NETWORK MANAGEMENT AS A SYSTEMS OPERATIONS OUTSOURCING OPPORTUNITY 1991 - 1996

INPUT

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Abstract

This report examines the market for network operations management. For the purpose of the report, network operations management, network outsourcing, network FM and managed network services are considered to be the same.

The importance of network management to the success of an organization and the difficulties that many organizations have with existing network management products and services are examined. The report addresses outsourcing as an alternative to the current process of managing networks in-house.

The report also examines the interest of users in outsourcing the management of their networks, and the factors that will cause users to consider outsourcing. It discusses which types of users are most likely to consider outsourcing, and why some users may not consider relinquishing control of their networks to a third party.

The report contains market sizes and forecasts for the network management market in Europe, analysed by country. The likely evolution of the market over the next five years is also discussed.

This report has 112 pages and 61 exhibits.

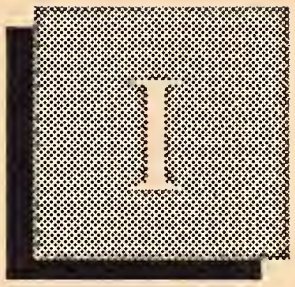
Table of Contents

Table of Contents (Continued)

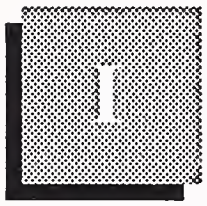
Table of Contents (Continued)

Exhibits

Exhibits (Continued)



Introduction



Introduction

A Purpose and Scope

Managing corporate networks has always been complex. With the increasing demand for network integration, this complexity is not expected to decline. Networks are increasingly critical to business operations and are continually impacted by changes in requirements and technology.

Although previous research indicated that there was limited opportunity for vendors to manage an organisation's network, the situation appears to be changing.

The changes are due to many factors. Integrated applications systems require increasingly integrated networks. The number of LANs is outstripping the ability of many telecommunications managers to manage them, let alone develop integration strategies.

With the changes taking place and an apparent greater willingness to contract for network management services, vendors have an interest in finding out whether network operations management is a growing market or a market limited to a few organisations that have unique sets of requirements.

A key objective of the report is to examine the market for network operations management, also referred to as network FM. The report examines issues and trends driving and hindering growth of this market.

The report addresses a number of specific questions, including:

- What are the trends and issues in network management and network operations? How will they influence the growth potential of this market?

- Is network management moving towards outsourcing?

- What capabilities should users look for in selecting a network management vendor?

The geographic scope of this report covers the following countries and groups of countries:

- France.
- Germany.
- UK.
- Italy.
- Benelux.
- Scandinavia.
- Spain.
- Rest of Europe.

Key objectives of the research are to identify the current size of the markets for network management services and to project the market sizes for the next five years.

B

Methodology

Research for this report included a review of published data to identify activities and trends that have been noted, and primary research with users and vendors. Key elements of the research included the following:

- A review of background data about trends and directions in the management of network services.

- A review of background data about key issues affecting the successful management of networks.

- INPUT's ongoing interview programmes with large, medium, and small network users.

- INPUT's ongoing interview programmes with vendors with different backgrounds in order to assess the reasons that drive organisations to offer network management and discover what services are typically included in a contract.

To develop an understanding of differences that might exist between users and vendors of network management products and services, INPUT's research includes both quantitative (factual) and qualitative (attitudinal) questions.

The factual questions were orientated towards developing an understanding of whether contracted services have been or will be considered and accepted.

The attitudinal questions were orientated to developing an understanding of the reasons that users adduce for or against contracting for network management services.

To develop a market forecast for network operations management services, INPUT took several factors into account.

- Companies that represent the greatest opportunities are believed to be those that have a diversity of network needs and lack the skills to effectively manage a broad technological base.
- From user responses, there appears to be little immediate enthusiasm for turning over management of an organisation's network to an outside contractor.
- Consideration was also given to how changes in other areas, such as IS systems operations (facilities management or FM), could affect the development of the market for network management services.

C

Report Organisation

Following the Introduction, the report is organised as follows:

- Chapter II is an Executive Overview of the report.
- Chapter III defines and sizes the network management market and gives its current status in Western Europe.
- Chapter IV provides a forecast for the market for network management services.
- Chapter V discusses the nature of outsourcing, the reasons that users choose to outsource, or not to, and factors that will cause the market to grow. It also assesses the alignment of vendor thinking with user requirements.
- Chapter VI discusses many of the network management issues that face large organisations today.
- Chapter VII provides a number of conclusions and recommendations to both users and vendors of network management products and services.

D

Definitions

The following definitions apply to the management of networks:

- Networks are electronic connections between sites or locations that may incorporate links between central computer sites, remote locations, switching nodes and/or regional data processing nodes. Network services typically move any mixture of data, voice, graphics, video, and/or textual information between locations.

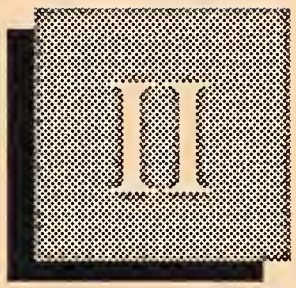
- Network management is the process of managing these networks at a number of levels. Network management typically includes functions such as network design, configuration management, problem management, capacity/traffic management, network administration and automated network control.

E

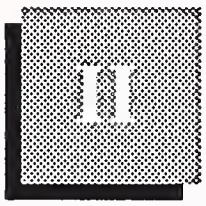
Related Reports

Other INPUT reports related to network integration include the following:

- *Network Integration: 1990-1995*—An analysis of the market for network integration services and the relationship of network integration to systems integration.
- *Network Management: User Needs and Requirements*—A comprehensive assessment of user needs to manage complex corporate networks.
- *Integrated Services Digital Networks (ISDN)*—An analysis of the state of development of ISDN, with an assessment of the impact on information services.
- *Systems Operations Forecast and Trends: 1990-1995*
- *Network Operations Management: 1990-1995*—An assessment of the markets for network FM in the U.S.A.
- *The Challenge of Network Service in Customer Services*—An assessment of the opportunity for customer services in servicing users of local-area networks (LANs).



Executive Overview



Executive Overview

A Network Management—The Hidden Sector

Network management is becoming an increasingly important and growing market in Western Europe. It will reach $0.6 billion in 1991 and is growing at over 27% per annum. It is, however, still a largely misunderstood sector and therefore suffers from lack of visibility.

INPUT considers Network Management to be a major outsourcing opportunity along with Systems Integration and IS Systems Operations. In order to take advantage of the opportunities which will arise, vendors need to be clear of the scope and definition of Network Management—the things it is and the things it is not.

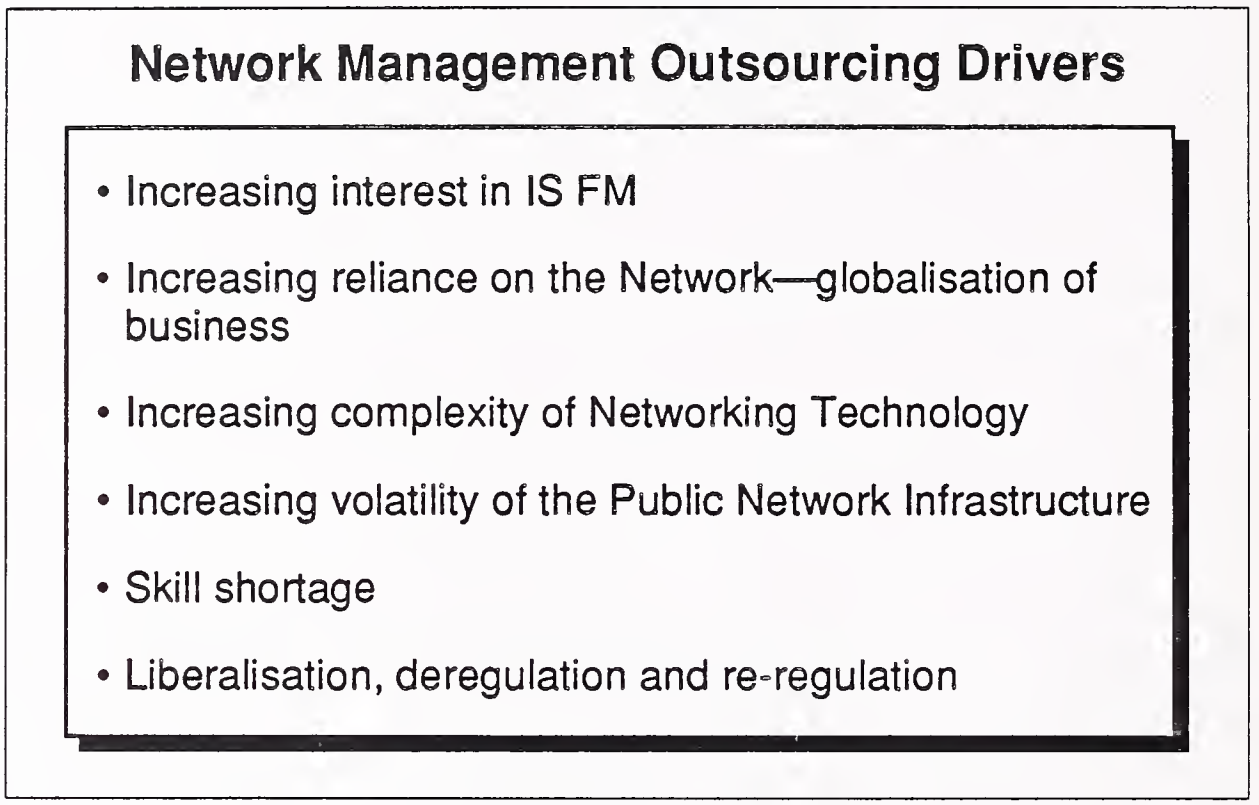
Network Management is not just the products (hardware or software based) that allow a network to be controlled on a day-to-day basis, although that is an important part of it. Nor is it just the day-to-day administration of the network with all that entails in terms of:

- Network Configuration.
- User Support.
- Logistics.
- Trouble-shooting.

INPUT is considering Network Management as the overall outsourced facility of the network infrastructure of an organisation, viewed as a sufficiently sizeable chunk of work to be worth contracting for with an external contractor. IS Facilities Management (FM) has led the way in popularising outsourcing in the industry. Networks of all types are now being seen by users as sufficiently large and important enough to be able to require similar treatment. In fact this is already happening and in some cases of IS outsourcing a second part or component of the contract covers the network or networks being supported as part of the infrastructure platform.

Network Management is being fuelled as part of the overall market for Network Services in ways which are listed in Exhibit II-1.

EXHIBIT II-1



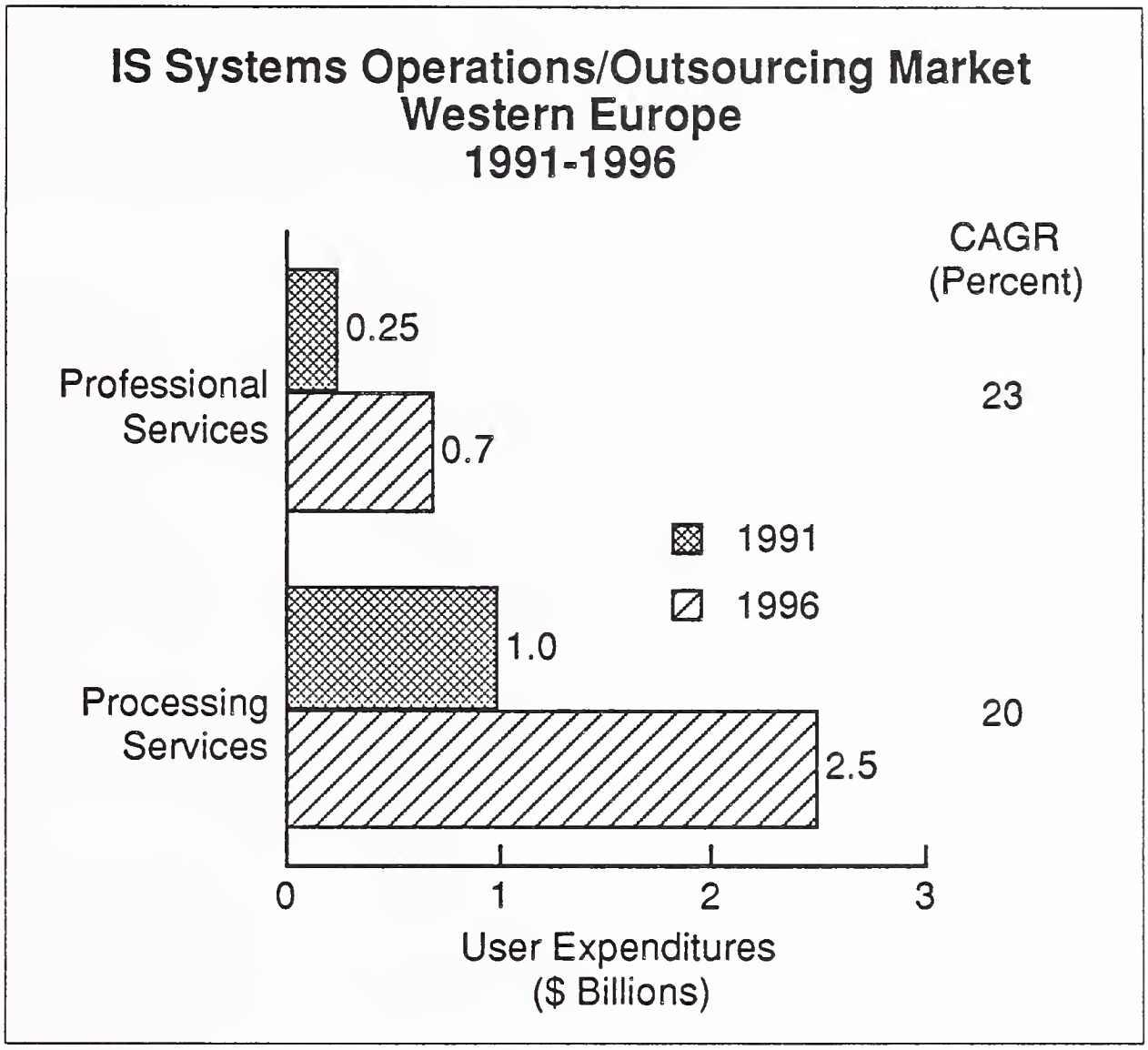
B

Outsourcing Markets in Western Europe

Network Management as defined for the purpose of this report overlaps with the IS System Operations market, whose size and growth is illustrated in Exhibit II-2. The two markets overlap because some users put out to tender for contracts covering the management of their IS centres and their networks.

The IS Systems Operations market in Western Europe is expected to grow by over 20% from its value of $1.06 billion reported in INPUT's 1990 report to reach $1.25 billion in 1991, split as shown in Exhibit II-2 between Professional Services and Processing Services in a 20% : 80% ratio.

EXHIBIT II-2



C

Network Management Markets

The overlap between the Network Management market sector and the IS Systems Operations market is shown in Exhibit II-3. The overlap is measured in 1991 terms as an anticipated $0.25 billion, whereas the market segment concerned with Networks-Only contracts will be $0.31 billion. This second segment is expected to be the fastest growing of the two since it includes voice, image and data networks, and can support vendors from more than one type of background.

EXHIBIT II-3

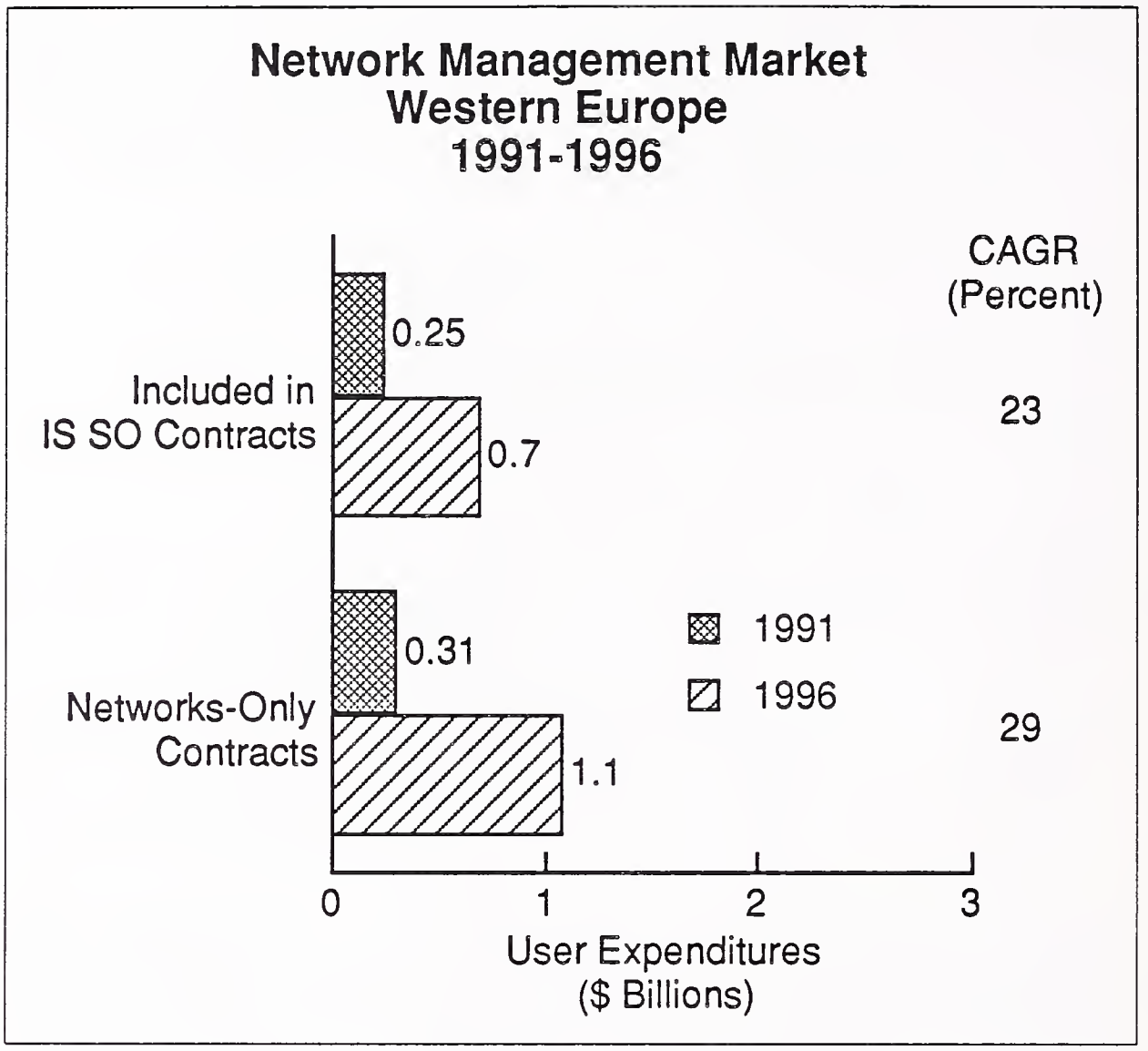
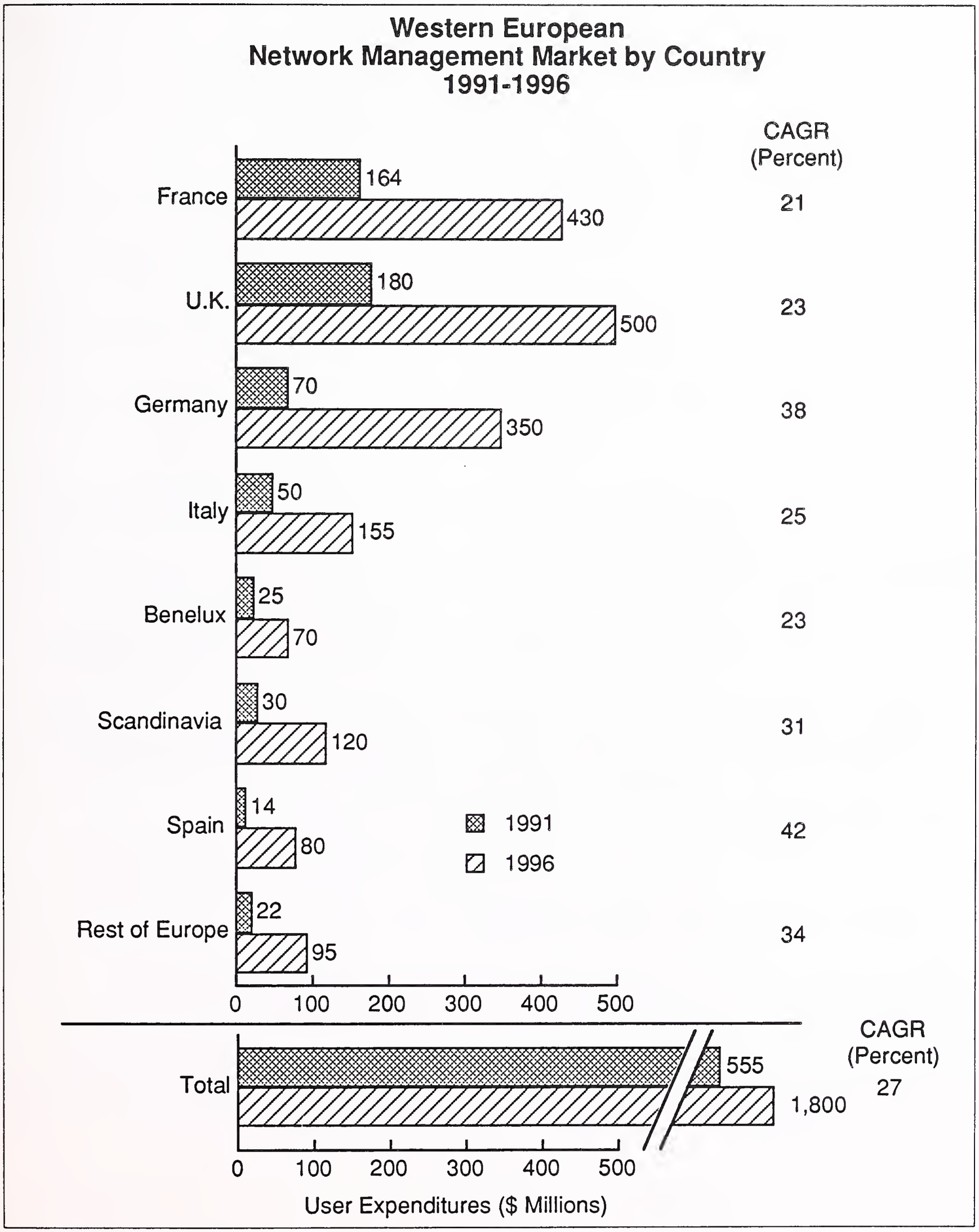


Exhibit II-4 shows the country market breakdown across the five major country markets and the three country groups—Benelux, Scandinavia and the Rest of Europe. Spain and Germany are forecast to have the fastest growth rates.

The total size of the network management outsourcing opportunity is expected to grow from just over $0.5 billion to $1.8 billion during the five year period.

EXHIBIT II-4



D

User Perspectives

The major reasons which users give for requiring network management from an external contractor are:

- Cost savings.
- Non-availability of networking expertise.
- Increasing complexity of the network supporting their business aspirations.
- Individual project time-scales.

Network Management outsourcing is most likely to be possible when at least two of these factors impinge heavily on a user's decision making. On the whole users expressed a preference for retaining management control of their networks in-house, although many expressed a potential future interest in the possibility of outsourcing:

- "When the next generation of network is available."

- "When we need to increase our network management sophistication by a significant step."

Users perceive the network management functions as having a three-stage life-cycle, illustrated in Exhibit II-5. This life-cycle determines the segmentation of the network management opportunities:

- Strategic feasibility studies relating network support to the overall business direction are needed every three to five years. External consultancy is often engaged as part of this exercise and user satisfaction ratings for this type of service have been reported as reasonably high.

- The second stage is network implementation. This results from any decision made to upgrade, to replace or to install from scratch. Network implementation exists at two levels.

  - At the strategic level, decisions concerning the installation of new networks or the integration of one or more networks into a newer generation of network will require comprehensive design, commission and test programmes.

  - At the tactical level, most networks undergo a continual process of upgrade, extension and reconfiguration during their lifetimes.

INPUT regards the strategic level implementation projects as candidates for outsourcing contracts and these are normally evaluated as part of the Systems Integration market. As such they are not measured as part of the Network Management market included in this report.

- The third stage of Network Operations Management starts when a newly commissioned network has been handed over for operational use in a sufficiently tested state to be capable of sustaining the traffic envisaged (at least in its first phase). This stage in the life-cycle is the part which is the prime candidate for being put out to tender for an outsourcing contract. These contracts can be applicable to voice, data or integrated voice/data networks. They can have a variable geographic scope, i.e., can be to cover local-area networks (LANs), metropolitan-area networks (MANs) or wide-area networks (WANs). In the case of local-area networking, INPUT would expect an outsourcing contract to cover more than one network. For example, it could cover all LANs in a certain country or in a certain subsidiary or division of a larger group. At the individual LAN level it would likely be uneconomic to go for the outsourcing option.

