruns. It is thus that some vendors will place very senior executives in charge of major projects to ensure the correct influence of 'political' clout to achieve adequate resources for the project.

Vendors need to carefully consider their approach to selling and using project management techniques. Awareness of 'schools of thought' on general and even industry-specific project management techniques is growing, leading to philosophical conflicts with client organisations espousing particular methods. Most vendors will be flexible in adopting a client's preferred methodology when one exists.

D

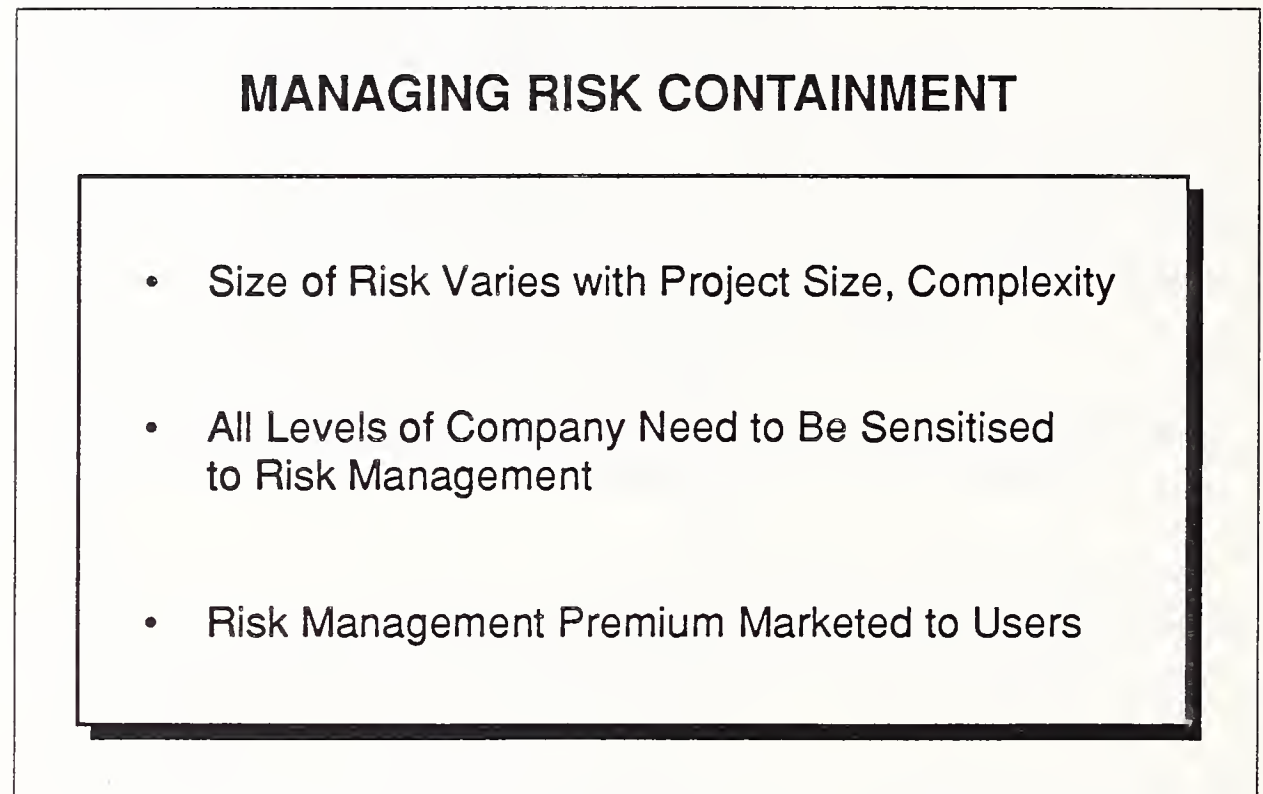
Risk Containment and Partnering

The considerable attractions of the commercial systems integration market should not obscure the very real risks that vendors face when transacting business in this market, namely the risks to the company's finances and reputation when systems integration projects fail. Commensurate with this risk is a premium that the vendor needs to apply to the overall project costs.