EXHIBIT II-5

Segmentation by Function

- Strategy studies
- Network implementation
- Network operations management

The very largest outsourcing contracts for network management could cover the last two of the above stages or all three. In other words:

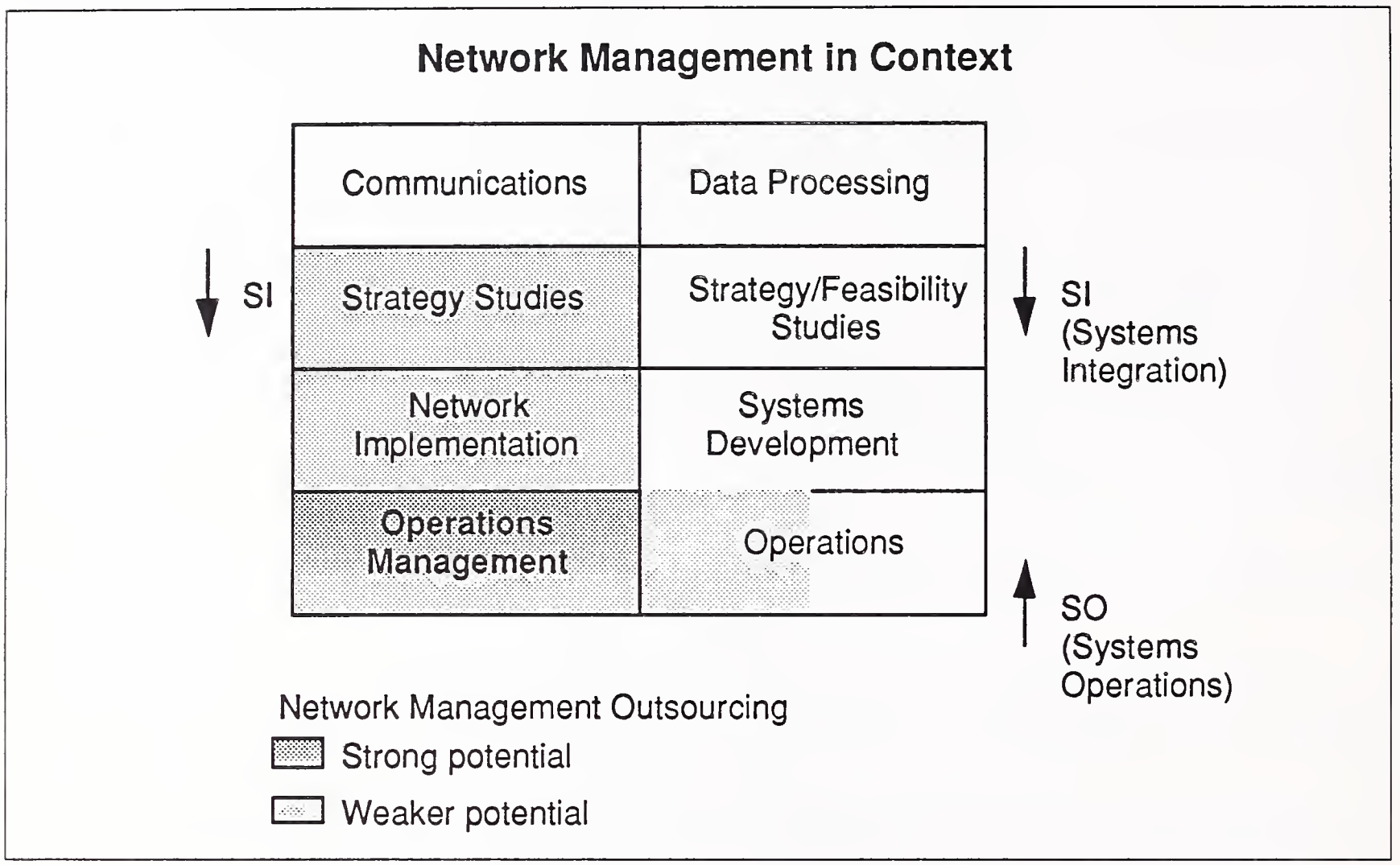
- A contractor could be brought in to pick up at the end of a strategic feasibility study and to implement and run a network (or integrated set of networks) in accordance with the specification or operational requirement resulting from such a study. An example of this can be obtained by looking at the case of the GDN (Government Data Network) contract which was awarded in the U.K. to the Racal-led consortium.

- More unusually, the complete project—from strategic conception through to daily operation—could be put out to the external contractor.

As outlined earlier, part of the network management market is created as a result of specifications which include data centre systems operations as well as the network.

Exhibit II-6 summarises the relationships between Network Management and its adjacent markets in Systems Operations and Systems Integration.

EXHIBIT II-6



E

Aligning Vendor Perspectives

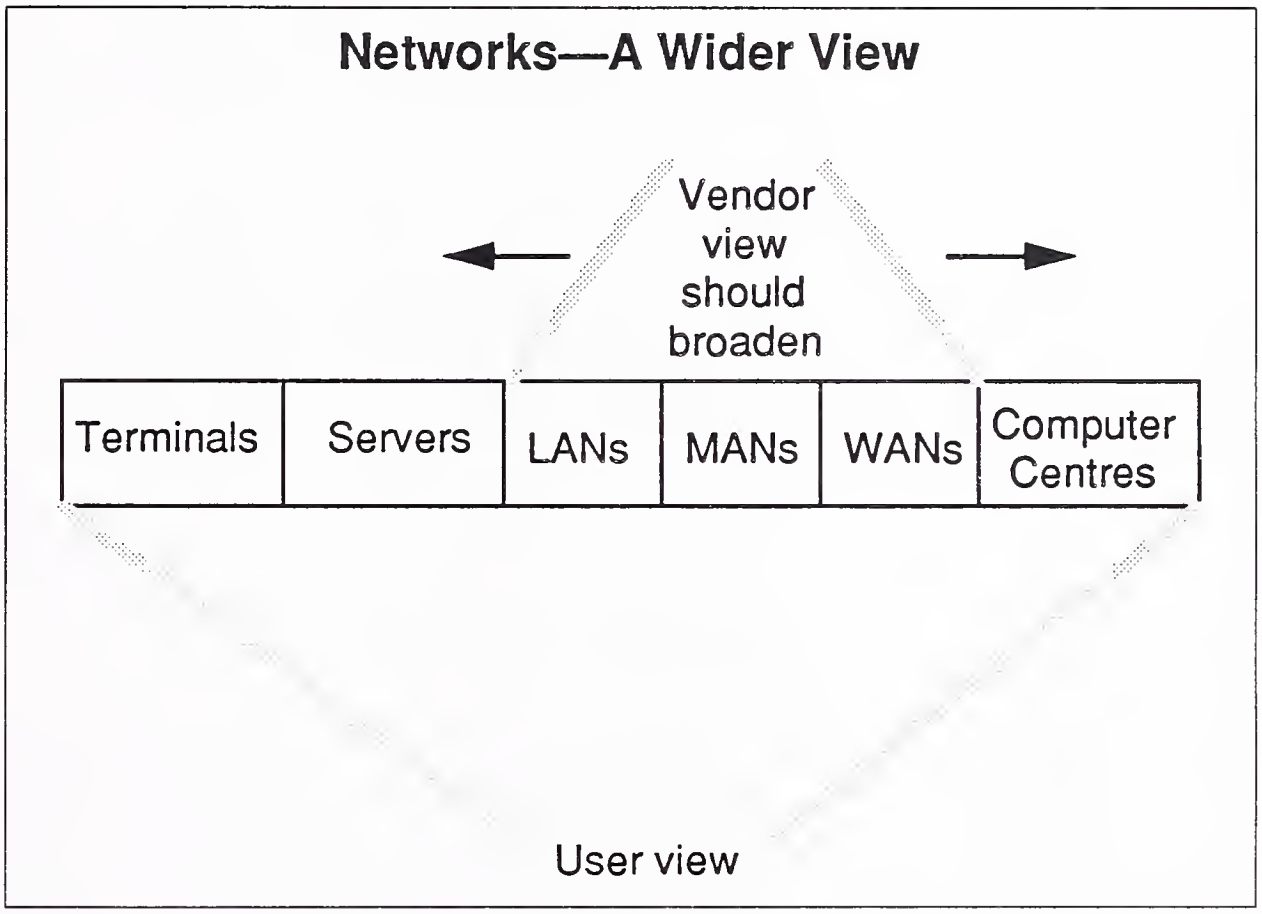
INPUT has detected a considerable gap in the views of users and vendors as to what constitutes a network. This difference of perspective has implications for the marketing of network management both as sizeable outsourced projects and as smaller amounts of discrete service—maintenance, consultancy or operational assistance.

Exhibit II-7 illustrates this divergence of views. Whereas the user from a viewpoint within his organisation equates his network with any part or component of it, the vendor tends to have a more restricted, narrower view determined more strictly along technological lines. This more limited vision is particularly inhibiting when it comes to the consideration of outsourcing possibilities.

The end-user necessarily interfaces to the system through the "viewpoint" afforded by the terminal, PC or workstation. The servers, computer centres and communications systems are the concern of the MIS function. At both levels the trend is for the information systems and the networks which support them to be thought of as synonymous. The emergence of client/server systems and X-Windows-based graphical interfaces will accelerate this trend to a blurring of systems and networks into one.

The view taken by the vendor has this tendency to be too narrow. This may be because it is an external view or it may be an unhappy historical accident due to the two distinct disciplines of networking and computing. Vendors are encouraged to widen their perspectives in order to become more aware of all facets of the network management market and especially to be able to take advantage of the different routes from which it can be approached.

EXHIBIT II-7



F

Practical Network Management

From the user's viewpoint, network management encompasses a vast range of individual tasks requiring a considerable range of specialist skills. Networking skills are among the most scarce of all IS specialist skills. Exhibit II-8 lists the major task areas for which a network manager may be responsible. It is not possible in this section to do more than summarise them. Later sections of this report will fill in the appropriate detail, both technological and commercial, and provide some insights gained from INPUT's recent research.

Some of the more interesting aspects of the key network management functions are:

- Outsourcing contract possibilities may surface at the time of a strategy study. Skills required at this stage include knowledge of the latest business strategy techniques, particularly their implications for top-down systems development methodologies, and network modelling as part of business modelling.

- Detailed implementation and test of a network is distinguished from network commissioning in that it involves testing the network with whatever network management tools are to be used. This form of testing involves different traffic volumes as well as proving the use of the chosen computer-assisted procedures.

- Operational management throws up possibilities for part of a network to have its management outsourced or for a major function within the overall management to be outsourced while at the same time retaining the overall network administration in-house:

  - Remote NMC is the case when a user's network is connected to a vendor's network for purposes of day-to-day management control. It is particularly useful as a temporary measure when migrating to a new network or when the user wishes to take advantage of new management tools but does not wish to employ the high calibre of staff needed to operate with them.

  - Customer helpdesk applications are a discrete area of network management which can be outsourced to a specialist contractor with expertise in customer service management systems or in staff resourcing of this type of application.

- Networks are usually viewed as inherently more robust and resilient than individual data centres. Many users do not see any need for the type of disaster recovery arrangements which they would need to make in the case of their major processing centres. They would often assume that rerouting, configuration, back-up units and good administration will be sufficient to cover the risks involved. Nevertheless as organisations grow more dependent on their networked systems, disaster recovery systems (DRS) services will extend as much to networks as to IS centres. Vendors with outsourcing market ambitions in network management must be conversant with managing the sets of skills and resources required in this area.

EXHIBIT II-8

Tasks to Be Achieved

- Strategy studies
- Specification and design
- Equipment selection and procurement
- Installation and commissioning
- Detailed implementation and test
- Training and education
- Operational management
  - Remote NMC
  - On site
  - User/customer helpdesk
- Other links
- Consultancy
  - Ongoing
  - On tools
- DRS—acknowledged gap
- Documentation—a chronic weakness

G

Conclusions for the Opportunities in Outsourcing Network Management

Network management is a complex and growing market area. As an increasingly mission-critical piece of the corporate infrastructure, the network is being viewed by senior management as a real possibility for an outsourcing or FM (facilities management) contract. The situation, however, will vary greatly from user to user depending upon:

- The state of development of IS within the particular organisation in question. Important factors here are the degree of sophistication which has been brought to the IS function and the lead-time before the next major upgrade to network, hardware infrastructure or application systems.

- The degree to which the organisation has to rely on the network to support its activities and the degree to which these activities are permeated by IT application support. Key factors here are the mix of activities within a large or conglomerate group, and the amount of telecommunications traffic, internal and external, that the organisation generates.

As always in the fields of communications and IS, there are a range of solutions competing for the user's budget. Matching solutions to problems at the detailed level is always necessary. Outsourcing, however, presupposes vendor strength and flexibility. Vendors must not only be able to know the range of solutions being sold in the marketplace but must also be prepared to offer a comprehensive and tailorable set to match the spectrum of opportunities that are available in this area from a range of vendors of different backgrounds:

- PTTs, common carriers and telecommunications authorities have experience in running some of the world's largest networks for themselves and for the customers of their public service networks—whether PSTN, PDN, international service or other specialists.

- Other specialist carriers, such as mobile radio, radio paging or satellite broadcasting operations, have also had to master a range of network management skills.

- The independent network service providers understand applications and the running of text, data and even mixed networks.

- IS equipment and telecommunications equipment vendors, if they are large will also have acquired considerable expertise in designing, installing and managing data and voice network systems.

- The major professional service companies have experience of implementing some of the largest IS systems contracts. Many of these involve systems integration contracts in which rationalisation, design, integration and even operation of networks are essential elements.

There is an equally varied set of outsourcing options for the user who might traditionally have only thought of managing the networks in-house through a Communications Manager and his team:

- Professional Services Systems Operations contracts cover the use of operational or systems staff provided by the outsourcing contractor to provide, for example, end-user help-desk facilities or a customer service management system.

- Processing Services Systems Operations contracts cover the situations where the user has access to dedicated equipment (which is vendor-owned) in order to implement his networking facilities. This equipment could be used to support a large portion (e.g., a private voice network) or the whole of the user's networking requirement.

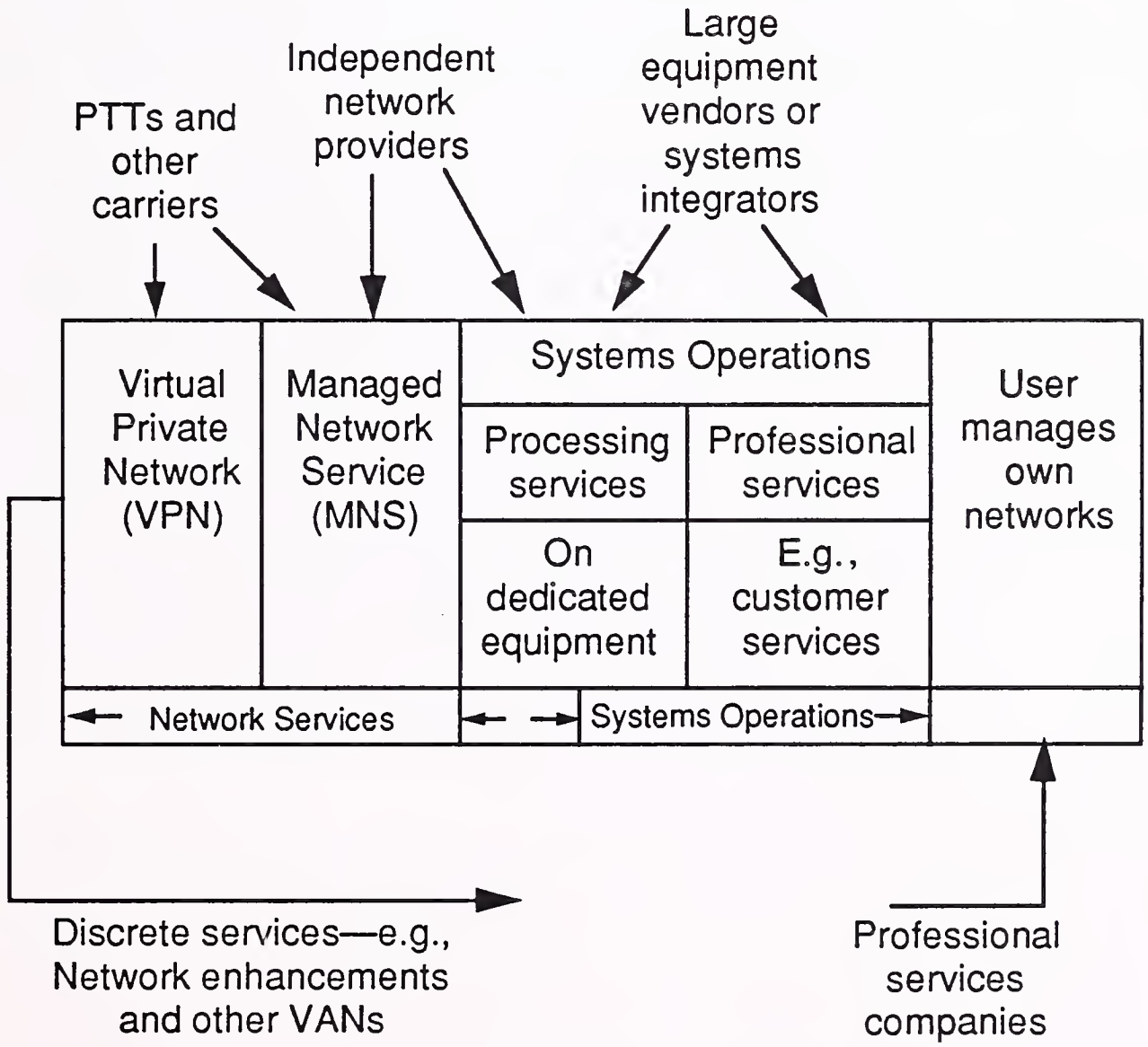
- A Managed Network Service (MNS) implements the same set of facilities as the last named option in a manner which is transparent to the user but usually requires use of a shared data or voice/data network.

- The Virtual Private Network (VPN) option is similar to the previous option (MNS) but implies that network management on a day-to-day basis has reverted to the user or that a degree of flexibility is inherent in the offering such that joint vendor-user management of the facility is feasible. VPNs require considerable capacity in the supporting vendor's network and are therefore still a rarity.

These major options are illustrated diagrammatically in Exhibit II-9.

EXHIBIT II-9

The Spectrum of Opportunities



H

Recommendations for Vendors

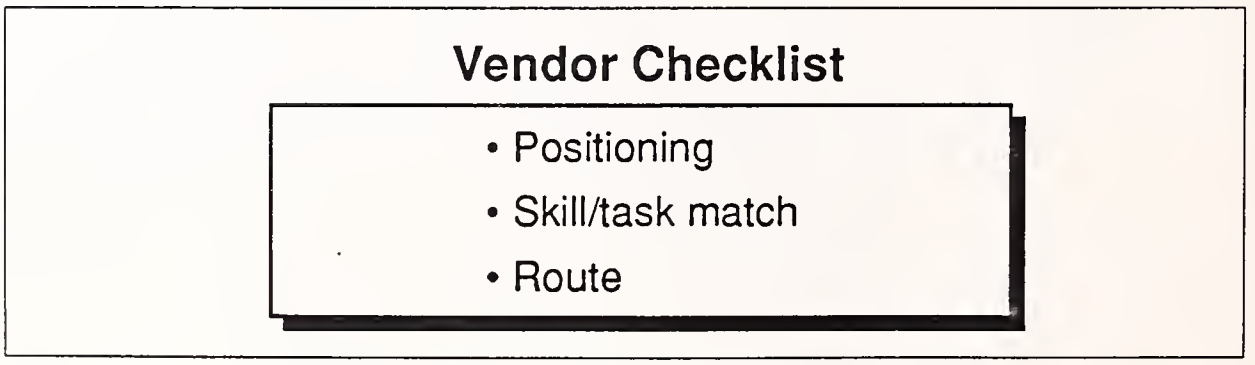
The Network Management Outsourcing market is still relatively young and non-homogeneous. We referred at the start of this chapter to its lack of visibility, caused among other things by its meaning different things to different people:

- Network administration.
- Software solutions to network control problems.
- Hardware boxes with varying amounts of embedded or programmable intelligence to control parts of a network, e.g., for modem management.

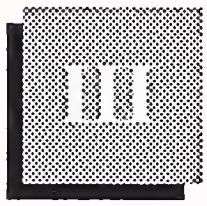
Each of these meanings has its own local validity, but in this report INPUT is directing its focus onto the outsourcing market for complete network management contracts. Vendors are recommended to prepare themselves correctly before addressing this market. A short check list of three strategic requirements is offered in Exhibit II-10. These three areas are of crucial significance in forming vendors into a state of adequate preparedness to tackle the opportunities which will be available.

- Positioning involves establishing the correct product mix to convince the market—customers and prospects alike—of the seriousness of your intent. The previous Exhibit II-9 has given the key to determining what possible service products are available to be offered. Picking a focus and understanding how to balance available resources against your chosen breadth of offering are both prerequisite to a shrewd and successful approach.
- Network Management, as Exhibit II-8 has shown, requires a range of experienced resources to cope with the gamut of technical and project management tasks which can pop up in any outsourcing contract. Finding the skills, from in-house or via subcontractors, and matching them in the right proportion and with an adequate level of quality to the tasks likely to be encountered is a major pre-launch marketing exercise.
- Understanding the route or routes by which you have approached this market opportunity will shed light on the quality and style of your competitors' offerings. Strengths and weaknesses should be analysed, taking vendor backgrounds, including your own, in account. As a large project sector, project contracting and estimating skills required at bid time will need to draw on a marketing database of detailed competitive information. This database must be maintained in an updated state incorporating analyses of past bid details for a vendor's own and his competitors' tenders.

EXHIBIT II-10



The Market Definition and Status



The Market Definition and Status

A

The IS and Network FM Market Sectors

The facilities management (FM) market represents a significant high-growth opportunity for service organisations, not just for information services (IS) FM, but also for network FM.

This chapter provides an introduction to the positioning of the Network Management sector within the total market for Facilities Management (FM).

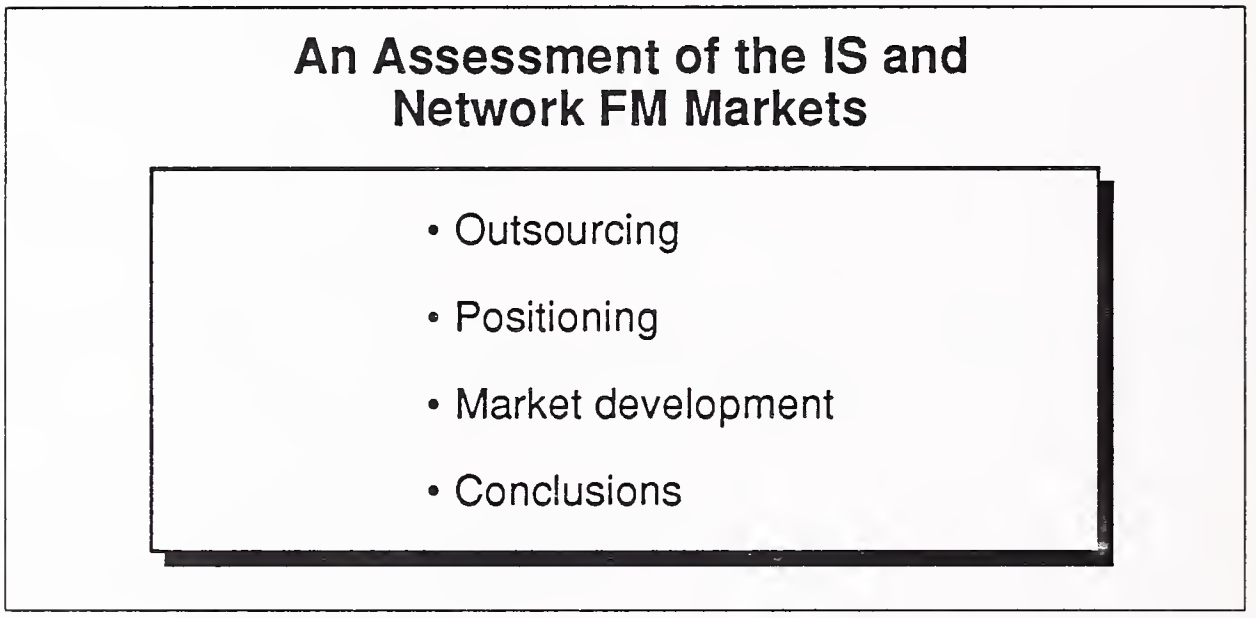
This study provides an assessment of the relationship between these two overlapping markets and an evaluation of their expected development over the next five years. The structure of this material, as listed in Exhibit III-1, is as follows:

- Firstly, the general background of the origins of FM is discussed. FM is one manifestation of the phenomenon of outsourcing—the deliberate and specific use of an outside contractor to supply a strategic service component. A distinction is therefore made between outsourced computer services like FM and systems integration, and supportive services like programming resources or processing (bureau) services. The overall size of the FM market is discussed.

- Secondly, positioning is addressed. Positioning is a central part of any strategic study. By positioning we mean the analysis of marketing parameters that will enable the role of FM to be set in the context of other services, thus aiding the market in its interpretation of a vendor's offering.

- Thirdly, the anticipated development of this market is discussed:
  - The observed activity of participating vendors.
  - An assessment of the relative sizes of the IS and Network FM markets in Europe.
  - The market evolution over the next five years.
- Finally, general conclusions are drawn with respect to the recommended approaches for exploiting the FM opportunities.

EXHIBIT III-1



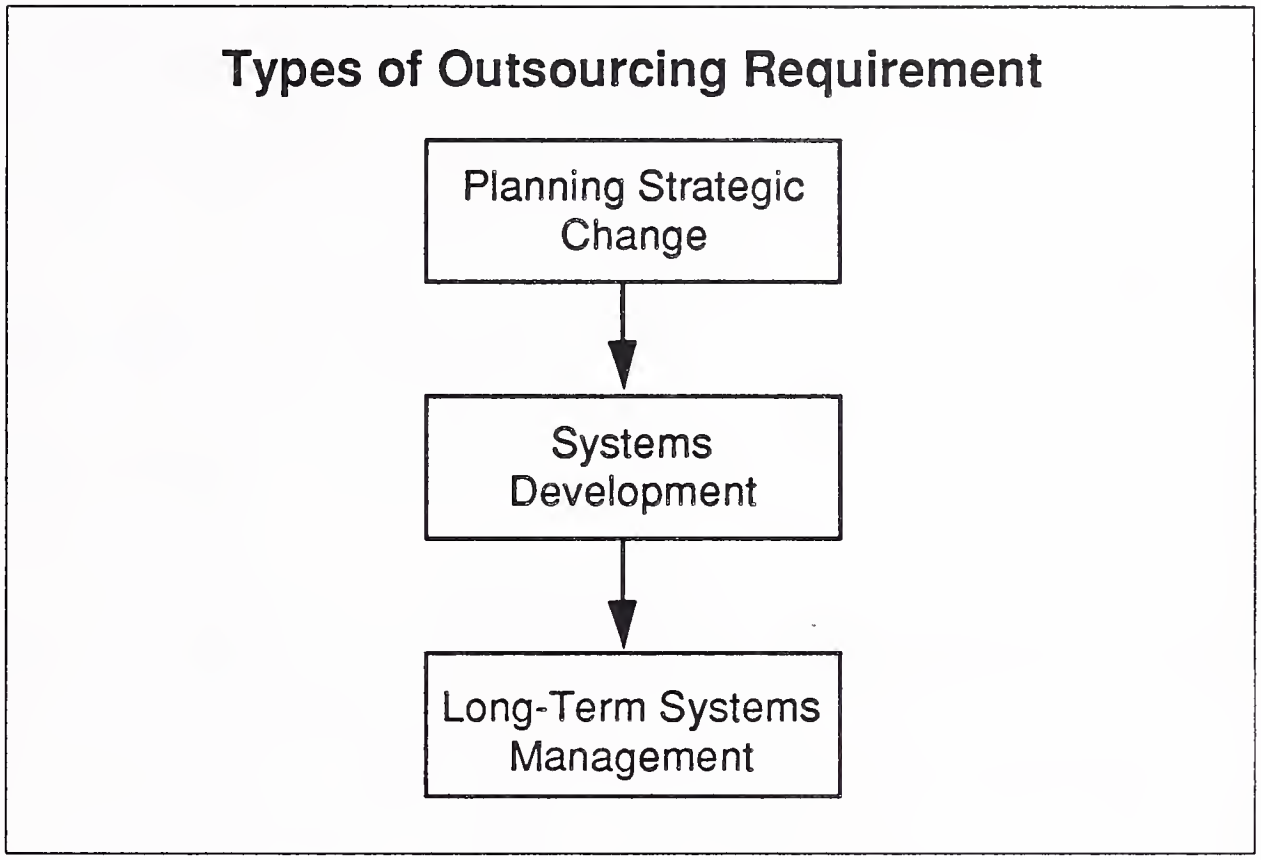
B

Outsourcing

The development of FM can best be interpreted within the overall context of outsourcing. Outsourcing can be used as a term to describe the purchase of all external services, but in this study INPUT preferred to restrict outsourcing's use to the supply of services that can be described as strategic. This is a difficult distinction to pin down precisely, but it is certainly a most important one. There exists a very different business approach between what motivates a company to hire contract programmers or operators and what leads to the contracting-out of a company's entire (or a substantial proportion of its) data processing activities.

Exhibit III-2 depicts the potential range of outsourcing requirements for an organisation's information systems activities. At the planning stage, consulting services might be used at the strategic level. As these plans are developed into systems or network designs, outsourcing is manifested as systems integration contracts, and the service vendor takes on total responsibility for the development and implementation of a complete information systems solution. Once systems or networks are up and running, their ongoing management represents an FM outsourcing opportunity.

EXHIBIT III-2



FM has existed as a concept for 20 years. It originated in the U.S. in the late 1960s and is generally associated with Ross Perot, the founder of EDS. Characteristically, FM is thought of as an option for the large organisation because it is in this area that the user can save most and the supplier profit most. However, in the networking area outsourcing opportunities can occur in companies of various sizes.

C

The World Market

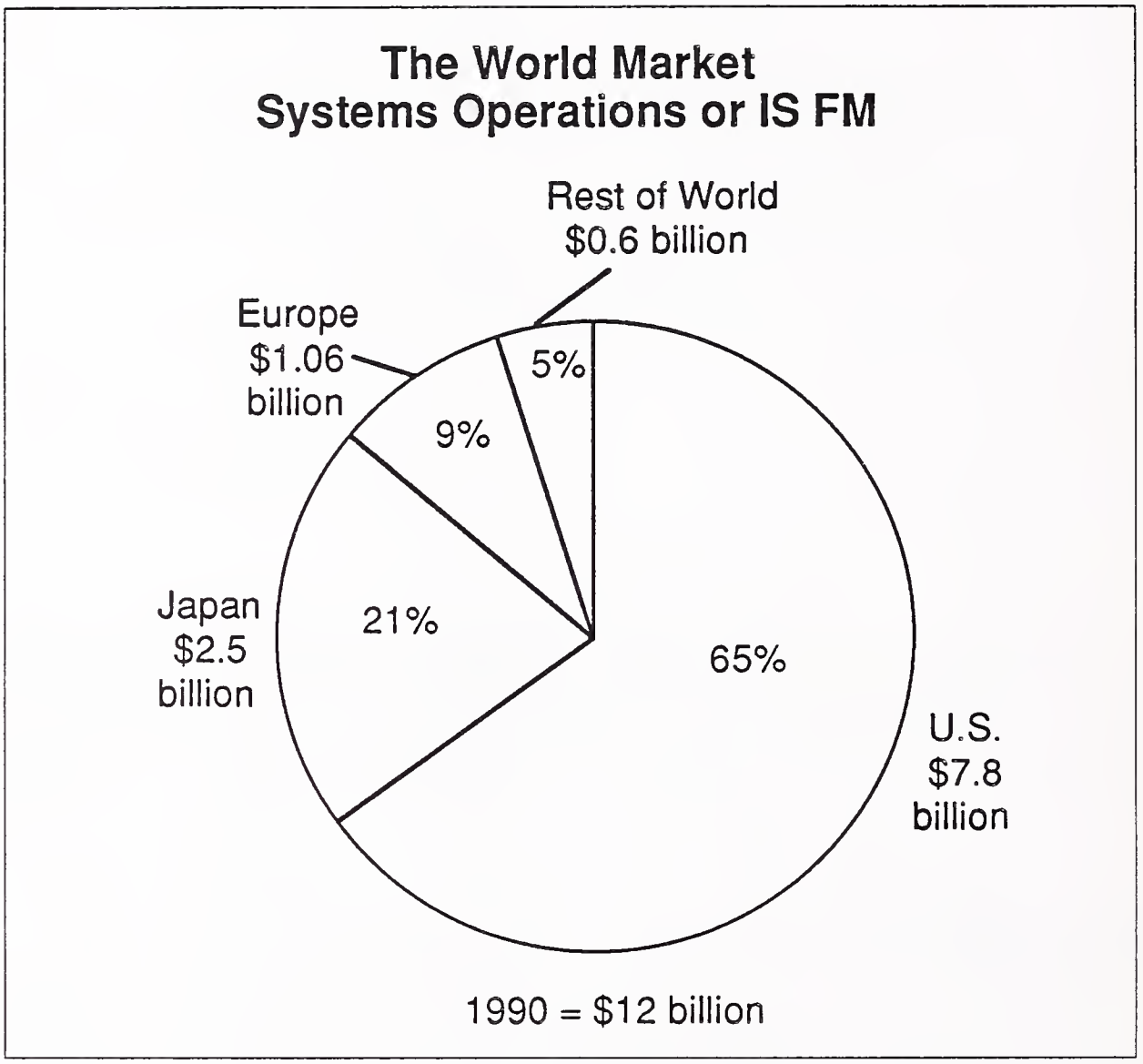
The most developed FM market in the world is undoubtedly that of the United States as shown in Exhibit III-3. The Japanese market is also substantial, particularly in relation to Europe, which has remained historically underdeveloped.

However, the last two years have witnessed an increasing and accelerating interest in the FM market in Europe, particularly in the U.K. This increase was marked by the placement of significant FM contracts—for example, that for Varity with Data Networks Plc. Of significance was the entry into the market by such organisations as Andersen Consulting and CSC alongside the traditional vendors, Hoskyns and EDS.

This activity took place amidst a resurgence of activity in the much more developed U.S. market. IBM's market entry with a major FM contract with Kodak and the deal for EDS to run and take part ownership in Texas Air's System One airline reservation system were particularly notable examples from the U.S. market.

There is undoubtedly a strong service orientation amongst U.S. management and a much greater willingness (compared to European management) to utilise third-party services for information systems. Consequently it is not surprising that the more extreme forms of service like FM have been more slowly accepted in Europe.

EXHIBIT III-3



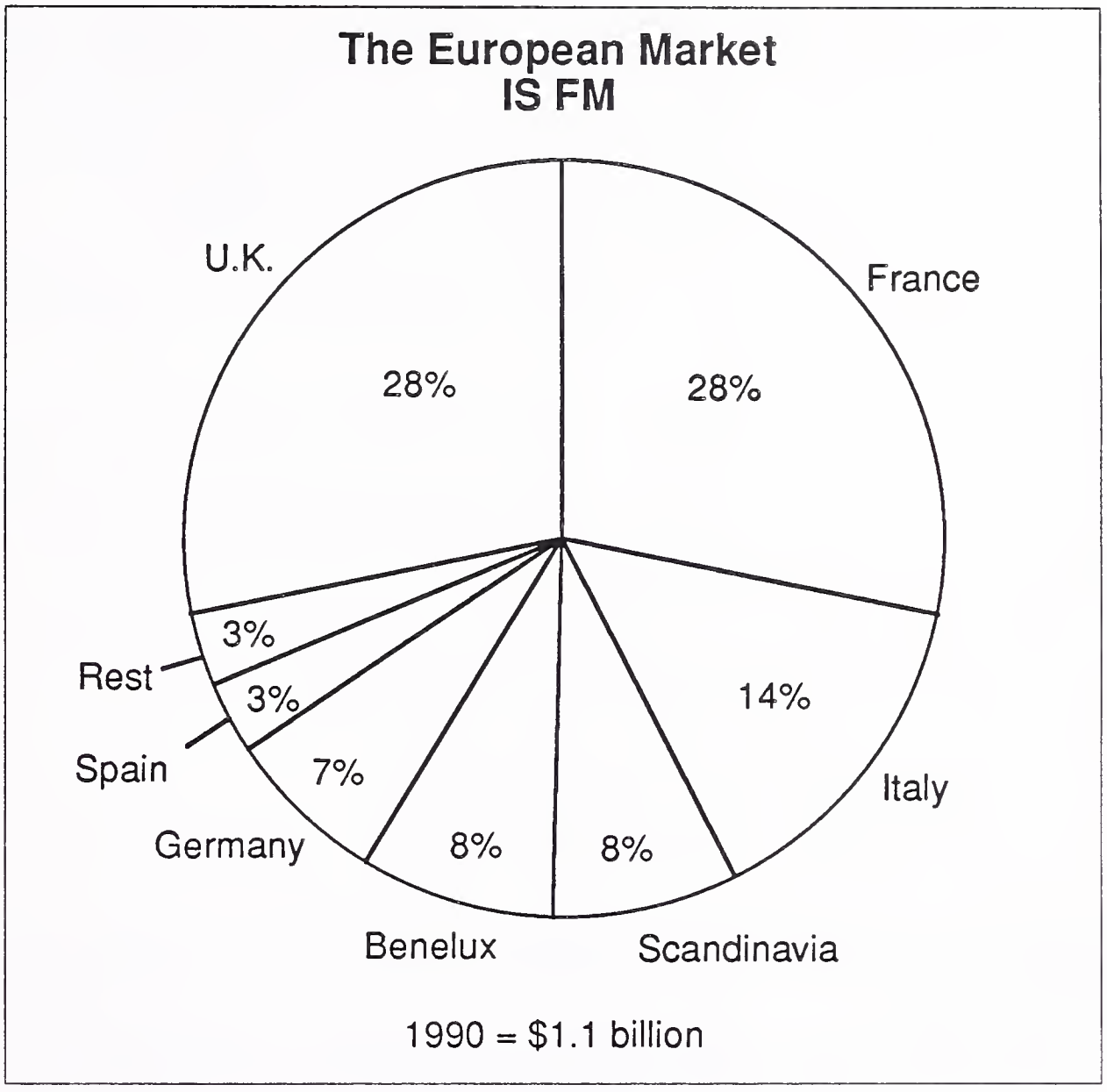
D

The European Market

Within Europe, the United Kingdom and France are the most strongly developed markets. Shares of the European market are shown in Exhibit III-4. Hoskyns is the U.K. market leader with around a 60% country market share. Other leading service companies such as Datasolve, SD-Scicon and Sema (Data Networks Plc) all have lesser market positions in the U.K. sector, which overtook the French market in value during 1990.

In continental Europe the most interesting markets are France and Italy. The Benelux has a considerable level of activity. Germany is noted as a weak market for services generally, and particularly to date for FM, although intense interest in the concept of outsourcing is starting to be manifested.

EXHIBIT III-4

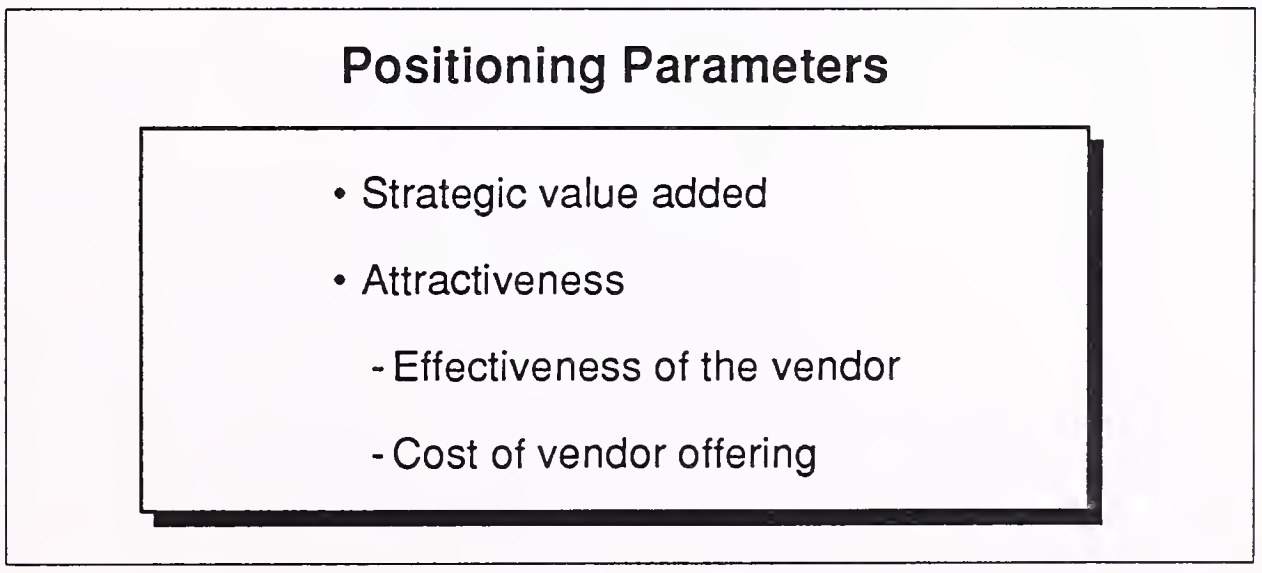


E

Positioning Parameters

In attempting to analyse the dynamics of the Network Management outsourcing marketplace, this report has firstly drawn up what are considered to be the principal reasons for considering the outsourcing FM services as seen from the user's perspective. These are summarised in Exhibit III-5.

EXHIBIT III-5



In general, the purchase of any major service component raises the question of its strategic role in an organisation and the extent that it adds value in the business process. The question of added value is often difficult to answer and will involve the personal perceptions of individual managements and even individual managers. A related aspect for IS systems is the extent to which the systems are used in the provision of the principal product or service that the organisation supplies. This aspect seems to emerge as a clearer market positioning parameter from the user's perspective.

Secondly, any potential service purchaser is likely to need to be persuaded of the effectiveness and cost savings of the proposed service. For the purposes of developing market positioning parameters it seems reasonable to combine these two related factors into the concept of FM attractiveness.

In the next section INPUT has developed a market positioning diagram using these two parameters:

- Strategic value added.
- Attractiveness.

F

Market Positioning—User Viewpoint

Exhibit III-6 shows the format of the market positioning diagram for FM from a user perspective. The degree to which IS is integrated into an organisation's functions is plotted on the x-axis; the attractiveness of FM to a user organisation is plotted on the y-axis.

It can also be seen in Exhibit III-6 that a certain industry sector pattern emerges from this analysis, although one must be careful to recognise the essential subjectivity of judging the positioning parameters.

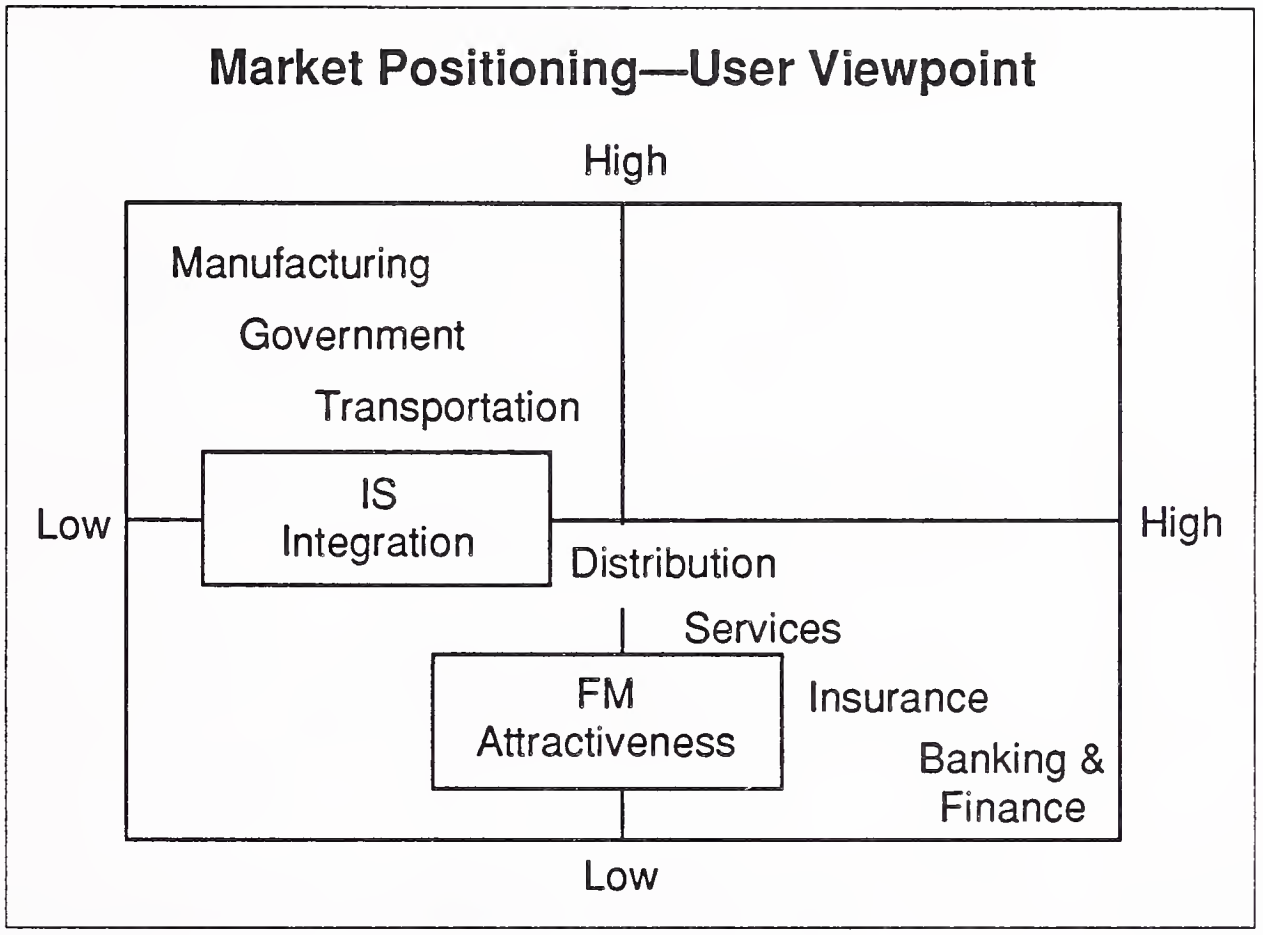
It must also be recognised that within each industry sector there is likely to exist considerable variation, dependent upon differing management styles and requirements. For example:

- The significance of front- and back-office systems to a financial institution.
- The diversity of products in a manufacturing group.

The positioning diagram provides insights into the potential for network FM. The value-added concept, expressed on the diagram as the relative attractiveness of FM, places emphasis on the application and not on the commodities of computer processing power or network transmission. This emphasis implies a greater acceptability for users to outsource network management in contrast to outsourcing their IS FM.

The factors of cost and effectiveness will of course affect the overall attractiveness of FM but are necessary conditions to the successful provision of any service.

EXHIBIT III-6

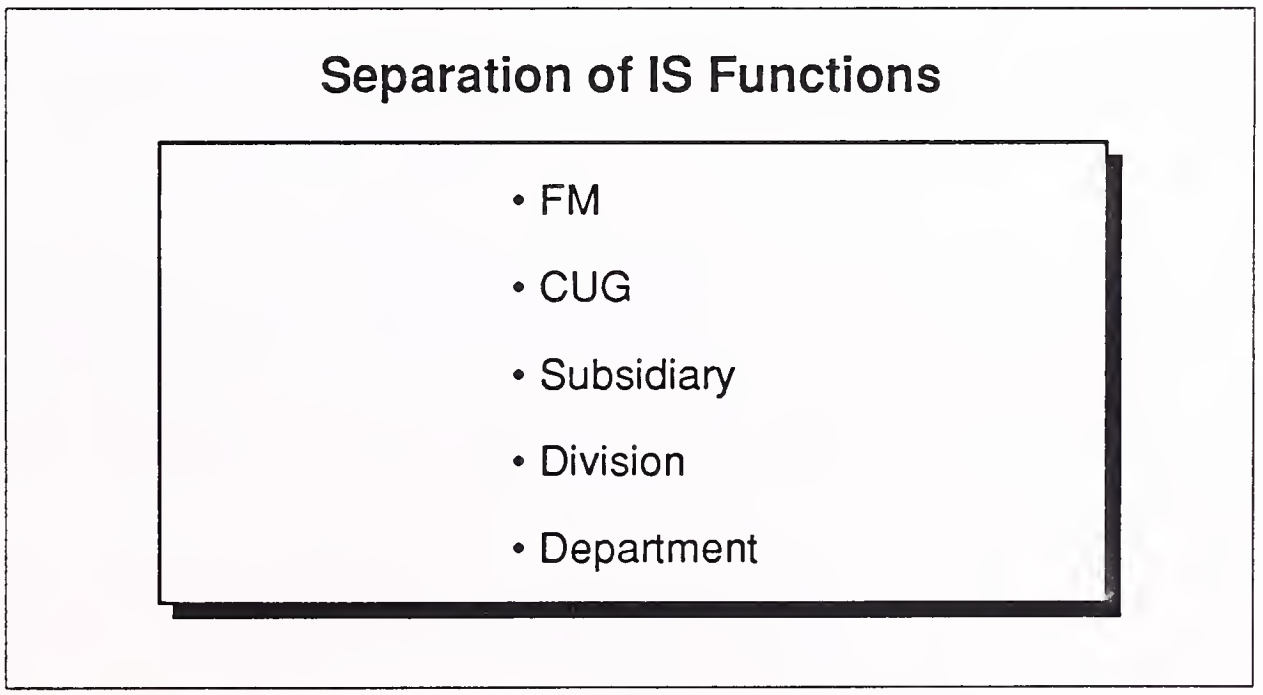


G

Separation of IS Functions

A particular requirement for the outsourcing of an information services operation is the need for it to be sufficiently separate that it is practical to hand responsibility to another organisation. A series of levels of separateness can be identified for data processing organisations; these are listed in Exhibit III-7. For these purposes, separateness is the inverse of IS integration, i.e., 100% IS integration equals zero separateness.