One of the reasons that users are amenable to the net additional expenditures of a systems integration approach is that the integrator assumes the

risks inherent in the development of such large, complex systems. These risks (see Exhibit VI-1) are formidable and wide-ranging and, at this early stage of development, their ultimate result is largely unknown.

EXHIBIT VI-1



Sources of risk include:

- Off-target or even unspecified systems requirements that vendors cannot pin down long enough to bid or changes that occur after the award
- Substantial bid development investment
- User and multi-contractor management project

Risk management is a company-wide activity and is ongoing. It is important to sensitise all levels of the company to the need for continuous monitoring of progress, costs and performance against specification rather than to limit this crucial aspect of operations to the project manager.

Just as important is the realization that risk management is not something that should be hidden away but can be capitalised on as a marketing tool in front of the prospect (for whom it is a serious concern).

Regardless of the reason(s) for failure and regardless of the source of the 'fault', it is the integrator who, having taken responsibility for the suc-

cess of the project in the first place, must bear the brunt of the repercussions. The financial value of the projects, the importance of these projects to the client organisations and the notoriety that such projects will receive make it unlikely that failure will be ignored, either by the shareholders or by the press.

To achieve the rewards of systems integration and to avoid the front page, not to speak of the courts, vendors must diligently assess, manage, and, as necessary contain the inherent risks. This is not a one-time activity, but rather it involves constant monitoring of the systems integration plan and its execution.

The assumption of risk that is necessary in commercial systems integration does not mean that the contractors must solely take all responsibility. It is possible that the risks, once assumed, can be shared with third-party providers. Subcontracts with these providers should be written in such a way that the provider guarantees on-time delivery at a specified price. Further, the contract should warrant the third-party's products/services and provide the integrator with remedies if these guarantees and warrants are violated.

Just as important as the legal relationship in these situations are the personal ones. If subcontractors are made to feel responsible for a part of the overall project, even if in a small way, they will be more inclined to extend the extra effort that will ensure success. In some instances the quality of the relationship is fostered by interest in long-term business alliances. When these seem out of the question, it seems best to appeal to the third-party's financial interest.

The important aspect for the integrator is the assurance that these parties will do their part to ensure the project's success. Legal remedies may help the integrator recover financially, but nothing will heal the integrator's damaged reputation from a project failure caused by a 'transparent' third party.

This 'control' must be tempered by an ability to manage under uncertainty. Project activity variances do occur. In fact, a critical aspect is the management of creativity that creates a project culture that fosters autonomy for creativity, but insists on accountability.

There are possibilities of tremendous legal and financial liability when things go wrong in a commercial systems integration project. Just as there is a question of the users' willingness to share the risks of complex

systems development, there is also the question of the course of action users may pursue if the developed system is unsuccessful.

It seems prudent for vendors to prepare for this eventuality by carefully assessing company liability insurance coverage. Does the existing coverage protect against the unique risks involved in a commercial systems integration project? Will the company be covered if the project is a failure? If a third party fails to deliver? If the client sues just because it is not satisfied with the delivered system?

E

Organising for the Opportunity

In the current developmental state of commercial systems integration in Western Europe it is clear that vendors can be broadly classified into two groups:

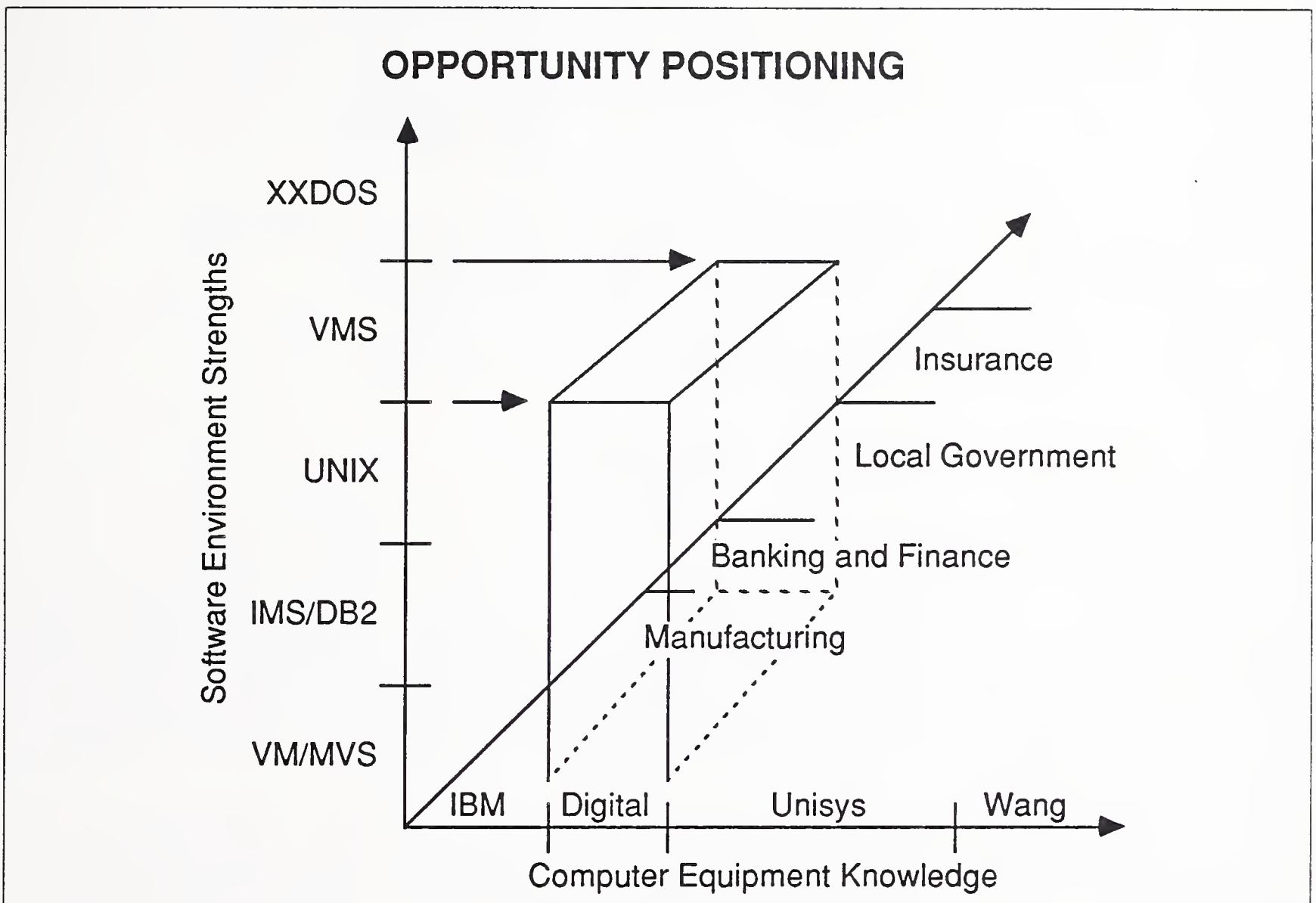
- A limited number of vendors like IBM, Unisys, SESA, Logica, EDS and Andersen Consulting that are organised to address the specific needs of the systems integration market.
- A much larger group of vendors that are de facto systems integrators as a result of client demand and the logical pursuance of their business interests.

INPUT believes that success in the commercial systems integration market will eventually reside with those organisations that are correctly organised to take advantage of the opportunity. This implies consideration of positioning from both marketing and technical standpoints.

Market positioning (or the ability to occupy a specific place and fulfill a specific role in the market) is not only dependent on the natural skill base that a vendor may have but also, at this stage of the market, on posturing (seizing the high ground in a given market area and holding it).

Technical positioning is a different matter altogether (see Exhibit VI-2). Here a vendor must analyse with respect to the target market(s) its abilities in terms of industry processes (e.g., shop floor operations in manufacturing) and typical hardware and systems software environments (e.g., DEC/VMS, IBM/VM/MVS), in addition to the application requirements of the users.