EXHIBIT III-7



This progression, first as an identifiable department and then as a completely separate subsidiary, is the classic model upon which many processing services (bureau) companies were developed. When the move is made to float the organisation off as a separate subsidiary, then automatically FM revenues are generated.

Additionally, one has also the joint ownership situation of closed user groups (CUGs). These are usually set up to serve very specific needs—for example, for interconnection of airline booking information in the case of SITA, or financial transaction messaging in the case of SWIFT. Typically INPUT has not included the revenues from these CUG organisations in its measurement of the Systems Operations market.

The provision of discrete processing services also provides another development path towards FM as an organisation's data processing activity builds to a significant level.

In the case of network services sufficient separateness exists intrinsically for an organisation to be able to consider network FM as a practical opportunity at any stage of system development. The network is quite clearly part of the organisation's infrastructure.

H

Summary of Arguments

One can thus summarise the position, from the prospective FM user's point of view, as a set of parameters or conditions that is likely to indicate the possibility that a systems operations approach might be considered. The parameters are listed in Exhibit III-8.

EXHIBIT III-8

Summary of Arguments

- Separate/practical
- Superior knowledge/expertise
- Cost advantage
- Attractive—overall

- The target activity must be sufficiently separate for an outsourcing solution to be practical.
- The vendor must as a rule be able to demonstrate superior knowledge and expertise in the chosen service area - in other words, superior effectiveness.

- The vendor must as a rule be able to demonstrate a cost advantage over the in-house solution.

- Finally, outsourcing must be attractive as an option; this particular adjective is used to imply that the user's system retains the unique strategic features that provide a value-added rationale.

I

Different User Perspectives—IS

Increasingly, INPUT is aware of a trend in the large-scale systems market towards the separation of the computer systems platforms and the applications that run on them.

As large systems become more complex and more standardised, and as the user interface becomes simpler, this trend is likely to increase. The implication is that users will see less need to be involved in running the equipment platform, and this reduction in the requirement applies to systems software as much as to hardware.

Exhibit III-9 is a diagrammatic representation of this bifurcation of the user perspective on the data processing element of his company's business. Four levels or layers of activity are identified, working from the bottom upwards:

- The basic computer equipment platform.

- The operating system software required to provide the processing environment.

- Applications enabling software, such as languages, system development tools and data base management systems.

- The applications software, either developed in-house or purchased as a product.

The first two layers comprise the more easily defined and more easily standardised part of the systems. Together these two form an area which could be considered for outsourcing.

J

Different User Perspectives—Networks

Analogous to the separation of the functions into layers for the data processing element as shown in Exhibit III-9 is that for networks. The equivalent separation for networks is expressed diagrammatically in Exhibit III-10.

In the case of a network, the distinction is made between the network infrastructure and the traffic that passes through the network. There are four levels of activity in total:

- The basic platform consists of the bearer services, essentially the physical communications pipelines that are operated by the authorised telecommunications operator.
- Network management is the set of functions concerned with the establishment or control of the network itself and not the traffic that is transmitted over it. These services have been traditionally measured by INPUT as the Managed Network Services (MNS) sector.
- Enhanced services add value in some way to the basic transmission activity—e.g., store-and-forward, error connection and protocol translation. They are essentially related to the traffic using the network.
- The network applications are concerned with the fundamental objective or purpose for which traffic is transmitted—for example, Electronic Mail or Electronic Data Interchange (EDI).

EXHIBIT III-9

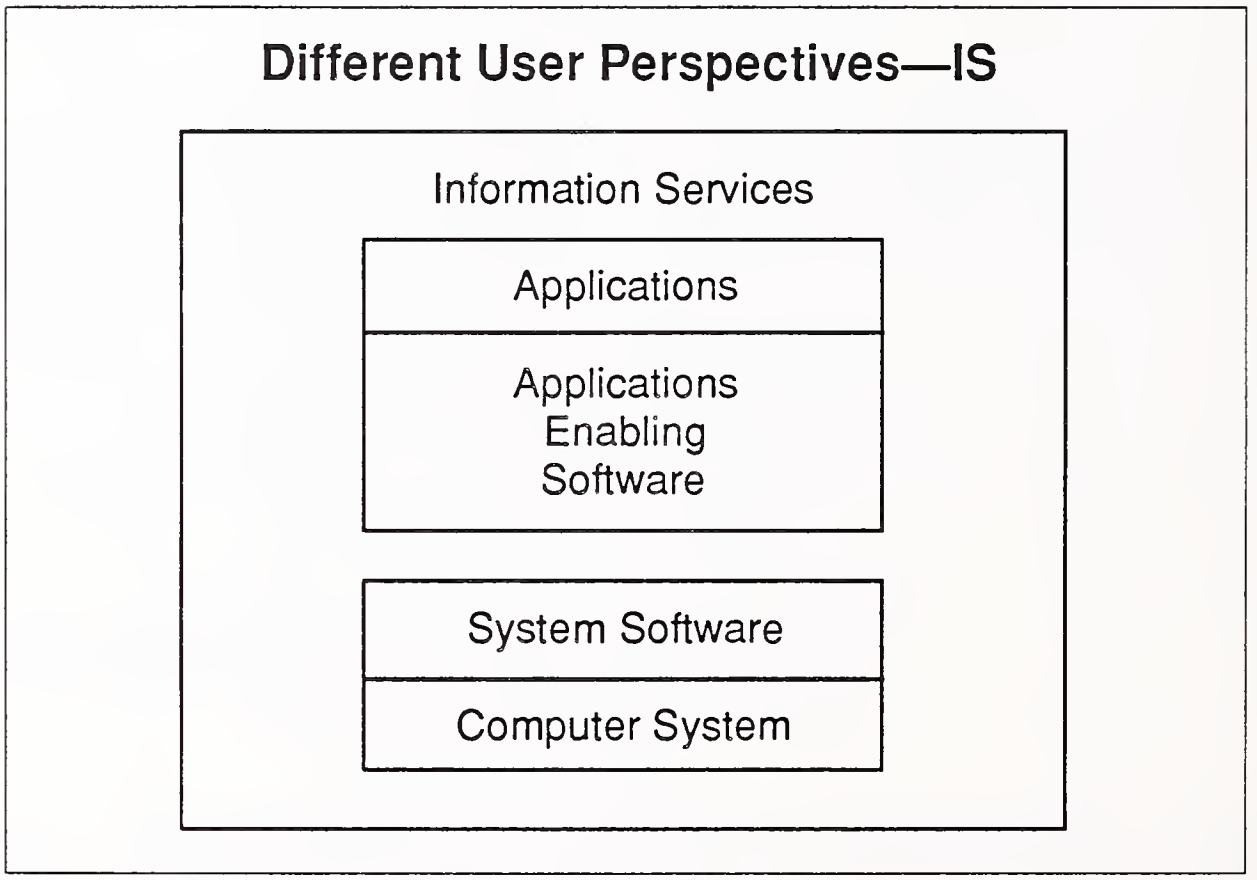
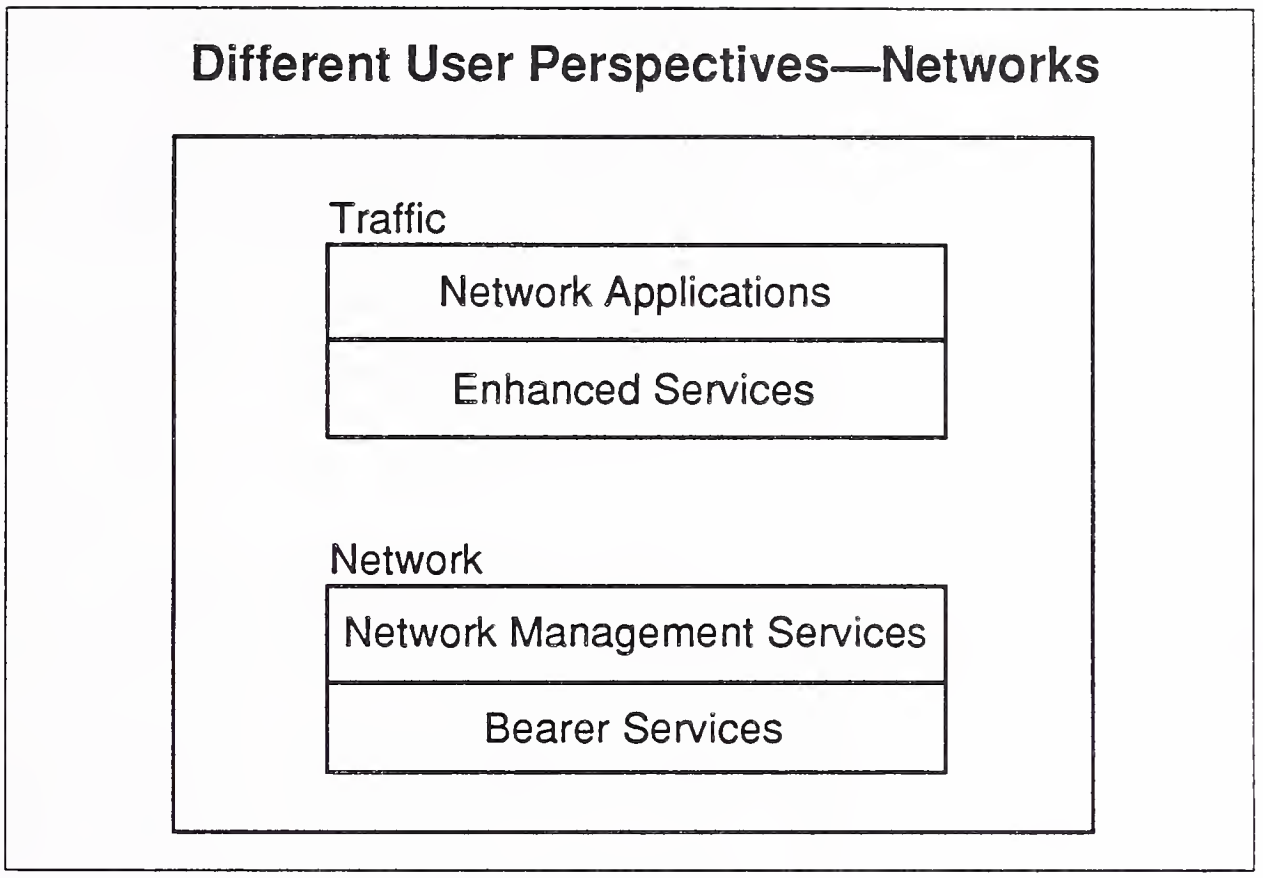


EXHIBIT III-10



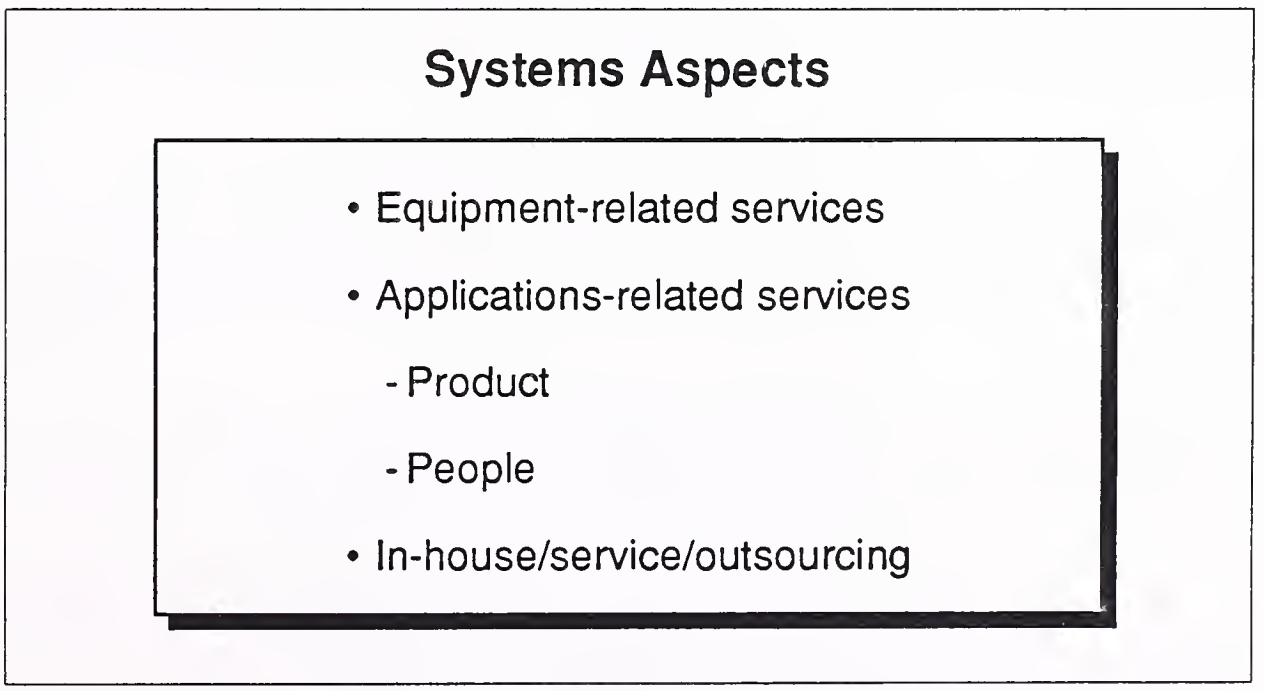
K

Systems Aspects

From the vendor's perspective, the first challenge of the FM sector is to identify its position and its relationship with other service markets. This challenge involves identifying aspects of the system that will provide positioning parameters for the FM market and throw light on the directions from which this business can be developed.

Exhibit III-11 lists the principal positioning parameters identified from the vendor's perspective.

EXHIBIT III-11



Firstly, and building from the analysis described in sections H and I above, one can make a distinction between equipment- or system-related services and applications-related services. Within the latter, one can make a further distinction between product- and people-related services—i.e., in the case of IS outsourcing between applications software products and professional services.

Secondly, one can analyse user expenditure on information systems into three categories:

- In-house expenditure.
- Discrete external services expenditure.
- Outsourcing.

The distinction between in-house and external services expenditure is self-evident. INPUT has defined outsourcing to imply service expenditure where the user makes a deliberate and conscious decision to have an external vendor take responsibility for a major proportion of the organisation's information systems activity. It is this much broader devolution of responsibility that gives rise to the difficulties in selling the FM or outsourcing concept.

This report has thus established two sets of criteria for positioning FM relative to other services. The two sets are developed in a map concept in the next two sections for IS and networks respectively.

L

Marketing Positioning—IS Outsourcing

Using the identified positioning parameters defined in the previous section, INPUT has developed the map shown as Exhibit III-12. Across the horizontal axis we have the following three areas:

- The systems platform.
- Applications-related services.
- People-related services.

Down the vertical axis are plotted these categories:

- In-house expenditure.
- Discrete services.
- Outsourcing.

Into this matrix (or positioning map) one can place the market assessments for the size of the various elements that contribute to the Western European data processing services business.

EXHIBIT III-12

Market Positioning Map—Information Services

1990 IS European User Expenditures
($ Billions)

	Systems Platform	Applications-Related	People-Related	Total
In-House	Equipment 46		People 56	102
Discrete Services	System Software 11.4 Equipment Maintenance 12.0 Processing 0.6	Software Products 9.0 Processing 7.0	Prof. Services 17.3	57.3
Outsourcing (FM)	IS Facilities Management 0.9		Prof. Services 0.2	1.1

Total (rounded) $160 billion

Annual Growth 1989-1990 = 13.5%

For the purposes of this analysis, INPUT has not included systems integration, or any strategic consultancy service under the outsourcing category. This was done in order to focus attention specifically on the FM area.

It is clear from this diagram that FM represents only a very small percentage of users' IS expenditures, around 0.7%. This low percentage serves to underpin the possibility of considerable growth potential.

Information Services FM has originated from the adjacent markets of processing services and professional services. It is reasonable to classify professional services FM in the people-related column, but clearly total FM can be a complete service covering the applications as well as the provision of the system platform resources.

M

Market Positioning—Network Outsourcing

In Exhibit III-13 we have provided an analysis of the network market revenues analogous to those in Exhibit III-12. Again FM represents only a small proportion of the total expenditure but is at 2%, a considerably higher proportion than for IS FM. There is also clearly a higher proportion, as would be expected, for service expenditure as opposed to in-house expenditure. In the case of networks, service expenditure includes user expenditure on line and equipment rental, traffic-related usage, and professional services applied to all types of telecommunications problems.

EXHIBIT III-13

Market Positioning Map—Networks

1990 Voice and Data Networking European User Expenditures
($ Billions)

	Systems Platform	Applications-Related	People-Related	Total
In-House	Equipment 9.7		People 4.5	14.2
Discrete Services	Equipment Maintenance 2.0 Data Comms. Rental and Usage 7.8	Network Applications 0.4 Enhanced Services (MNS) 0.2	Prof. Services 2.8	13.2
Outsourcing (FM)	Network Facilities Management (MNS) 0.4			0.4

Total (rounded) $28 billion

Annual Growth 1989-1990 = 12%

Comparison of Exhibit III-13 with Exhibit III-12 (for IS) implies a greater likelihood for networking FM to be acceptable as an outsourcing concept compared with IS FM. Significant factors in this argument are the existing penetration of FM in networks, the relative size of service expenditure, the smaller proportion of applications content and the perception that there is a lower emotional threshold for networks as opposed to IS.

N

Vendor Activity

Exhibit III-14 lists the principal entry points of FM vendors, i.e., the original market areas from which FM business has developed.

EXHIBIT III-14

Vendor Activity

- Origins
  - Processing services
  - Professional services
  - Systems integration
  - Network services
  - Network maintenance
- Network management
  - Telesystemes (Cogecom)
  - BT
  - Mercury CDN
  - SigmaNet
  - GDN

A number of vendors, notably Hoskyns (owned by CAP Gemini Sogeti) and SD-Scicon, have developed their outsourcing businesses from a processing services (or bureau) operation. Also included in this category would be FM businesses such as IT-NET and PCL that have been created as management buy-outs of the data processing division of a larger entity.

Vendors such as the Sema Group and Andersen Consulting seem to have been directed towards outsourcing opportunities by the needs of their user base in professional services activities. As their professional services businesses have been drawn towards systems integration and the requirement to meet a greater range of service needs, so the need for operational support, and therefore FM, has arisen. EDS in particular has always stressed in its marketing a close coupling of systems integration services and operations.

Clearly there is a considerable interest in FM from the starting position of network services. Telesystemes in France, British Telecom (BT), Racal, and Extel in the U.K. are all examples.

The equipment vendors that have entered the market (most notably, IBM) could be classified as a totally distinct category. However, it should be noted that these vendors have substantial professional services revenues as well and, in the case of IBM, processing services and network services businesses.

The significant vendor activity observed in the specific area of network management is also listed in Exhibit III-14. In addition to BT, Mercury, with its Corporate Data Network, is a potential competitor. Andersen Consulting's arrangement with Motorola Codex to offer network support under the name SigmaNet, and Racal's U.K. Government Data Network (GDN), are all important examples of Network FM.

O

Outsourcing Market Analysis

Exhibit III-15 illustrates INPUT's assessment of the complete outsourcing market in Western Europe in 1990 in the data processing and network areas. This analysis shows how the different categories of expenditure can be separately attributed to specific IS or network activity. Further, it indicates the size of adjacent markets that could represent entry points to the outsourcing business.

Overall in Western Europe INPUT has assessed the FM market at $1,300 million. INPUT attributes 81% to the IS category and 19% to the network category. Within this figure, INPUT has also measured a telecommunications-only network FM market that to date INPUT had not included in the basic FM market measurement because no IS was involved. An example of this expenditure would be the contract that SD-Scicon has with BP to manage its telecommunications network.

A further relevant sector is the sector for enhanced network services—the provision of managed data network services that typically have not been considered full FM. This market has developed from the provision of discrete services and not from a deliberate and clear decision to outsource the management of the network. This sector has been covered in more detail in INPUT's report, *The Challenge of Network Services in Customer Services, 1990-1995*, published as part of INPUT's Customer Service Programme.

Exhibit III-15 indicates that INPUT has identified a total infrastructure outsourcing market in Europe of nearly $1.5 billion in 1990, of which the network proportion amounts to around 40%.

EXHIBIT III-15

Outsourcing Market Analysis, 1990

	European User Expenditures ($ Millions)		
	IS	Network	Total
Full Facilities Management	860	200	1,060
Telecomms Network FM	-	240	240
Enhanced Network Services	-	170	170
Total	860	610	1,470
Data Communications Services	-	7,800	7,800
Network Applications	-	400	400
Maintenance	-	2,000	2,000

Additionally, INPUT recognises some further adjacent markets that could all represent market entry points for the more closely defined outsourcing of network management:

- Data communications services.
- Network applications services (e.g., EDI and Messaging).
- Network equipment maintenance.

P

European Analysis and Forecast

It is important to place the overall assessment of the FM outsourcing opportunity into the perspective of total user expenditures on information systems. The overall market corresponding to the earlier positioning maps is shown in Exhibit III-16.

This exhibit builds on the market revenue analysis shown in Exhibits III-12 and III-13 but extends the analysis to show last year's forecast of market sizes for 1995.

EXHIBIT III-16

European Analysis and Forecast

IS	1990 User Expenditures ($ Billions)	CAGR (Percent)	1995 User Expenditures ($ Billions)
In-house	102	9	157.0
Services	57	15	115.0
FM	1	25	2.7

IS	1990 User Expenditures ($ Billions)	CAGR (Percent)	1995 User Expenditures ($ Billions)
In-house	14	10	23.0
Services	13	18	30.0
FM	0.4	26	1.4

Total	188	12	330

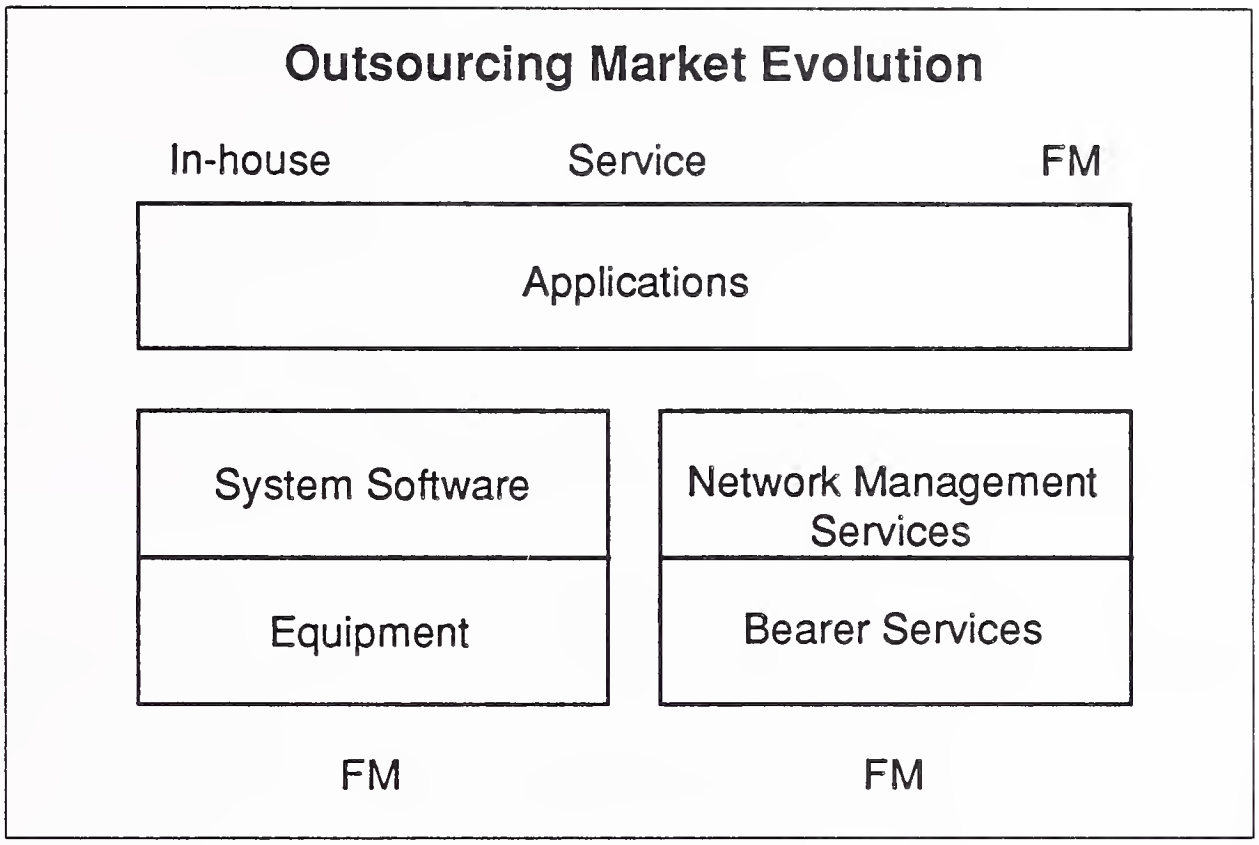
This analysis makes clear that although FM is expected to grow, for both IS and networks, at a significantly higher rate than for the market as a whole, FM nevertheless remains a relatively small proportion of overall IS expenditure. On these estimates of expected growth, the total FM market will only reach 2% of the total market by 1995, based on INPUT's 1990 forecast. Even if these growth rates were doubled (i.e., to approximately 50% per annum), then FM would represent just over 5% of total user IS expenditure in 1995.

Q

Market Evolution

One of the key objectives of this report is to provide an analysis of the way that the outsourcing market will evolve over the next five years. Exhibit III-17 represents graphically the basic outsourcing trends observed by INPUT.

EXHIBIT III-17



Firstly, INPUT expects the equipment platform and network taken together or separately to be seen as discretely identifiable functions and consequently more readily serviced by a external organisation. Increasingly the computer user is less interested in what goes on under the bonnet; increasingly the concern is for the application and its contribution to the business.

This separation of functions clearly implies an opportunity for FM at the level of provision of computer and network facilities. The nature of wide area networks and the lack of the same tradition for in-house management as in the IS area indicate a potentially greater readiness to accept network management outsourcing.

The area of network FM will be met by an array of adjacent or supporting services in addition to the central core of IS FM.

On the data processing side, the essential FM service is the provision of the computer facility—a MIPS power station. Associated with the "power station", and supporting it (both in-house and out of house) will be services such as:

- System software support.
- Equipment maintenance.
- Disaster recovery services.

The network aspects will be more readily met by the provision of virtual networks—the pipelines through which the MIPS are supplied to the ultimate users. The more complete that network management function is, the less opportunity exists for independently provided services, like equipment maintenance, being targeted at the end user. Increasingly such services will be sold to the outsourcing supplier.

The separation of the equipment platform referred to above also creates a separately identifiable opportunity for the management of a user's applications. Clearly, management of a user's application is a much more contentious area and thus much less likely than the operations side to fall prey to the arguments for outsourcing.

For application systems the user will have the basic choice of:

- Providing the complete application support service in-house.
- Purchasing discrete services to support an application which is essentially managed in-house.
- Specifically contracting for the operation of the applications support to be provided on an outsourcing basis.

As with the outsourcing of platforms, there exist adjacent markets for the outsourcing of systems and applications, notably the maintenance of in-house-developed systems and of externally purchased products.

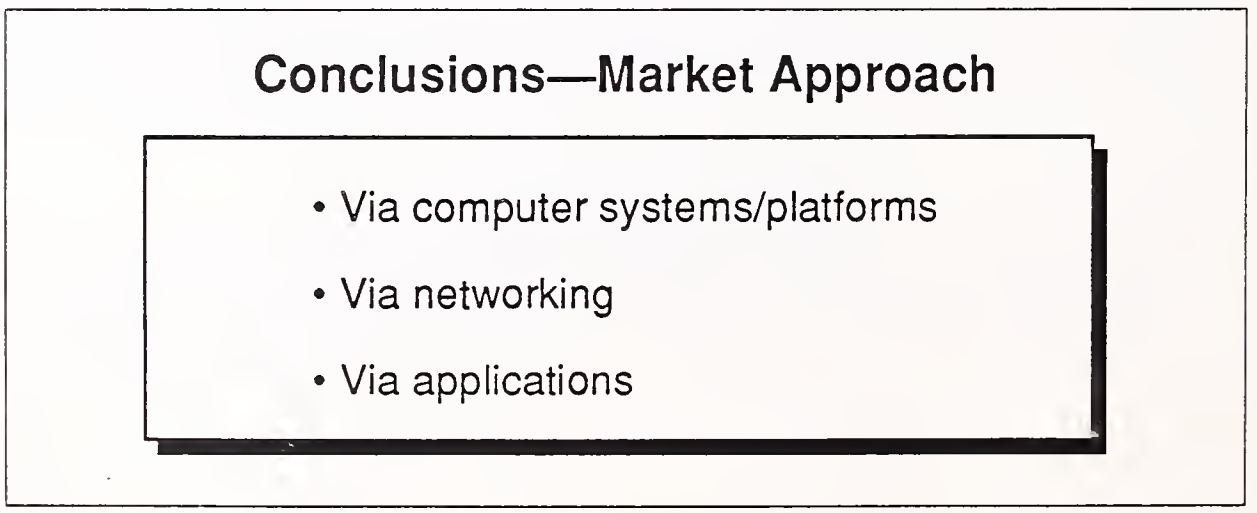
R

Conclusions—Market Approach

A central question posed for this research report is therefore to determine whether the network FM and information services FM markets are linked or are separately accessible, and whether each can be approached by either route.

Exhibit III-18 lists the three basic options that follow logically from the analysis of the market evolution as shown in Exhibit III-17. In principle the market can be approached from the three directions shown.

EXHIBIT III-18



However, the applications route is probably the most difficult, since it is in this area that the most management resistance to the outsourcing concept is likely to be met.

The most attractive route appears to be via the provision of other network services, notably the adjacent markets of:

- Data transmission services.
- Equipment maintenance.

INPUT believes the network outsourcing market is directly accessible and is not reliant on the IS outsourcing entry point. Indeed, INPUT expects greater penetration of the network market by FM contractors in growth terms than for IS over the next five years. For 1995, INPUT forecasted in 1990 that the network FM market—the majority of which is directly accessible by network-only vendors—would reach $2.4 billion (versus $2.7 billion for the comparable data processing FM market).

S

Summary

Exhibit III-19 lists the principal findings of this chapter.

EXHIBIT III-19

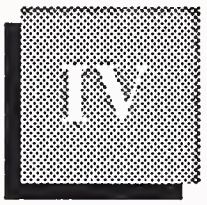
Summary

- Significant high-growth opportunity
- Network outsourcing separately accessible
- Incremental development strategy advisable

The outsourcing market in Western Europe offers a significant high-growth opportunity within the overall market for information systems. In particular, the network FM market is expected to grow as fast as if not faster than the IS FM market (26% per annum vs 25% per annum).

IV

Market Analysis and Forecast



Market Analysis and Forecast

A Outsourcing

This chapter measures the current size of the markets for network management. It measures the Western European market in its entirety and as a set of separate country markets. The chapter also develops an overall market forecast across Western Europe and the individual countries.

In the context of outsourcing, not only can one observe the continuing growth of user expenditure overall on information services (IS), but also the key business trends that are actively driving the need for "more complete" IS solutions.

The key business trends relevant to this need in general, and of particular importance to networking, include the following:

- Business operations are becoming increasingly complex. With the increased complexity, there is a need to ensure that information flows between operational units as cost-effectively as possible.

- Organisational downsizing in answer to recessional and competitive pressures has meant that corporate staff must be able to access a greater amount of needed information quickly. Decision-making information must be available at the time and place necessary to support decision-making processes.

- For organisations to maintain their strategic position, a variety of decision-making data must be available quickly. Integrated networks are necessary to ensure the delivery of the information.

- Organisations are competing increasingly in a global marketplace. With this increased global focus, integrated networks are the only effective means to ensure the timely, cost-effective delivery of information.

In addition to the changes taking place in business, a number of technological trends are causing organisations to consider integrating their networks more fully into the operational environment. The key technological trends are listed below:

- Public networks are becoming more robust and more applications orientated. As digital services become more available, options for providing broader sets of services using them will also become increasingly available.

- Virtual private networks (VPNs) provided through the public networks will provide capabilities that will increase functionality and afford opportunities for greater flexibility and organisational control.

- Hybrid networks which make use of private and public networks will become more structured, more integrated and more visible.

- Value-added networks, once orientated primarily to the needs of low-speed, infrequent use, are being enhanced to provide the necessary virtual capabilities, as well as higher capacities and a greater range of services.

- Providers of PBXs are continuing to expand the capacity and flexibility of their equipment. They are focussing on providing equipment that can become a central point for the integration of network services at the local level.

- The growing capacity of LANs and their ability to be interconnected via bridges and routes is blurring the distinctions between local-area, metropolitan-area and wide-area networks.

- The enhanced capability of intelligent multiplexers has increased their importance as focal points for integrating network functions. These enhancements include network management capabilities.

- The spread of relational database systems is expanding the need for access to remote locations. With databases becoming increasingly common on minis, technical workstations and PCs, the process of interconnecting systems becomes more complex and more necessary.

- The acceptance of the value of distributed processing by all the major vendors and the emergence of viable management systems for distributed databases increases the need for networks connecting a variety of systems.

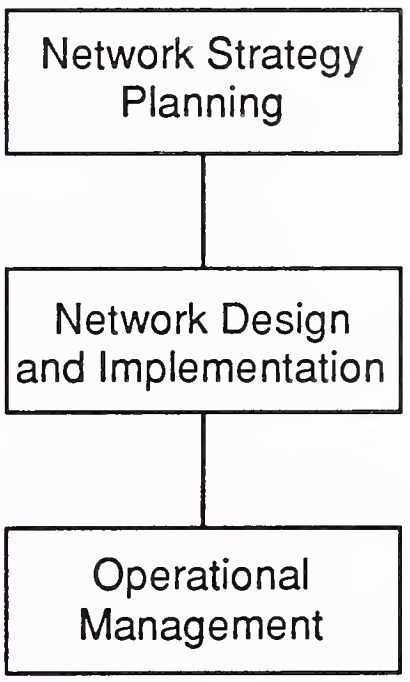
- The growing use of PCs, technical workstations and X-terminals, coupled with the growing need to access or share data, contributes to the need for networking and network integration.

All these influences which add up to a continuously changing environment are causing users increasingly to seek third-party support for data processing and network needs. Such support can be referred to generally as outsourcing, but in this study we have preferred to restrict the use of the word outsourcing to the supply of strategic services. This is admittedly a difficult distinction to pin down, but INPUT considers the distinction important. There exists a very different scale of commercial values and business ideas behind the decision to hire third-party assistance, for example, in the form of contract programmers or operators, than behind the decision to contract out the management of the data processing activity.

The spectrum of potentially outsourced network services is depicted in Exhibit IV-1. At the planning level, strategic consulting services might be utilised. INPUT notices a trend for services organisations to become increasingly interested in providing consultancy on business planning as a precursor to involvement in further systems development services. In the networking field strategy studies are not normally undertaken more frequently than once every three to five years.

EXHIBIT IV-1

The Spectrum of Network Services



Network design and implementation is the networking equivalent of systems development for IS applications. It comprises all network design functions, the building and commissioning activities, and, of course, systems implementation and test.

Operational management is the complete set of activities concerned with the operation of a network on a day-to-day basis. It is composed of all or some of the following:

- Day-to-day management of the network.
- Trouble-shooting.
- Network monitoring services.
- User helpdesk facilities.
- Network reconfiguration.
- Network user control.
- Network equipment maintenance.
- Network management.
- Network management software evaluation and selection.
- Contingency planning.

Network management can be considered strategic if it involves handing over management responsibility to a third-party organisation.

Organisations are turning to third-party organisations to provide network management services for a variety of reasons. Principally the reasons include:

- Scarcity of the staff with appropriate skills.
- The increasing complexity and multiplicity of large computer networks.
- The need to implement information systems on a shorter time-scale than might be possible in-house.
- The need to reduce the risk of cost and time overruns.

All of these factors are thrown into sharp relief by the increasing dependence on networked information systems by user organisations. Network management is thus an outsourcing service that has arisen to meet the user need for help in information services activity.

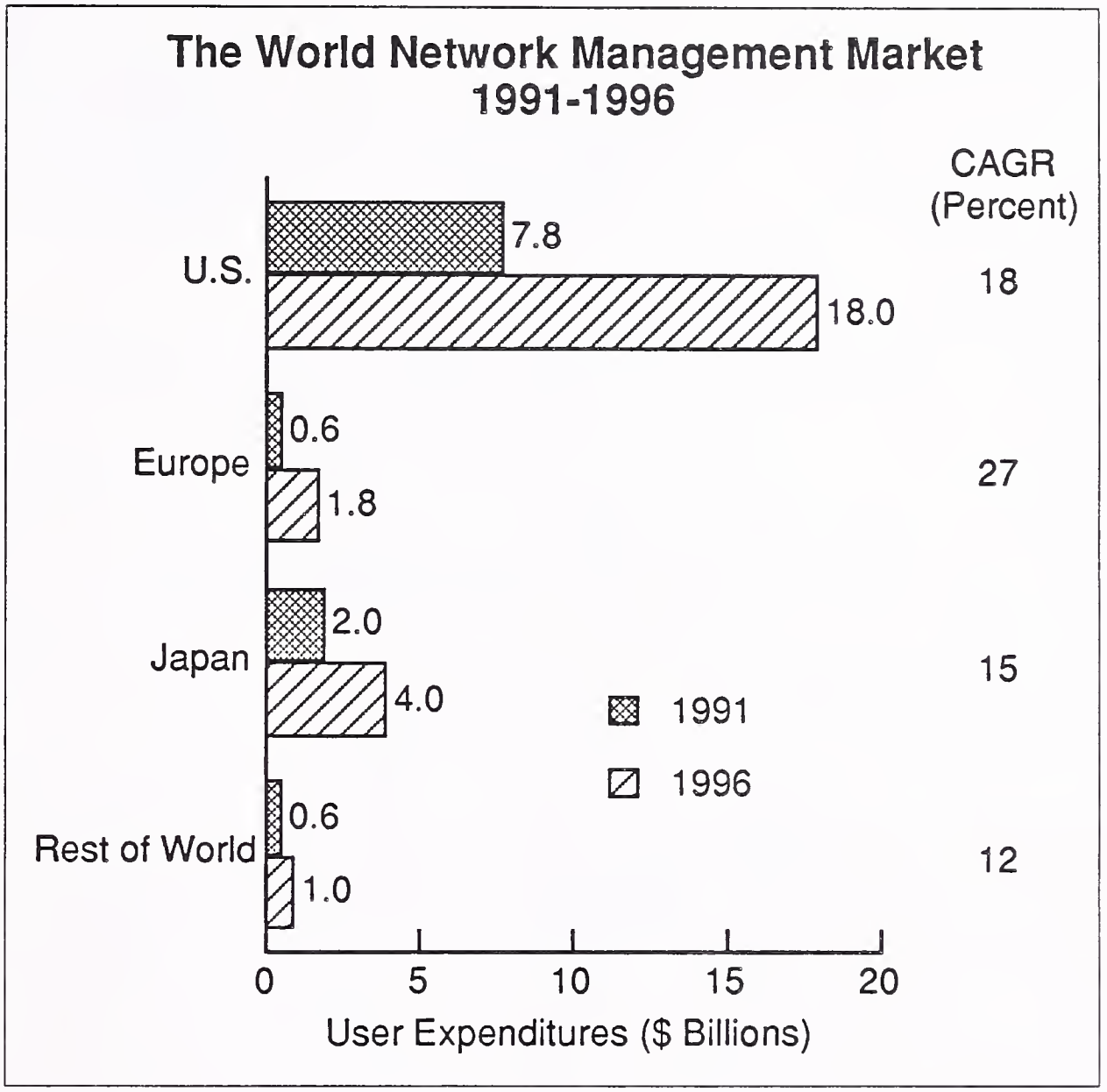
B

Market Size

On a world scale, the most developed network management market is in the United States. The scale of U.S. dominance of the world market is shown in Exhibit IV-2, which analyses the global network management marketplace.

The use of network management services has been relatively restricted in Western Europe due to the general caution exercised by buyers in respect of service solutions by comparison with those in the United States and in Japan.

EXHIBIT IV-2

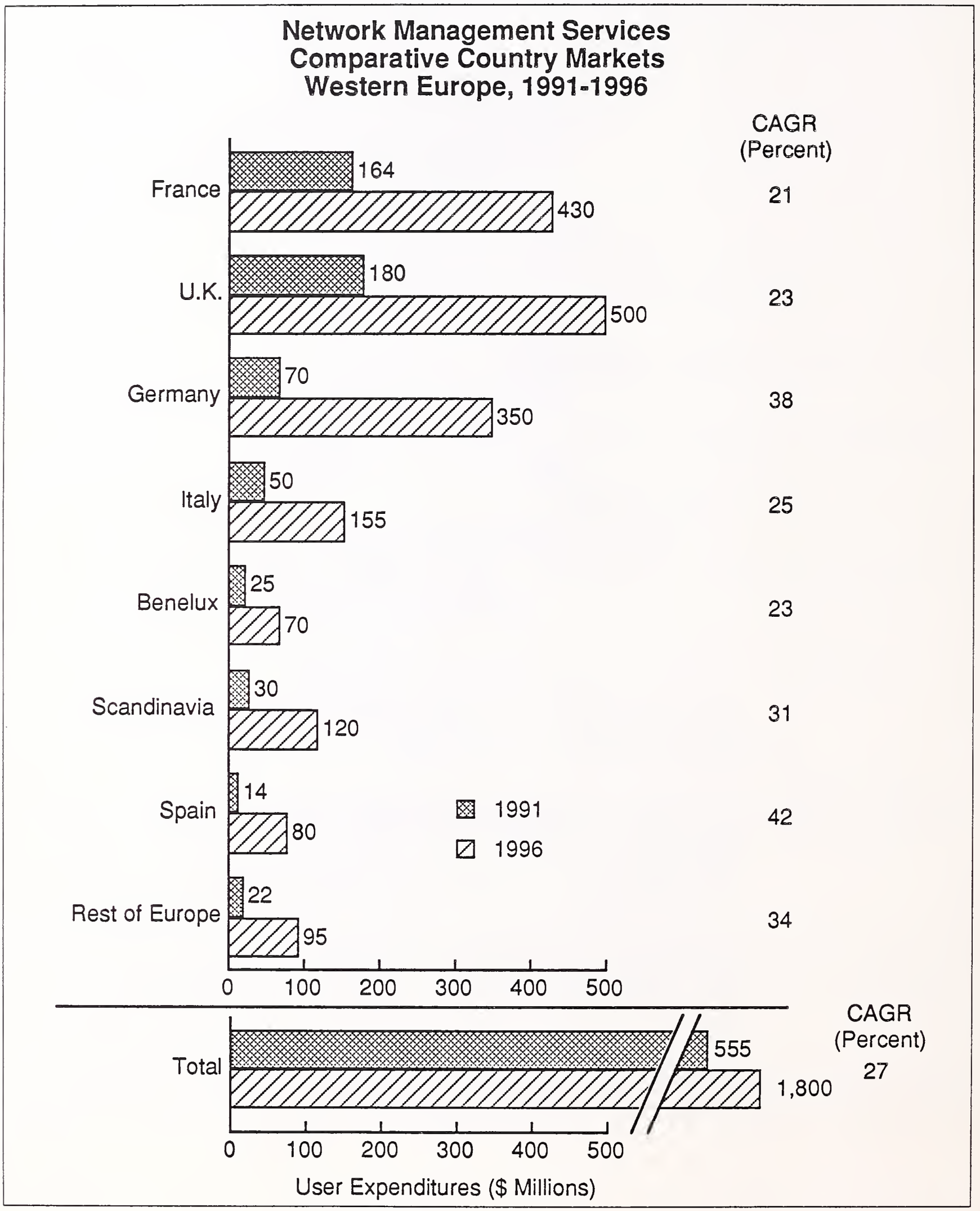


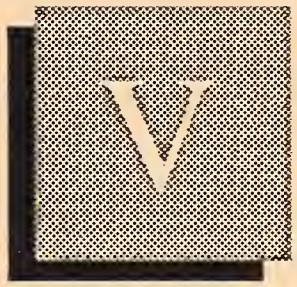
Important UK contracts have been increasing in number in the last two years with the arrival of leading vendors such as Andersen Consulting and CSC into this area of the market.

On the European mainland, CSC has been active in the Benelux, but apart from this new activity the remainder of Europe has continued to view outsourcing generally as primarily a response to legislation prohibiting or restricting computer ownership by government departments. Thus, there is considerable activity in Italy, where FINSIEL is the leading vendor. France is an important outsourcing market with widespread awareness of this approach. Leading vendors in France are GSI, Telesystemes and CISI. Germany is noted for its generally lower level of take-up of services, but intense interest in outsourcing has been in evidence in recent months.

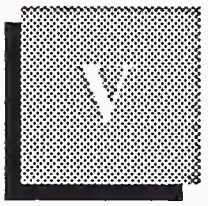
Exhibit IV-3 shows the relative market position of the countries in Western Europe in the network management sector.

EXHIBIT IV-3





Vendor and User Considerations



Vendor and User Considerations

A Importance of Network Management

In addition to interviews with large and small user organisations that are either currently contracting for or are potential candidates for network management, INPUT interviewed major providers of network management services.

The purpose of the vendor interviews was to assess the extent to which vendors are currently involved in managing user networks and whether their perspective of the potential is similar to that of users'.

In most cases, users' and vendors' perspectives are fairly similar. However, there are some areas where there are differences.

Several questions were designed to assess the extent to which vendors consider network management important to their product offerings.

As indicated in Exhibit V-1, all of the vendors consider network management to be an important element of their strategy. Though only 50% are offering some form of network management product or service as a specific offering today, 90% expect network management to be an offering within the next five years.

However, judging by users' concerns about contracting for services, considerable work remains to be done to make network management products and services generally acceptable. Key issues include the following:

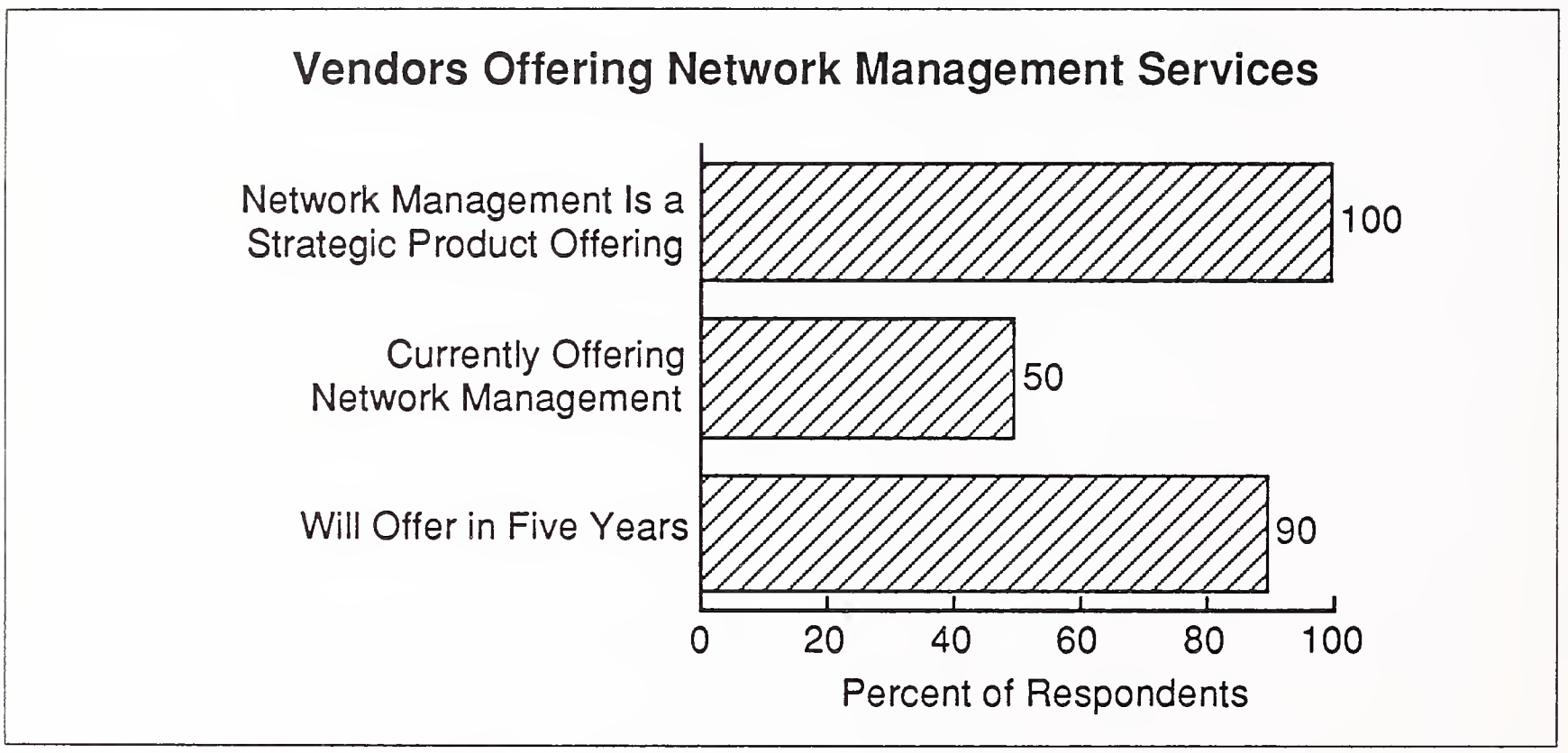
- Many users are sceptical about a vendor's ability to successfully manage a user's network, for several reasons. Key reasons are concern about whether vendors will place appropriate emphasis on an individual user's network and its problems as compared to other users' networks.