EXHIBIT VI-2



Clearly then, each commercial systems integration vendor must define its strategic goal in terms of its assets that will be leveraged (customer base, internal skills and strengths, and understanding of new approaches to specific industry processes) and the partners that it needs to complement these assets. In many cases, this will require a restructuring of the company's organisation.

Internally organising for the opportunity also implies the creation of the internal support infrastructure necessary to provide the comprehensive and in-depth support needed for systems integration contracting. Generally a matrix management approach is required to economically provide the necessary levels of support. Consequently legal, contractual and project management skill support areas need to be established, as well as country and vertical (or specialised business) support groups. Generally it is economical to establish the former centrally, whilst the other groups may need to be distributed geographically.

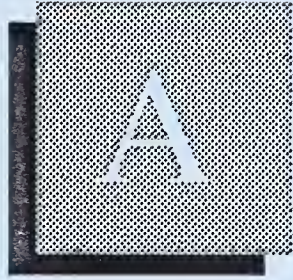
The critical success factors for vendors operating in the commercial systems integration market can be summarised as:

- Publicly acknowledged expertise in an industry and application area
- Demonstrated experience with a variety of technologies
- Quality third-party relationships and marketing strength
- Ability to assess, contain and manage risk
- Willingness to accept risk
- Disciplined bid preparation
- Complex project management and risk management skills

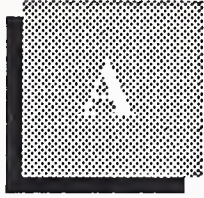
The realistic potential for each vendor must be sized and weighed against the entry requirements and costs involved. Caution also dictates that the vendor consider possible modes of participation. It may be preferable for the vendor to participate in systems integration as a prime or subcontractor rather than as the integrator.

Careful selection of the industries to enter will be very important. Commercial systems integration will be a dynamic, ever-changing market over the next few years. User perceptions will change, vendor positions will not be static and requirements will change.

Obviously, commercial systems integration will be only a part of the overall corporate strategy of any given vendor, and in some cases its goals may conflict with more important long-term aspirations. Like most markets, vendors that will be a success in this market will be those that are able to continuously focus their energies, products and services on areas that have direct relevance to their corporate goals, thereby maximizing the efficiency of their marketing, sales and technical skills and investments.



Appendix: Analysis of the Research Sample



Analysis of the Research Sample

EXHIBIT A-1

VENDOR INTERVIEW PROGRAMME— RESPONDENT ANALYSIS

Country	Number of Respondents		
	Hardware Manufacturers	Professional Services Companies	Total
West Germany	3	5	8
France	3	6	9
United Kingdom	1	7	8
Italy	1	1	2
Belgium	-	2	2
Sweden	1	1	2
Total	9	22	31

EXHIBIT A-2

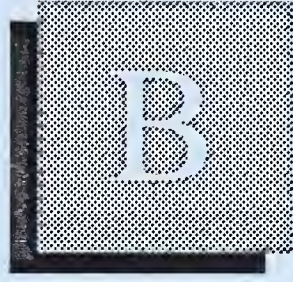
**USER INTERVIEW SAMPLE—
INFORMATION SYSTEMS MANAGEMENT**

Number of Interviews	Industry Sector	Number of Interviews	Country Market
10	Discrete Manufacturing	20	France
20	Process Manufacturing	20	West Germany
10	Retail Distribution	20	United Kingdom
10	Wholesale Distribution	10	Italy
1	Transportation	10	Scandinavia
11	Utilities	10	Benelux
26	Banking and Finance	10	Spain
3	Insurance		
-	National Government		
-	Local Government		
9	Other		
100	Total	100	Total

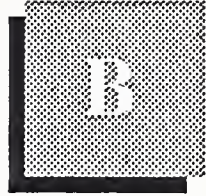
EXHIBIT A-3

USER INTERVIEW SAMPLE— GENERAL MANAGEMENT

Number of Interviews	Industry Sector	Number of Interviews	Country Market
11	Discrete Manufacturing	20	France
20	Process Manufacturing	20	West Germany
		20	United Kingdom
10	Retail Distribution	10	Italy
7	Wholesale Distribution	10	Scandinavia
4	Transportation	10	Benelux
9	Utilities	10	Spain
28	Banking and Finance		
2	Insurance		
-	National Government		
-	Local Government		
9	Other		
100	Total	100	Total



Appendix:
User Questionnaire—
Systems Integration



Appendix: User Questionnaire— Systems Integration

QU: 1 In which areas has recently/is/will your organisation be making significant investments in system development?

Business Area/ Application	Have Recently Developed	Currently Developing	Planning to Develop
i. _____	_____	_____	_____
ii. _____	_____	_____	_____
iii. _____	_____	_____	_____

QU: 2 In general terms, would you please briefly describe the principal challenges that your organisation has encountered (if applicable) when implementing information systems?

e.g., training, cost control, security risks, incompatibility with existing systems, etc., operating in an unfamiliar applications environment (e.g. with specialised equipment)

QU: 3 Are there any major systems that you would like to develop but cannot because of resource, technical or other constraints?

___ Yes ___ No

If Yes:

a. What are these?

b. What are the primary constraints?

___ Financial

___ Technical

___ Personnel Limitations

___ Other (specify) _____

QU: 4 At the beginning of our discussion you mentioned _____ major projects (see Q1). Could you please give me some outline details about them?

Business Area/ Application	i.	ii.	iii.
a. Elapsed Timescale for the Project	_____	_____	_____
b. Total Cost of the Project (approx.) in Local Currency	_____	_____	_____
c. An Approximate Percent Split of Expenditure across:			
Computer Hardware	_____	_____	_____
Communications Hardware	_____	_____	_____
Packaged Software Products	_____	_____	_____
Custom Software Development	_____	_____	_____
IS Consultancy	_____	_____	_____
Overall Project Management	_____	_____	_____
Training/Documentation	_____	_____	_____
Operation/Maintenance	_____	_____	_____
	100%	100%	100%

QU: 5 Have any of these major system developments (or some part of them) been subcontracted to third-party organisations, e.g., independent computer service firms, computer or communications equipment manufacturers? (Circle)

Business Area/Application	i.	ii.	iii.
Completely In-House	1	2	3
System Development Subcontracted	1	2	3

Project Management Subcontracted 1 2 3

Contractor Took Total Responsibility 1 2 3

Comments: (i.e. which vendors)

If subcontractors never used GO TO QUESTION 6.

Otherwise GO TO QUESTION 7.

QU: 6

Are there any particular reasons why your organisation has not used outside suppliers for developing or helping to develop major projects? (Please check)

For example:

___ Too Costly

___ Loss of Control

___ Security

___ Have the In-house Expertise

___ Difficult to Select or Evaluate Suitable Vendors

___ Others (please state)

QU: 7 When contracting/planning to contract with an external supplier for a significant systems development project, could you please rate on a scale of 0 to 10 (with 0 being totally irrelevant and 10 being critical) the importance of the following potential supplier selection criteria?

(For respondents who claim never to use subcontractors—please attempt to obtain an answer in respect of their possible future use.)

Selection Criteria (ROTATE)	Rating
Ability to Assume Total Project Responsibility	_____
Ability to Offer Substantial Amount of Support (Hardware and Software)	_____
Specialist Knowledge of Your Industry/Business	_____
Proven Reliability for Delivery of a Complete Project On Time and Within Budget	_____
High-Quality Technical Staff	_____
Price	_____
Legally Binding Performance Guarantee	_____
Other (Please state.)	
_____	_____
_____	_____
_____	_____

QU: 8 What do you think the main benefits would be to your organisation from utilising outside contractors for major system development?

Note: Could be:

- Meet Total Requirements from One Contract
- Integrate Disparate Information Systems
- Cover In-house Lack of Expertise
- Achieve a Well-planned, Managed, Executed Project
- Minimise the Project Risk
- Establish Corporate Connectivity
- Meet Changing Regulatory Requirements
- Enhance Competitive Position in Market
- Improve Efficiency of Management Information Systems