Users are also concerned about the breadth of skills a vendor can bring to bear. For example, they ask whether a vendor, whose primary line of business is PABXs, can successfully address the design and management of interexchange circuits and/or a local-area network?

- Users also indicate that many network management products are weak in their ability to address multiple types of networks (LANs, voice, data). They also comment that while the level of training and support provided is adequate, the commitment to ongoing product development is less so.

Whether users' perceptions are accurate or only a reaction to historical problems is not clear, but the problems expressed will need to be addressed for the INPUT forecasted market to be realised.

EXHIBIT V-1



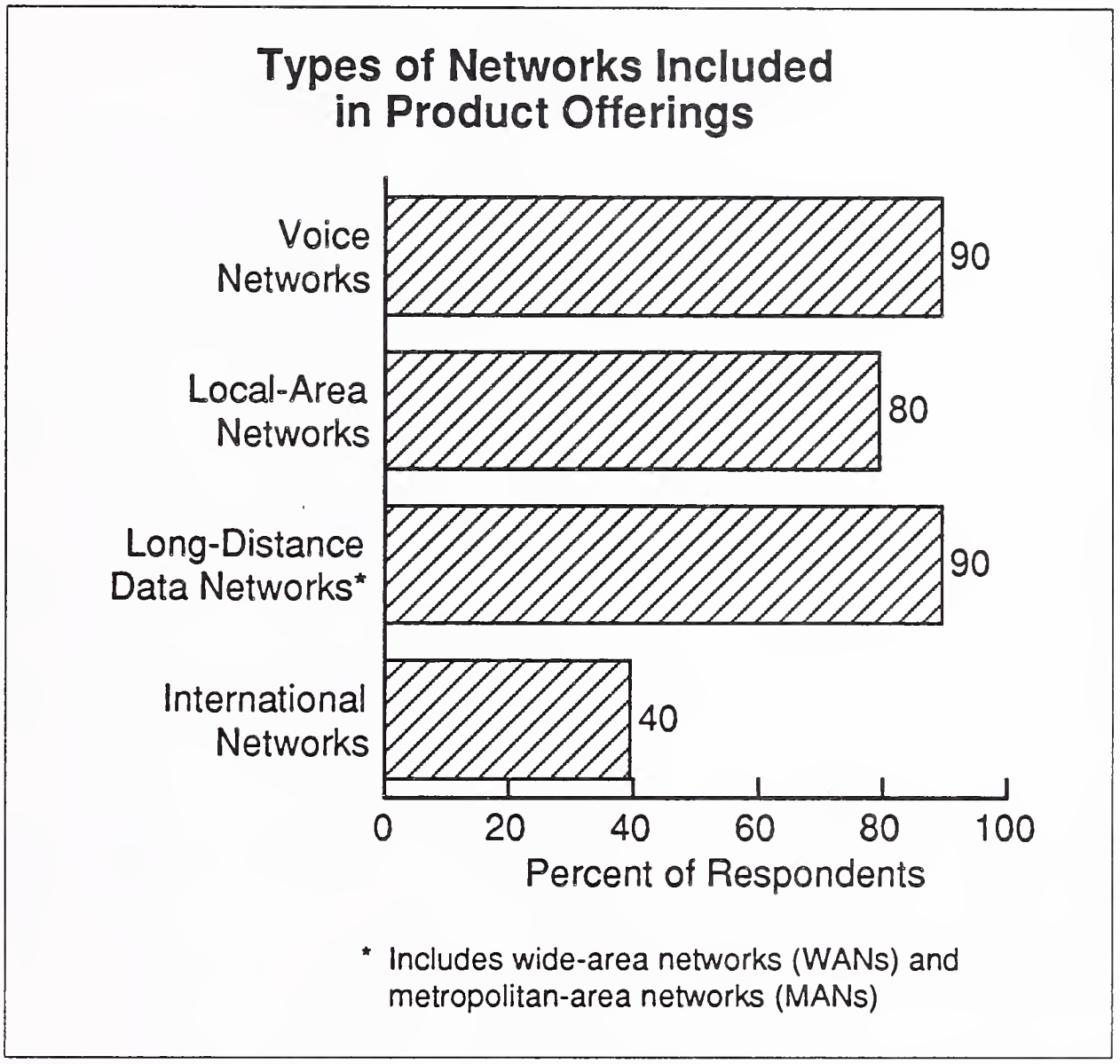
B

Vendors Manage All Types of Networks

When considering the types of networks and management functions that vendors include in their product offerings, the offerings are closely aligned with users' expectations.

As shown in Exhibit V-2, vendors are orienting their offerings to provide services for different types of networks, although international services are only offered by the very largest vendors.

EXHIBIT V-2



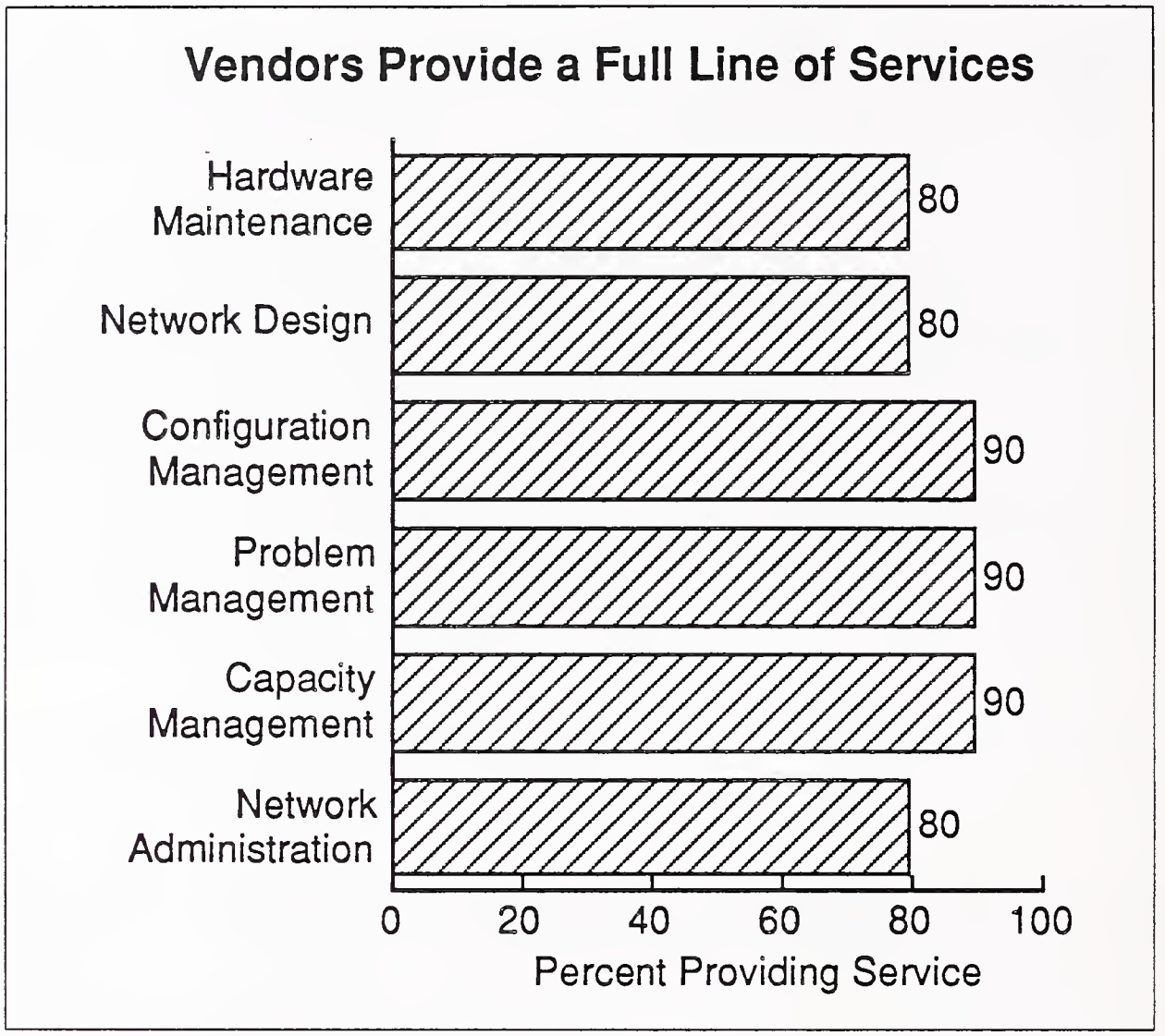
As shown further in Exhibit V-3, vendors indicate that they are able to provide a full set of services for most types of networks.

However, when considering the types of networks and the management functions that vendors indicate they are either able to provide or plan to provide, concerns begin to arise:

- As previously indicated, when users were asked to rate the ability of different categories of vendors to successfully manage the user's networks, the responses were not enthusiastic, indicating that users are not all certain that vendors can successfully deliver the products and services offered.

- In comments related to the rating of vendor capability, users suggest that a PABX vendor may be able to manage voice systems and a LAN vendor may be able to manage an organization's local-area, wide-area, or metropolitan-area networks, but transferability of skills between voice, local-area, and data circuit management may be open to question.

EXHIBIT V-3



Though additional research might be needed to confirm the strength of these findings, there is a strong suggestion from user comments that vendors may not be successful at providing all services to all users - at least without significant expansion of their base of skills.

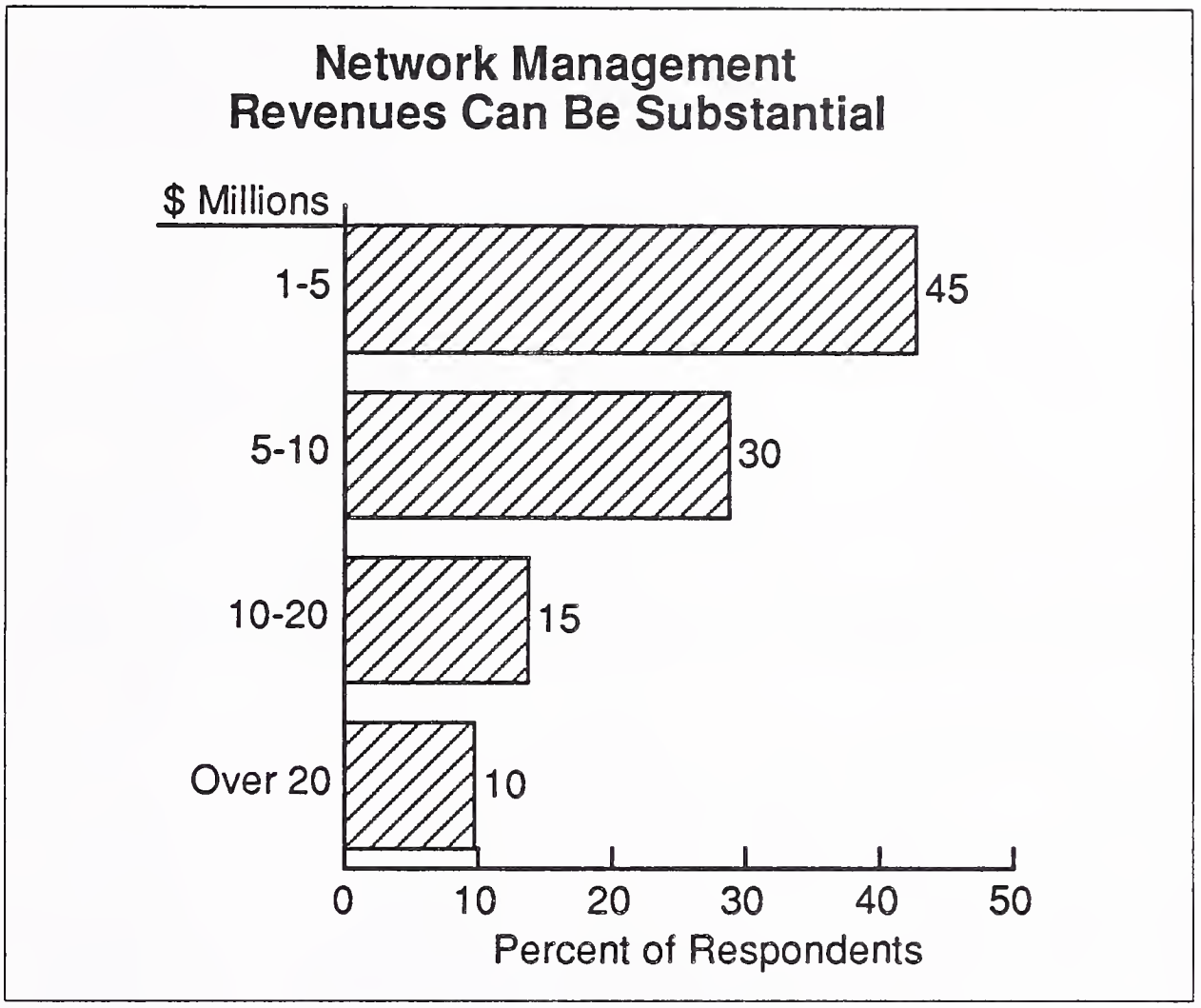
C

Contract Revenues

As part of the research, vendors were asked to indicate the revenues they receive from network management services. Though many consider the information to be proprietary, several did indicate their revenues within predetermined ranges. Exhibit V-4 provides a summary of the vendor responses.

From the vendor responses and comments made by users about the amounts they are currently paying in network management fees, INPUT believes that the $1-5 million per annum range is reasonably representative of the annual amount that may be expected from a typical network management contract, including all elements.

EXHIBIT V-4



However, there are several factors that need to be taken into account when considering expected revenues:

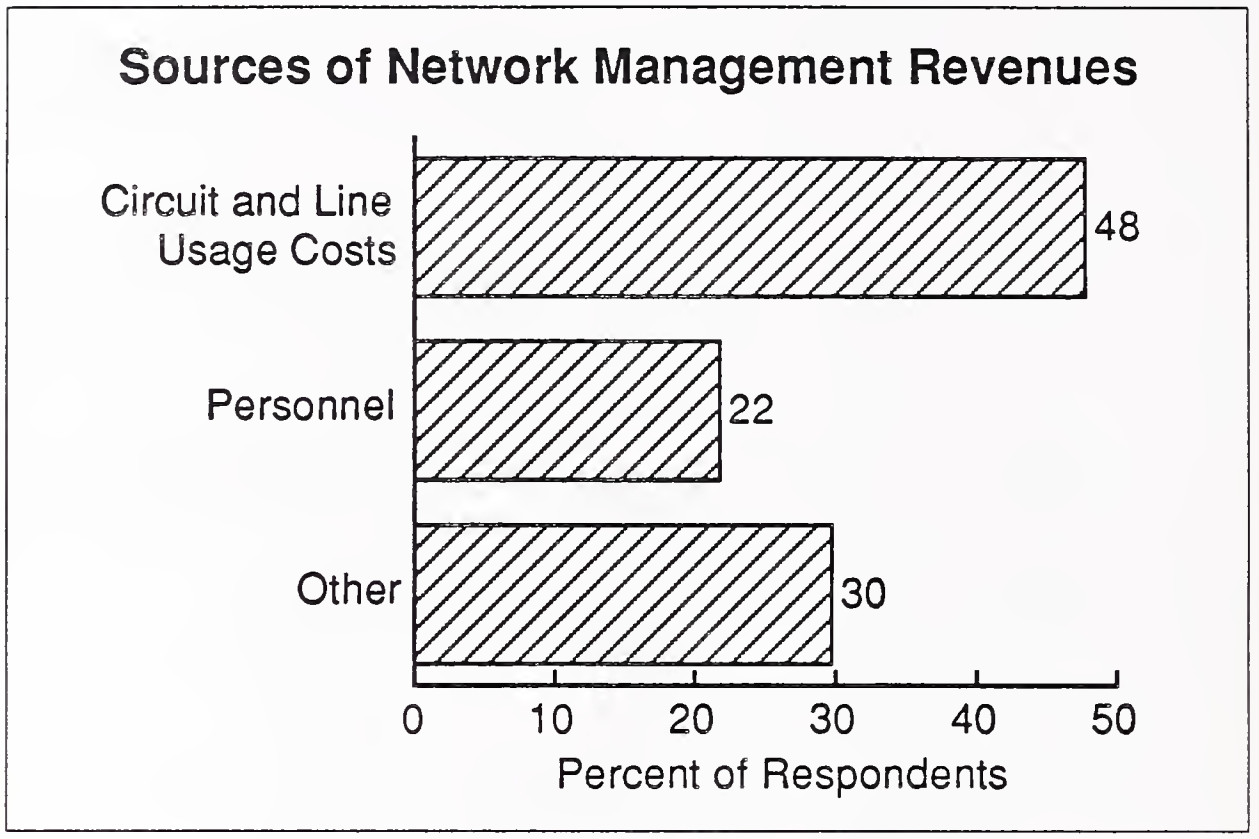
- The one thing to consider is a breakdown of the source of the revenues. As indicated in Exhibit V-5, a significant portion of the revenue may be derived to cover carrier services.

- Circuit and line usage costs represent almost 50% of a user's expenses. Though this is an important source of revenue for carriers, it should be remembered that a carrier would receive these revenues anyway, and a non-carrier would need to acquire the capacity and pass the costs through to the user.

- Performance of network management functions provides approximately 22% of the revenues. This portion represents both internal personnel expenses and expenses for consulting services.

- The other category includes network equipment rental, maintenance and purchases that are expensed. It also includes software and any specialized network management hardware.

EXHIBIT V-5

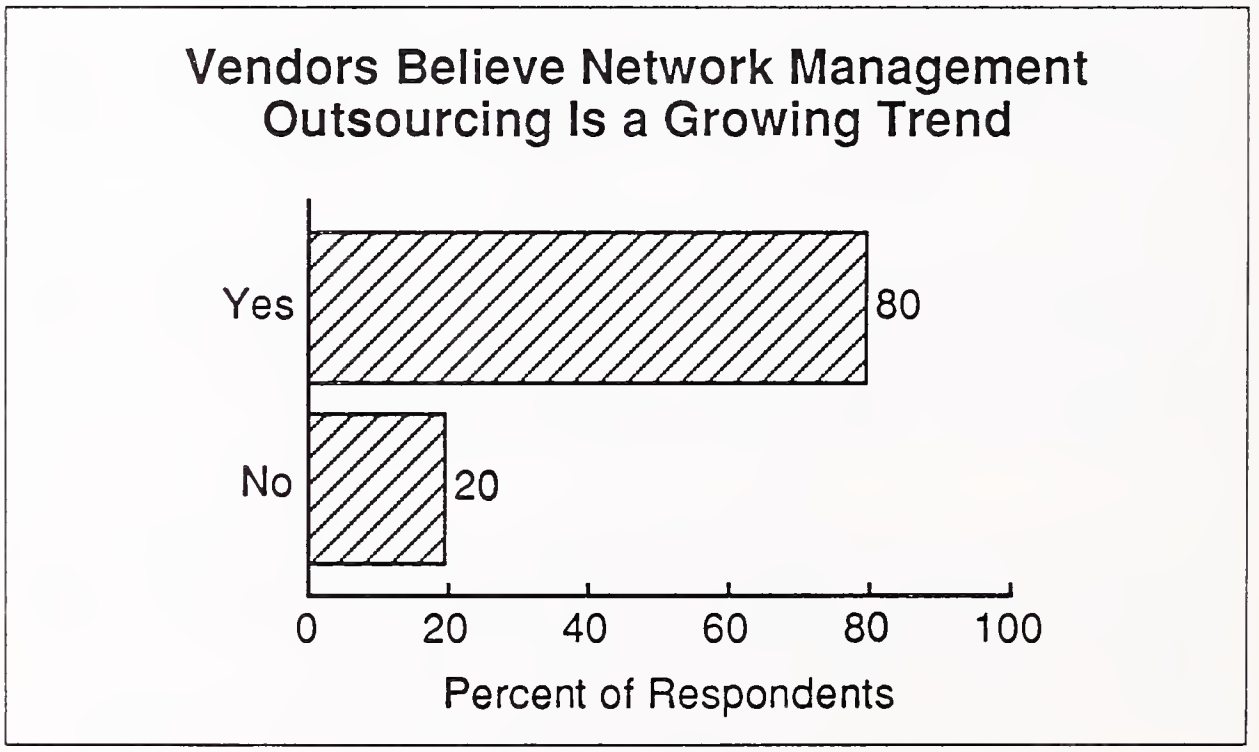


D

Vendors and Users Agree on Trends

When asked whether network management outsourcing is a growing trend, vendors generally agree with users that it is. As indicated in Exhibit V-6, the majority of the vendors indicated clearly that contracting for network management will become a way of life in many organizations.

EXHIBIT V-6



Note should be made that at least one vendor indicated that, though outsourcing will grow, there is not strong enough indication that it can be called a trend. The primary reason noted is that network management products are becoming so capable that many users will be able to successfully manage their own integrated networks in the future. This vendor believes that robust network management products will inhibit market growth.

Though the majority of vendors agree that outsourcing is a trend, the reasons were somewhat varied.

- The most frequently mentioned reason for the growth of vendor-provided network management is its reduction of operating costs. However, with users expecting a 20% savings for outsourcing to be considered attractive, and staff costs averaging 20% of expenditure profitability margins could be slim.

  - With circuit costs becoming increasingly competitive, there is less savings opportunity from circuit pricing, unless and until retailing of circuits (via resale arrangement) becomes more acceptable to the European telecomms authorities..

  - There is a strong indication that there will be a requirement for organisations to retain some level of in-house expertise to manage the vendor's work. The need to retain an expert staff reduces the benefits of slimming down on personnel expenses.

- Another frequently mentioned reason for network management growth is the growing scarcity of qualified staff for increasingly complex, integrated networks. However, if more comprehensive network management products emerge, integrated networks might be managed without significant additions to staff.

- Several other reasons for vendor management of networks were also cited. They include:

  - Increasing focus on core business competitiveness.

  - Greater availability of connectivity solutions.

  - Increasing risk (in making wrong decisions).

  - Political decisions.

The general theme of the comments suggests that the market for network operations management is at a turning point and could move in either direction - toward or away from outsourcing. INPUT believes that staff availability and quality will be key determinants to the direction.

In organisations where significant investments have been made in staff resources, and considering improvements made to network management products, larger organizations may not consider network operations management to be as attractive as do other organizations.

However, in organizations were staff is in short supply and funds are not readily available to meet the needs of increasingly complex networks, there is increased focus on network management outsourcing.

E

Vendor Qualifications Important

Both vendors and users consider vendors' qualifications to manage a user's network important. However, there is doubt in the minds of users about vendors' current qualifications and their ability to increase skills and capabilities.

1. Vendor-Identified Qualifications

As part of the research, vendors were asked to identify the qualifications necessary for a vendor to successfully provide network management services. The qualifications identified in Exhibit V-7 were closely aligned with users' comments about the requirements for successful management.

- Technical expertise was the qualification most frequently mentioned by all vendors. However, the important factor is that the expertise needs to be broad as well as in-depth. Vendors must be able to demonstrate expertise in telephone, local-area, and long-line data circuits, not in just one area.

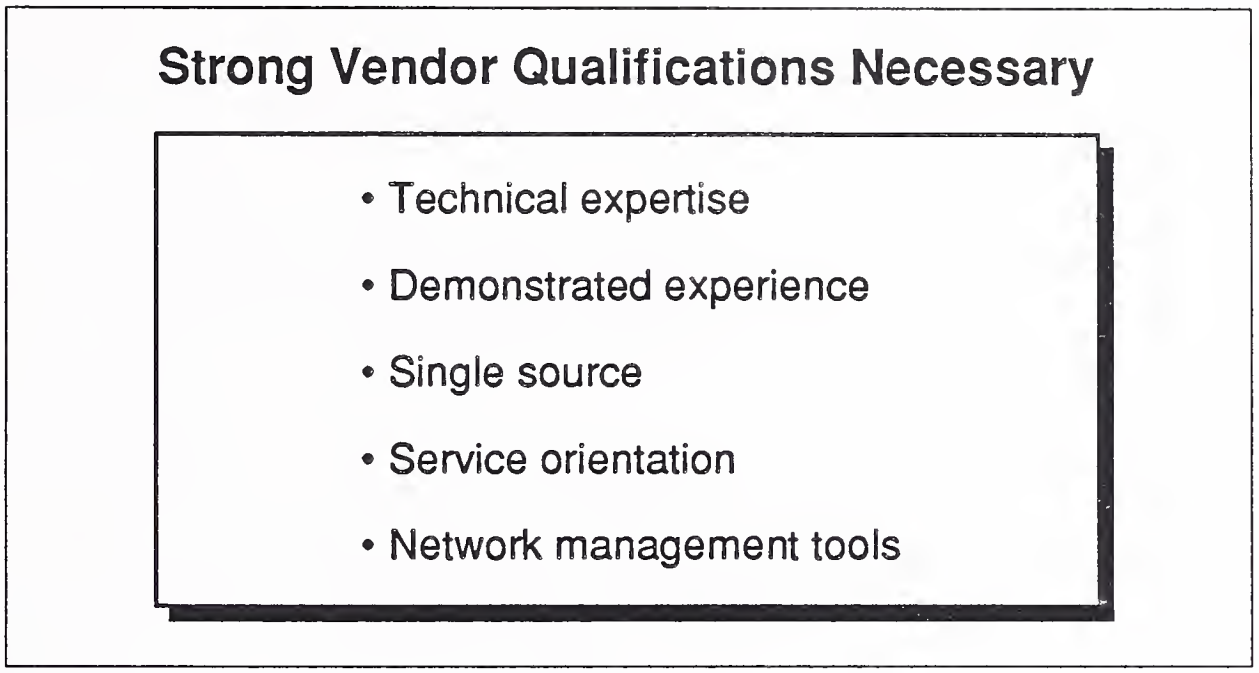
- Vendors must have proven experience. Comments from users indicate that vendors recognise that prior experience is an important factor in users' decisions to contract and in the selection of a particular vendor. This is not surprising, considering the growing criticality of networks to the business and users' perception of vendors' ability to successfully manage networks.

- Vendors agree that they should be able to act as a single source for all types of services. Users generally do not want to have to contract with multiple vendors to meet the needs of a variety of network types.

- Vendors must have a strong service orientation. Vendors realize that users are concerned about giving up control of their networks and are aware of the visibility that results from having control. Proactive support can provide users with the degree of control necessary.

- Being able to provide comprehensive network management tools is also important. The availability of and ability to use network management tools demonstrates an understanding of the functions necessary to manage a network.

EXHIBIT V-7



2. User Ratings of Vendor Qualifications

Although there is a general understanding among vendors of the qualifications necessary to successfully manage a network, responses from users indicate that vendors have not as yet successfully demonstrated that they have the necessary qualifications.

As indicated in Exhibit V-8 users generally do not think that any of the categories of vendors have sufficient ability to provide network management services.

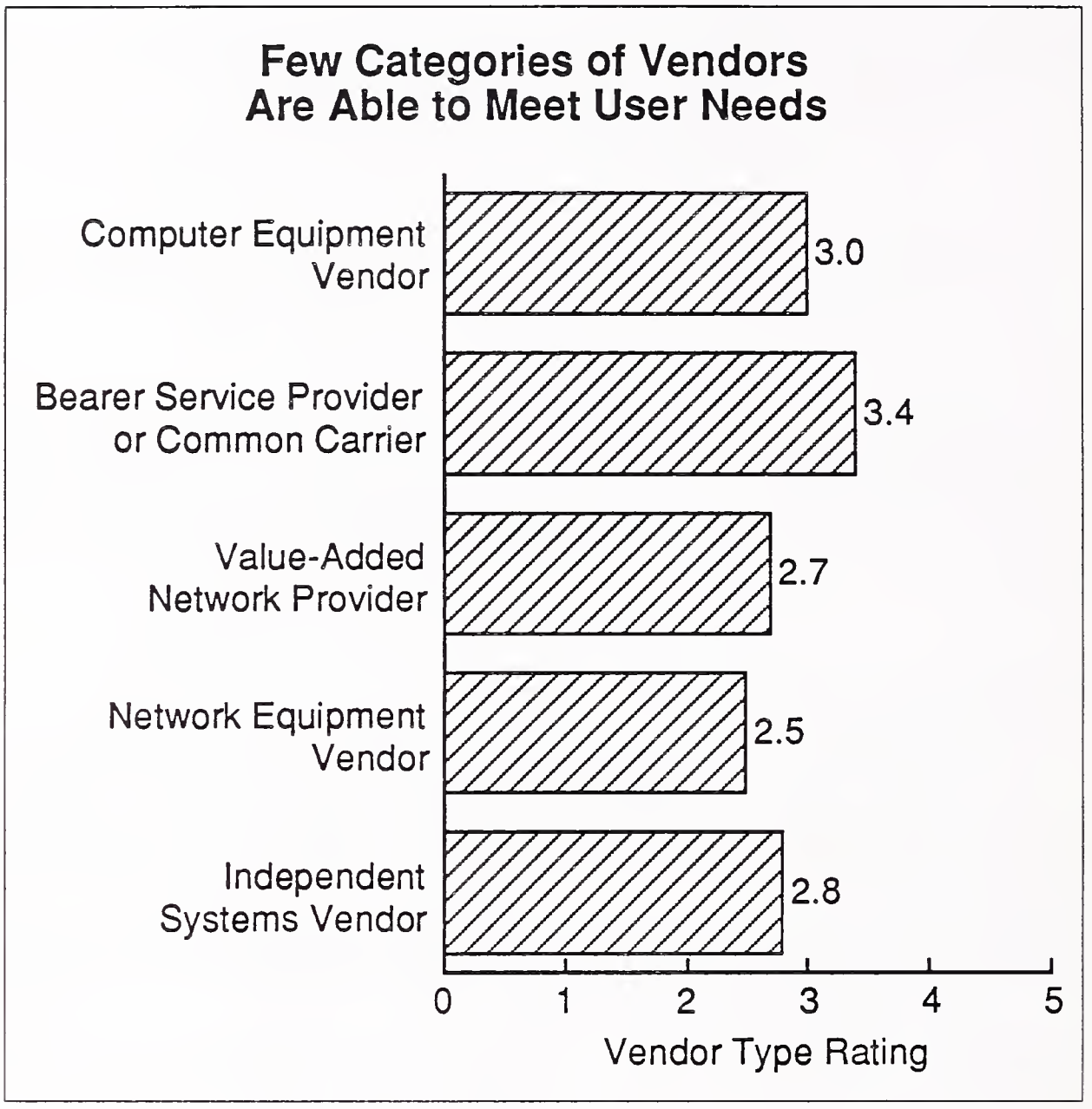
- Common carriers such as AT&T, France Telecom or British Telecom received the highest rating, but the rating was not significantly higher than for other types of vendors.

- Computer equipment vendors, including DEC, IBM, and Unisys, were rated only slightly lower than the common carriers.

- Aside from the common carriers and equipment vendors, no types of vendors received a higher than average rating.

- Overall, the ratings indicate that all types of vendors need to upgrade their skills and to demonstrate that they can successfully manage a variety of types of user networks.

EXHIBIT V-8



F

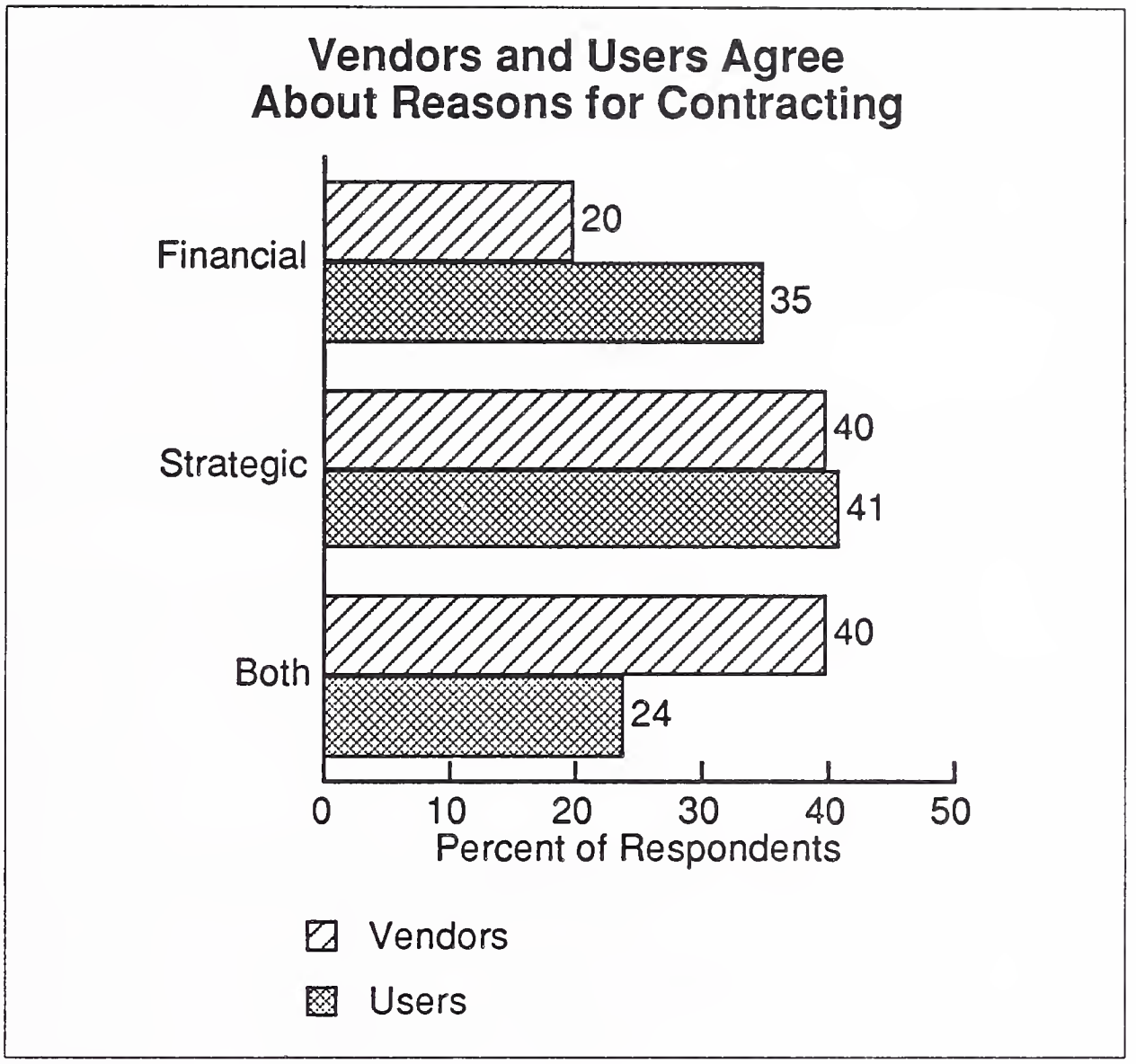
Vendors Perceive Strategy Benefits

Vendors generally believe that the primary benefits of contracting for network management services are strategic or a combination of strategic and financial. As indicated in Exhibit V-9, few believe that the benefits are purely financial.

In examining the responses, it is important to note that the percent of vendors and of currently contracting users that consider the benefits of contracting to be strategic is approximately the same. However, when considering whether the reason is financial, users and vendors disagree to a certain extent.

A greater percentage of vendors than users consider the benefits to be both financial and strategic. Users have a greater tendency to consider the financial benefits more obvious.

EXHIBIT V-9



G

Reasons for Contracting Out

Recognizing that there could be resistance to contracting for network management services, vendors and users were asked to identify the key factors that cause users to seek outside management services.

Vendor and user perspectives of key reasons that users contract for network management services are summarized in Exhibit V-10. Though the responses from vendors and users are similar, there are some differences.

- For vendors, the most frequently mentioned reason that a user would consider contracting is increasing internal costs. The responses indicate that vendors believe that increasing cost pressures will necessitate seeking outside assistance.

- For users, cost considerations are also important, but their interest is more in cost benefit, rather than in cost reduction. To users, cost reduction alone is not enough; intangible benefits such as improved quality or potential cost avoidance are perceived as being as important as short-term cost reduction.

- Vendors indicate that increasing focus on the core business will cause users to seek network management assistance. Users did not mention increasing business focus as a reason for contracting. With respect to increasing business focus, INPUT believes that vendors are more closely aligned with industry trends than are users.

- Expertise is an important factor to both vendors and users. However, their perspectives are slightly different. Vendors tend to view a lack of current expertise as a reason to contract. Users consider a loss of expertise to be a reason for contracting.

  - The vendors' view indicates that users do not have the expertise to manage complex networks.

  - Users' responses indicate that they have the staff and only need training to have the necessary expertise. Users are concerned about losing their base of expertise and not being able to meet future needs.

- Increasing network complexity was mentioned by both vendors and users. Both generally agree that networks are becoming increasingly complex to manage, and that integrated networks will require increasingly knowledgeable management.

In general, vendors' perspective of needs and requirements are closely aligned with users'. However, vendors tend to rate their abilities to meet user requirements higher than do users.

INPUT believes that time will be required for vendors to become more closely aligned with user requirements. The business of managing user networks is in the early stages and many vendors will need to make the necessary investment to meet the requirements.

EXHIBIT V-10

Reasons Users Contract for Network Management

Vendor Perspective	User Perspective
• Increasing costs	• Loss of expertise
• Business orientation	• Network complexity
• Network complexity	• Cost benefit
• Lack of expertise	• Short project timeframes
	• Existing supplier relationship

H

Market Leadership Opportunity

When considering the vendors of network management services, it is important to recognize that the market is young and there are no real leaders, at least in the mind of the users.

As part of the survey, users were asked to rate the ability of five categories of vendors to successfully provide network management services. None of the vendor categories were rated highly and the ratings for the leading categories were heavily qualified.

Based on the user responses and a review of industry data on the product and service trends of major vendors, INPUT developed a ranking of the likely leaders in providing network management services. The current and potential future rankings are discussed below.

1. User Ranking

In reviewing the user rankings, it is important to acknowledge that the rankings are based on the users' perception of vendors' ability to successfully manage a network.

The ranking is intended to reflect the ability of vendors to meet the broad requirements of design, implementation and ongoing management of increasingly complex networks that include voice, data circuits, and local- ,wide- and metropolitan-area networks.

The fact that some types of vendors are not market leaders is not a reflection on those vendors' products as a critical element in the management process.

It is also important to acknowledge that the industry is changing rapidly and that strategies being developed today could result in a change in the rankings in the not-too-distant future.

The ranking of vendor categories, based on the user responses, is shown in Exhibit V-11. There are several considerations related to the ranking.

- The fact that user ratings resulted in common carriers being ranked as leaders was as much a matter of default as of positive recognition. The same can be said for the equipment vendors. In general, having no real basis for comparison, users tended to identify leaders based on name recognition.

- The high ranking of independent vendors was influenced by two factors:

  - The survey contained a percentage of public sector organizations, which, for competitive reasons, have a greater inclination to select independent vendors than do large national and international companies.

- In a number of cases, organizations that selected independent vendors did so to meet a specific need, for example, the management of a local-area network. Few large vendors are perceived as having the necessary inclination or experience to successfully manage local-area networks.

EXHIBIT V-11

User Ranking of Leading Vendor Categories

Vendor Category	User Ranking
Bearer services/common carriers	1
Computer equipment vendors	2=
Independent systems vendors	2=
Value-added network providers	2=
Network equipment vendors	5

2. Potential Future Ranking

Since users perceive that there are no current leaders, INPUT reviewed industry data about the products and services of the vendor categories in an attempt to identify which vendor category might be best positioned to emerge as a future leader in network management services.

INPUT's assessment of likely leaders is summarized in Exhibit V-12. There are some notable differences from the ranking based on user assessments.

- Providers of network equipment - specifically those providing modems or large, intelligent multiplexers, such as Motorola Codex, NET and Timeplex; and providers of standalone network management equipment, such as Master Systems or Spider Systems are expected to remain at the bottom of the list for several reasons.

  - Much of the equipment is oriented to data networks and, though the products are changing rapidly, there is no strong indication that these products will be able to meet the range of needs for managing a large, integrated network.

  - Considering the specific expertise needed to develop these types of products and the increasingly reduced margins, investments in the breadth of staff expertise necessary to manage areas beyond their product focus does not seem likely.

  - For this category of vendor, alliances with larger vendors that have a broader base of expertise (such as carriers and equipment vendors) appear to be a more suitable approach than venturing on their own.

  - Having said that, certain vendors in this class were rated as highly service-orientated companies.

- Although independent vendors are not ranked high, the ranking must be qualified.

  - The ranking reflects consideration of the total market opportunity, in which independent vendors are not expected to be major providers. Their expertise is generally oriented to a particular technology (e.g. LANs) or to a particular market sector (eg. manufacturing systems).

  - If a specific market sector or a particular technology in which the vendor had particular expertise or was highly price-competitive was being considered, independent vendors would be ranked much higher.

- Computer equipment vendors are becoming increasingly able to provide a wide range of expertise and are expected to be key participants in major contracts. However, there are several reasons that they are not the potential leaders.

  - Major equipment providers are traditionally orientated to their primary products and have not yet demonstrated significant expertise outside their traditional line(s) of business.

  - Though they have expanded their product lines increasingly throughout the enterprise, there is not much evidence to suggest that they have the breadth of knowledge to take on the full range of responsibilities associated with managing large, integrated networks, particularly in terms of demonstrating a flexible, service approach.

  - The design and engineering of large voice networks is one area in which the majority of computer equipment vendors lack expertise.

  - However, note should be made that equipment vendors can be expected to take opportunities where the primary focus is on systems operations as well as network operations management.

- Bearer service providers are generally perceived to be in the best position to provide network management services. They have extensive knowledge in both voice and data networks and much of their knowledge can be applied to local-area networking.

- Based on these considerations, bearer service providers and common carriers could be ranked as the leaders. However, there are several reasons why they have not been ranked at the top of the list.

  - Although substantive changes have been made to both their images and their offerings carriers are still burdened with the management style of a regulated entity. This frequently makes responding to rapidly changing markets difficult.

  - With the exception of very large national and international contracts, carriers may have limited opportunity for price negotiation.

  - Carriers such as AT&T have difficulty competing in local markets, and national carriers have difficulty competing at the international level.

  - Though major carriers have network management and local-area networking products, there is currently little to suggest that they have the knowledge to take on the full range of responsibilities associated with managing local-area networks.

- INPUT believes that the major value-added network services (VANS) providers are in the best position to become market leaders over the next several years.

  - The nature of the VANS business frequently places them in closer touch with end users, which gives VANS providers a degree of end-user knowledge that other providers may not have.

  - VANS carriers have placed increased emphasis on the development of enterprise-wide network solutions. The solutions include both intra- and inter-organisation networking. Included in the development of enterprise networks is the interface of local-area networks.

  - Though VANS providers do not have extensive experience in voice systems, the nature of the VANS business necessitates an understanding of voice network engineering and management. In addition, consortia alignment of the major VANS with carriers provides them with a high degree of voice system expertise.

  - This type of alignment with carriers also gives the VANS providers access to high-capacity circuits. And because the VANS vendors are not under heavy regulation, they have greater pricing flexibility than do regulated entities.

  - Like carriers, VANS providers also have sophisticated network management capabilities. Research indicates that they are continuing to enhance this capability with products for specific customers' sites.

EXHIBIT V-12

Ranking of Potential Leaders by Vendor Category

Vendor Category	Ranking Potential
Value-added network providers	1
Bearer services/common carriers	2
Computer equipment vendors	3
Independent systems vendors	4
Network equipment vendors	5

Many factors can influence the ability of any of the categories of vendors to become market leaders.

- The VANS providers must move quickly to establish recognition that they have strong network management capabilities. As indicated by the user ratings, they are not generally recognized today. For VANS providers, the key issue is whether they will be able to make the necessary investment to establish themselves in the market.

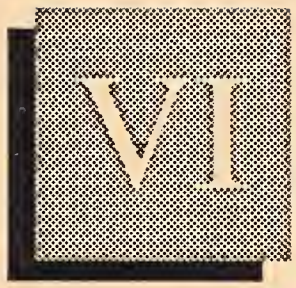
- For national common carriers, establishing a market position will be difficult, except in those cases where an organization's activities are totally within their area and the organisation's networking requirements are voice- and data-oriented.

- For the major international carriers, the key issue will be the extent to which they can successfully leverage their acquisitions of major VANS suppliers.

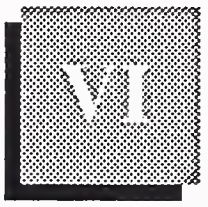
- Unless the VANS providers and the national carriers can successfully meld their interests for mutual benefit, including ongoing support, their positions as potential leaders may be lost to the major equipment vendors.

- Equipment vendors can increase their leadership potential by establishing strong, committed relationships with organizations that are more heavily orientated to voice and local-area networks.

- The ranking of computer equipment vendors may be partially dependent on the extent to which network management contracts are tied to systems operations contracts. If the development of systems operations contracts results in major network management contracts, either equipment vendors or systems integrators could emerge as the leaders.



Managing User Networks



Managing User Networks

A Network Management Described

To understand the growing importance of networks, several factors must be taken into account, since they have a direct bearing on the size of the market for network management services and the approach to be taken to penetrate the market.

The first factor is the definition of a telecommunications network. INPUT defines a network as:

"Electronic interconnections between sites or locations that may incorporate links between central computer sites and remote locations and switching and/or regional data processing nodes."

When considering the definition, there are several things to keep in mind.

- The definition encompasses data, voice, video, and textual information.
- The definition excludes applications software systems.

With the definition in mind, vendors of network management services must be aware that a network is viewed differently by end users, by information systems and network managers, and by vendors of network-related equipment or services.

Awareness of these differences is necessary, since the view of a network has a direct bearing on the degree of difficulty in marketing network management services.

1. User Perspective of Networks

Both general industry and INPUT research concludes that end users (salespeople, accountants, executives, etc.) generally view a network as the method by which a fax or a message is sent or received or a telephone call is made.

Beyond the somewhat vague reference to the presence of a network, they have little knowledge of how systems connect or how data is transmitted.

In general, a network is viewed by end users much like a cloud might be viewed. They know that it is there, but have little knowledge of its composition or the complexities of creating one.

Just as people expect days to be sunny, they expect lights to turn on with the change of a switch and networks to transmit data fast and reliably. They certainly have little, if any, interest in or knowledge of what is required to manage a network.

The user's perspective of a network is important to both information systems managers and vendors.

- To the information systems manager, the user's perspective means that increased education and greater effort is needed to install an understanding of the value of effective network management.

- To the vendor, the user perspective is also important. Since the end user is increasingly the customer, the user must readily understand the value of effective management.

2. Information Systems Management's Perspective of Networks

Information systems management's perspective of a network is also important, since management must be able to understand the need for a variety of skills to address the rapid changes in technology.

From an information systems or telecommunications manager's viewpoint, a network is more a collection of discrete parts that must fit together into a single delivery highway. They frequently have little understanding of a user department's needs or concerns.

Since the network management process can be time-consuming and costly, particularly in the light of rapidly changing technology, managers must continually weigh the benefits of in-house management with the advantages of a comprehensive management service.

Compounding the difficulty of managing increasingly complex networks and recognizing that users are increasingly in charge of expenditures, information systems and telecommunications managers must be able to convey management needs and outsourcing options in terms that users can understand.

3. Vendor Perspective of Networks

A vendor's perspective is generally orientated to a specific product or service. Vendors of large PBXs or intelligent multiplexers provide a high degree of product expertise.

However, in the opinion of users, though many products are good and will meet specific needs, vendors do not have sufficiently broad technical or management skills to meet the needs of managing a complex network.

4. Describing Network Management

Network management is a complex set of interrelated tasks, a primary purpose of which is to balance a wide variety of technological solutions in a continually changing environment.

Primary network management functions, listed in Exhibit VI-1 and discussed further in this section, have the following characteristics:

- Network design is a continual process of trying to balance the benefits of new technology with the requirements of constantly changing organizations.

- Configuration management is a process of trying to ensure the maximum utilization of available equipment and services.

- Problem management is a process of continually reacting to end-user problems, to failures and capacity overloads.

- Capacity management is the ongoing process of ensuring that the network is able to handle end-user needs despite the fact that they are generally not well-known nor forecast.

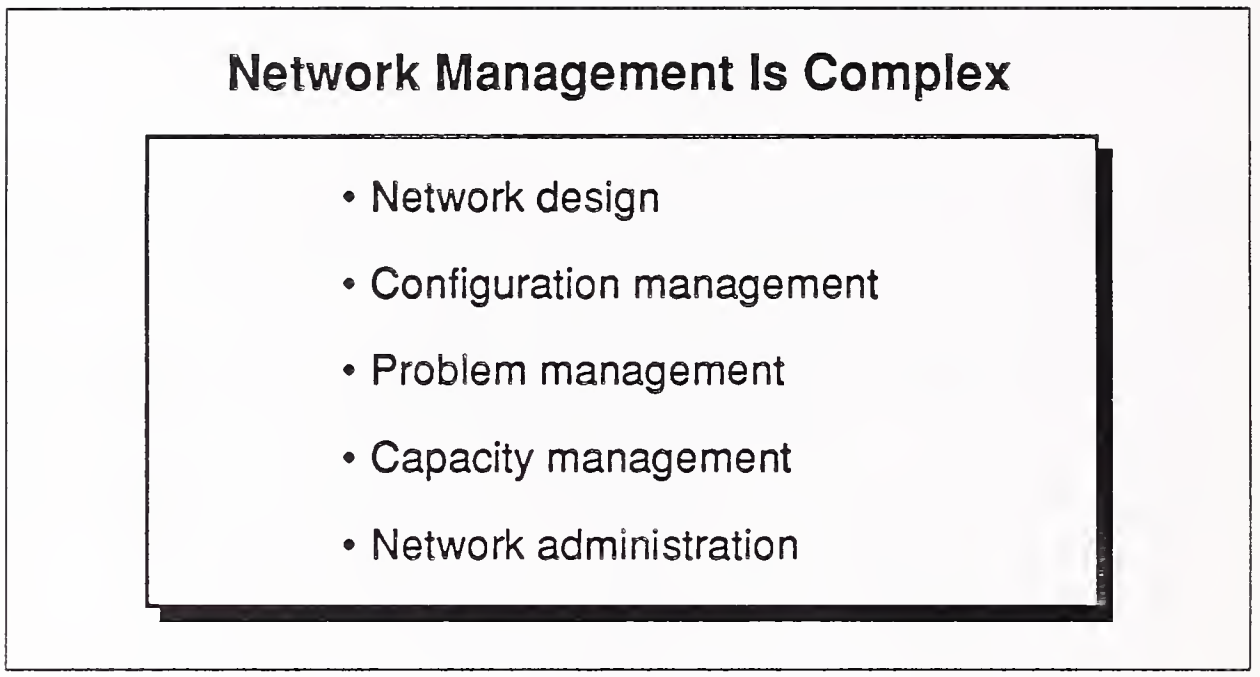
- Network administration handles the end-user billing very much as a utility bills its customers. Bills have to be accurate and any errors must be corrected. Administration also includes:

  - Handling orders for new service or changes to existing services.

  - Managing the network equipment inventory.

For the purposes of this report, management reporting is considered part of administration. In some larger organizations, this may be a separate task.

EXHIBIT VI-1



B

Network Management Functions

Network management covers a wide range of activities. Although these activities can be described as being in several neatly separated categories, they are, in fact, a closely interwoven set of daily activities.

The following provides a description of major activities included in each of the functions.

1. Network Design

Numerous activities are included as part of network design. Performed inadequately, they can have a significant effect on an organization's strategic position and operational ability.

a. Strategic Planning

In telecommunications, as in other parts of organizations, strategic planning has until recently been given verbal support, but frequently little else. This has begun to change.

Until recently, only a small percentage of information systems organizations included strategic telecommunications planning as part of their plans. Two years ago, users indicated that only 60% of information systems plans included telecommunications. Today, that number has grown to 90%.

An increasing number of organizations have developed strategic telecommunications plans, but the plans are frequently less than comprehensive. The plans are often narrow in focus and orientated to the application of current technology.

In addition, few telecommunications plans are followed. Operational necessity frequently requires focus on daily activities and crisis management rather than strategic planning.

Today, telecommunications is increasingly accepted as a strategic asset and there is increased emphasis on ensuring that integrated networks are in place to meet future needs.

b. Network Design

Network design is an increasingly critical activity for several reasons.

Users are placing increased emphasis on the application of new technology that can improve cost-effectiveness. The ability to use wideband circuits multi-functionally can provide significant economic advantages.

There is an increasing need to integrate LANs into the corporate network. Developed as standalone islands, LANs are becoming a corporate asset and need to be managed like other assets.

Users are devoting more time to planning for the use of public services that will enhance the value of their networks. Services such as EDI and electronic mail are receiving increased attention.

In addition to the development activities, there are continuing needs to assess least-cost routing alternatives for leased circuits. With the increase in competition for national and international services, additional emphasis is being placed by a number of organizations on assessing alternative services and design.

c. Network Optimisation

As networks grow and improved technologies become available, opportunities arise to improve the performance of the network. Most users interviewed are in a continuous process of network optimisation planning.

The frequent changes in price and structure of existing services and the introduction of new products and services require frequent examination of the network to optimize costs and service performance.

d. Disaster Planning

Few organizations have a formalized disaster plan. Typically, they have plans for management of component failure situations, but few plans address major failures, particularly the failure of a communications centre in a major plant or office.

2. Configuration Management

Configuration management includes two separate but related activities.

- Static configuration management is maintenance of a network as it exists at a given time, usually at the time it is set up. This is frequently used as a basis for inventory management, but can become quickly outdated.

- Dynamic configuration management is the actual configuration at any given time. It reflects changes that have been made to accommodate line and equipment outages and plans for pending changes.

Frequently viewed as a less important activity, proper management of an organization's configuration can result in significant savings.

As the process of network integration grows in importance, configuration management must also become more important. As an increasing number of workstation and PC users demand access to corporate systems, network managers must have knowledge of the demands that can be made at any given time.

3. Problem Management

Problem management is the most common function of network management, and continues to require the largest portion of network management expenditures. But it is only one of many tasks.

Although users expect that new diagnostic tools, digital networks, and improved management procedures will help contain costs, the integration of complex networks may make problem management increasingly difficult in the future.

In a network, identification of a problem can be difficult and time-consuming. Integration will make this problem more difficult.

- Isolating a faulty piece of equipment at the distant end of a network will require sophisticated tools that are only now becoming available. The complexity of the task is greater when device types are mixed on a network.

- In an integrated network, differing areas of expertise are needed to assist in problem identification and resolution. The skills necessary to identify, for example, voice system and LAN network problems are frequently different.

4. Capacity Management

As networks grow in both size and numbers of applications supported, the process of managing capacity becomes increasingly complex. The process will become more complex in the future, as organizations focus on integrated network services.

Forecasting capacity has always been difficult. Information staff forecast in technical terms (numbers of transactions) and users forecast in volume of business (eg. numbers of purchase orders). Traditionally, reconciling the two in terms of network capacity requirements has been less than satisfactory.

As network elements become integrated, forecasting will become increasingly difficult. The capacity forecasting measurements of voice and data have always been different, making integration difficult. The addition of interconnected LANs to an integrated network will make the process of forecasting capacity requirements even more difficult.

5. Network Administration

The process of network administration is similar to that used by the PTTs and common carriers. Activities include maintaining a directory, handling orders for new equipment, and maintaining a catalogue of equipment allowed on the network.

Network administration is highly customer-oriented, labour-intensive, and time-consuming. Although the integrated networks of the future may reduce some of the day-to-day problems of the past, they will increase the complexity and costs of network administration in some organizations.

C

Organisation of Network Management

1. Management Responsibility Changing

Until recently, data and voice networks were managed by different organizations for reasons that have both historical and technological precedent.

Voice communications have traditionally been part of a corporate administrative or other (operating) department function. A mainstay of corporate communications long before data communications, voice communications management was well-established before data communications began receiving management interest.

In addition to the historical precedent, design specifications for voice and data communications are different.

Voice communications can generally be of somewhat lower quality than data communications, since the human being has a greater ability to make adjustments to factors such as line noise and line feedback. Data communications must consider factors such as peak hour line loading, and voice communications must consider factors such as call holding time.

Until recently, voice and data communications have been viewed as sufficiently different that they needed to be managed by separate groups. However, this situation has been changing and will continue to do so.

As indicated in Exhibit VI-2 (from INPUT's 1990 forecast), responsibility for voice communications is fairly evenly split between information systems (data network management) and other areas of the organization.

- Research indicates that nearly 50% of information systems organizations now have responsibility for voice communications management. Only a few years ago, this figure was around 25-30%.

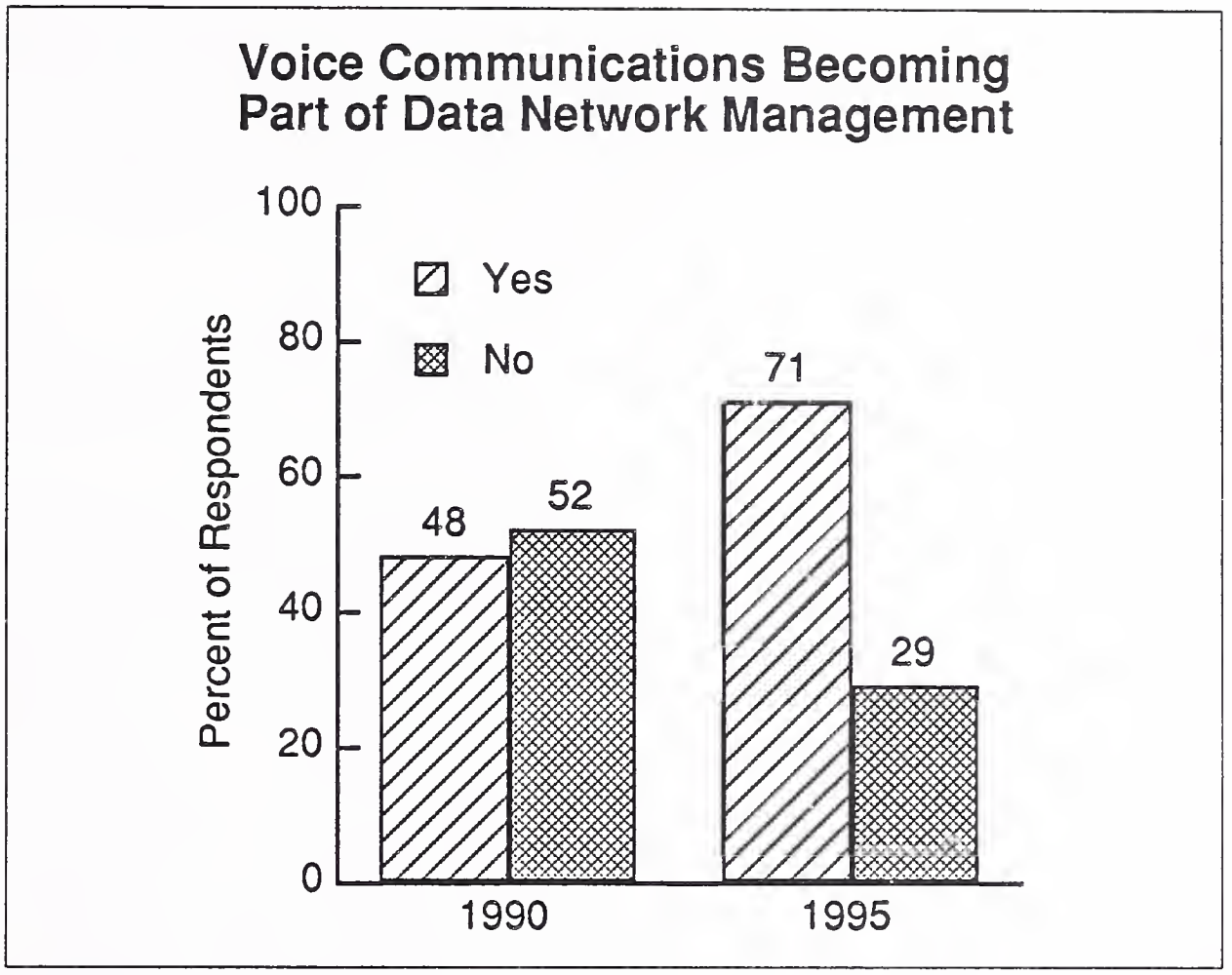
- As Exhibit VI-2 also indicates, users expect that the percentage of information systems organizations that will have responsibility for voice communications will increase to approximately 70% within the next five years. There are several reasons for this shift:

  - One reason is that, in many organizations, administrative or operating groups are more oriented to other aspects of the business and are not able to devote the time or technological expertise to this increasingly important business service.

  - Another reason is the growing emphasis on the integration of network-based services. As network services become more integrated, it is necessary to have an integrated management process.

  - The scarce resource represented by networking specialists will have to be shared from under one management function.

EXHIBIT VI-2



Today, voice communications that are not part of information systems are managed by a variety of groups. As indicated in Exhibit VI-3, a third are managed by an operating division or department. Nearly 40% are managed by an administrative department, and slightly less than 30% are managed by some other group.

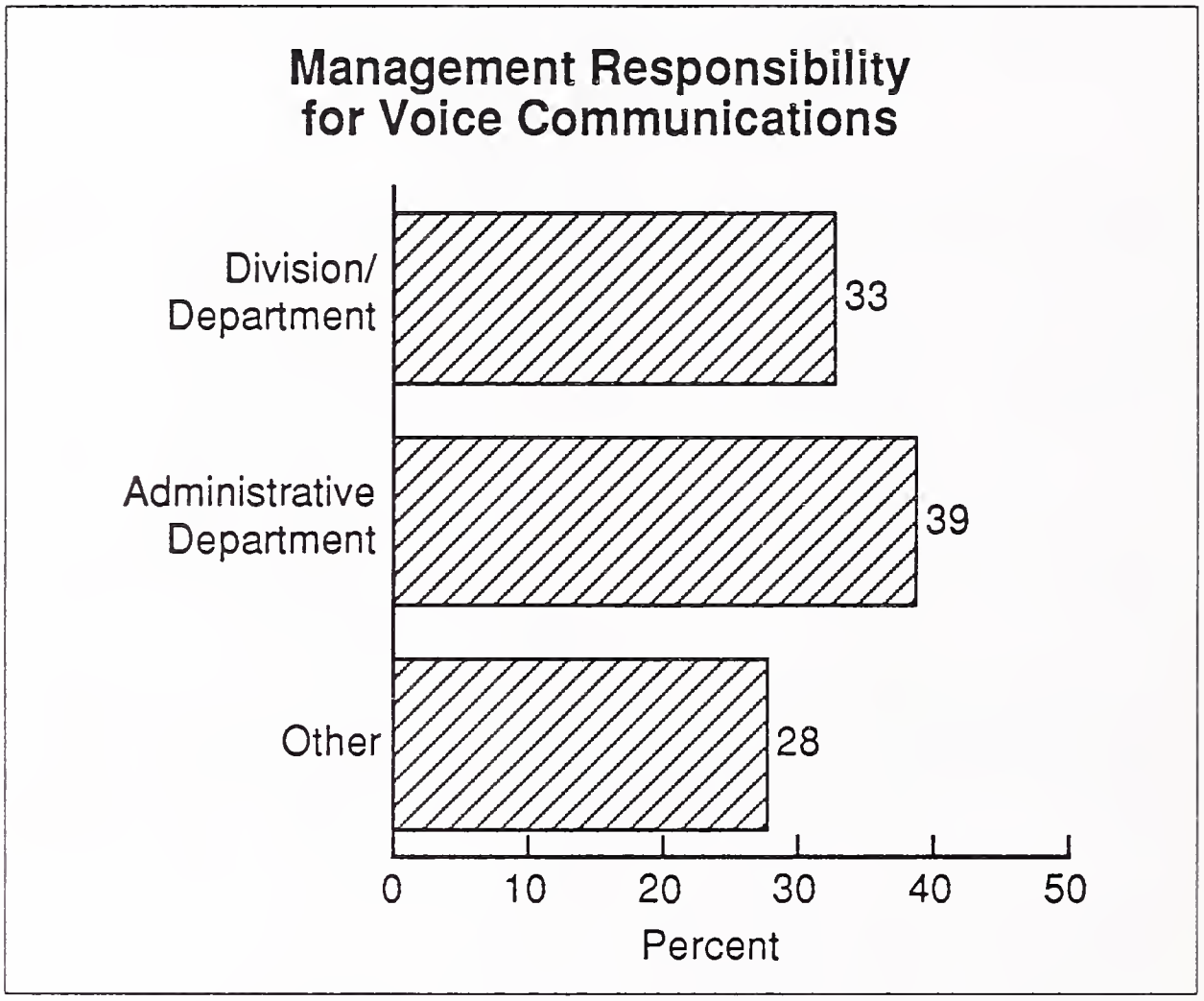
- The other category noted by nearly 30% of the respondents is managed by a separate organization set up specifically to manage voice communications. This practice is not uncommon in large organizations where there is an exceptionally large voice communications requirement.

- Migration of the other category to information systems responsibility is not a difficult transition. The organization and expertise exists and reporting responsibilities can be changed as necessary in response to growing needs.

- Migration of responsibilities that currently fall between divisions/ departments could prove to be more difficult. Divisions have frequently taken on responsibility because of their size and because the corporate information systems group has not demonstrated responsiveness to the users' needs and requirements.

- Migration of administrative department responsibilities is a logical transition. Many administrative managers will be more than happy to give up responsibility for voice communications. Those who do not want to relinquish control will find management in an integrated network environment increasingly difficult and will, of necessity, give up control.

EXHIBIT VI-3

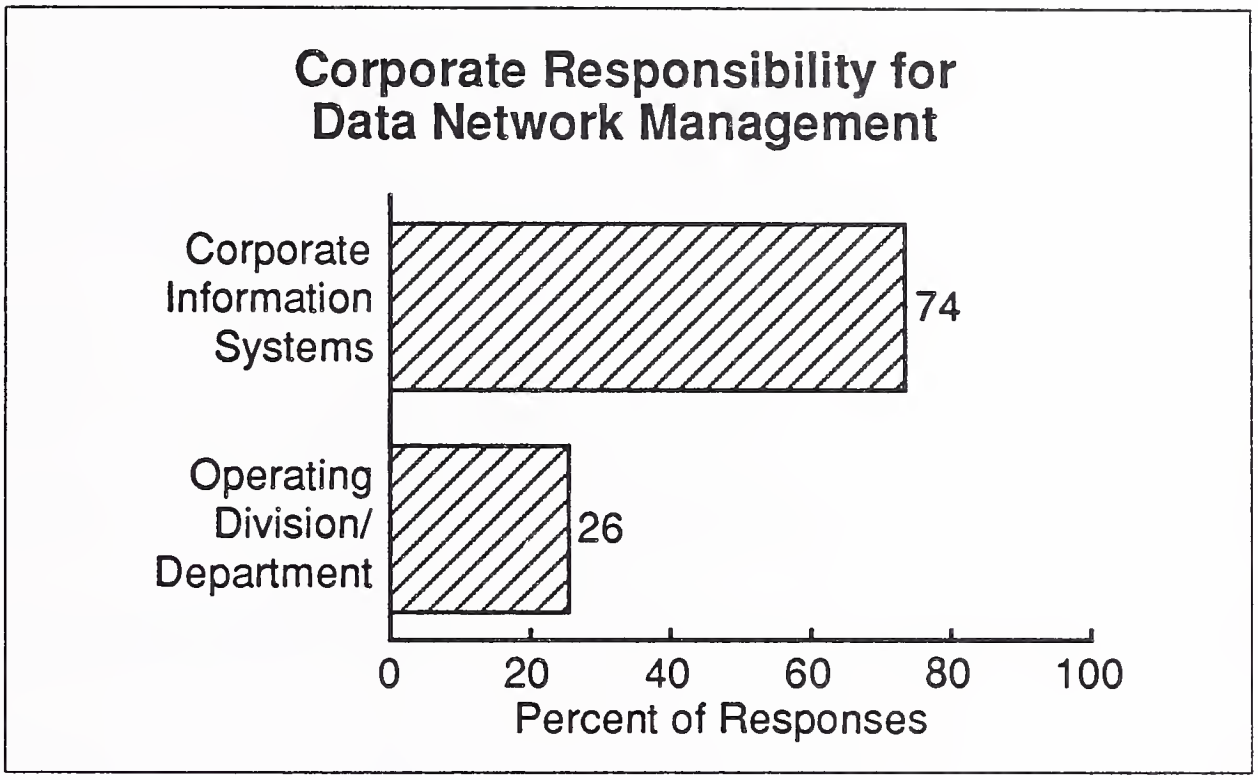


Whether the transition is easy or difficult, information systems will be increasingly responsible for both voice and data communications. As indicated in Exhibit VI-4, data networks are managed predominantly by a corporate information systems group.

Although an assessment of trends in responsibility for information systems is beyond the scope of this report, industry research suggests that at least some level of application responsibility will remain with a user's department or division.

However, INPUT believes that this will not be the case with an organization's networks. Though an application may only have a single user, a network must increasingly be able to serve multiple users. As a result, while some local voice requirements may continue to be met by division management, the majority will shift to corporate management.

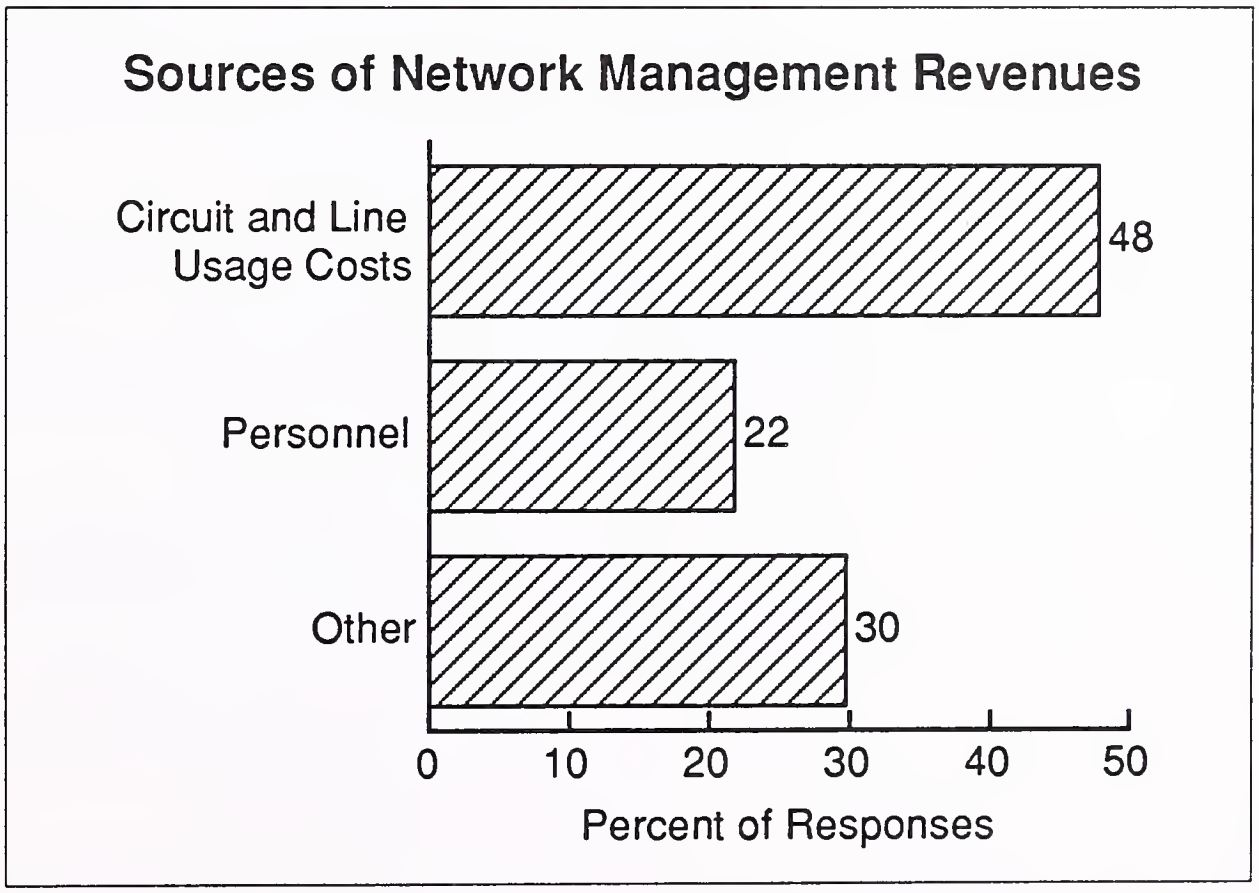
EXHIBIT VI-4



2. Network Management Expenditures

Over 80% of users surveyed for this study manage some part of their networks with in-house staff. When considering those that manage their networks in-house, users indicated that nearly 50% of their expenditures were for bearer services such as circuit and line usage charges, as shown in Exhibit VI-5.

EXHIBIT VI-5



When considering the breakdown of expenses into categories and interest in network operations management, several points are important to note.

- Circuit and line usage charges are generally tariffed rates and there is frequently little room for a vendor to offer a major cost advantage over any other vendor. Saving through options are available, but the real advantages may be realizable by only the largest organizations.

- Some saving may be realizable in the areas of hardware cost and maintenance, but the equipment and maintenance is highly competitive and there are frequently only small margins from which savings may be realized.

- The greatest savings potential is in the area of staff expenses, which can be more than 20% of an organization's costs.

When considering the breakdown of expenses by functional activity, there appears to be a reasonably even split between many of the activities, as indicated in Exhibit VI-6.

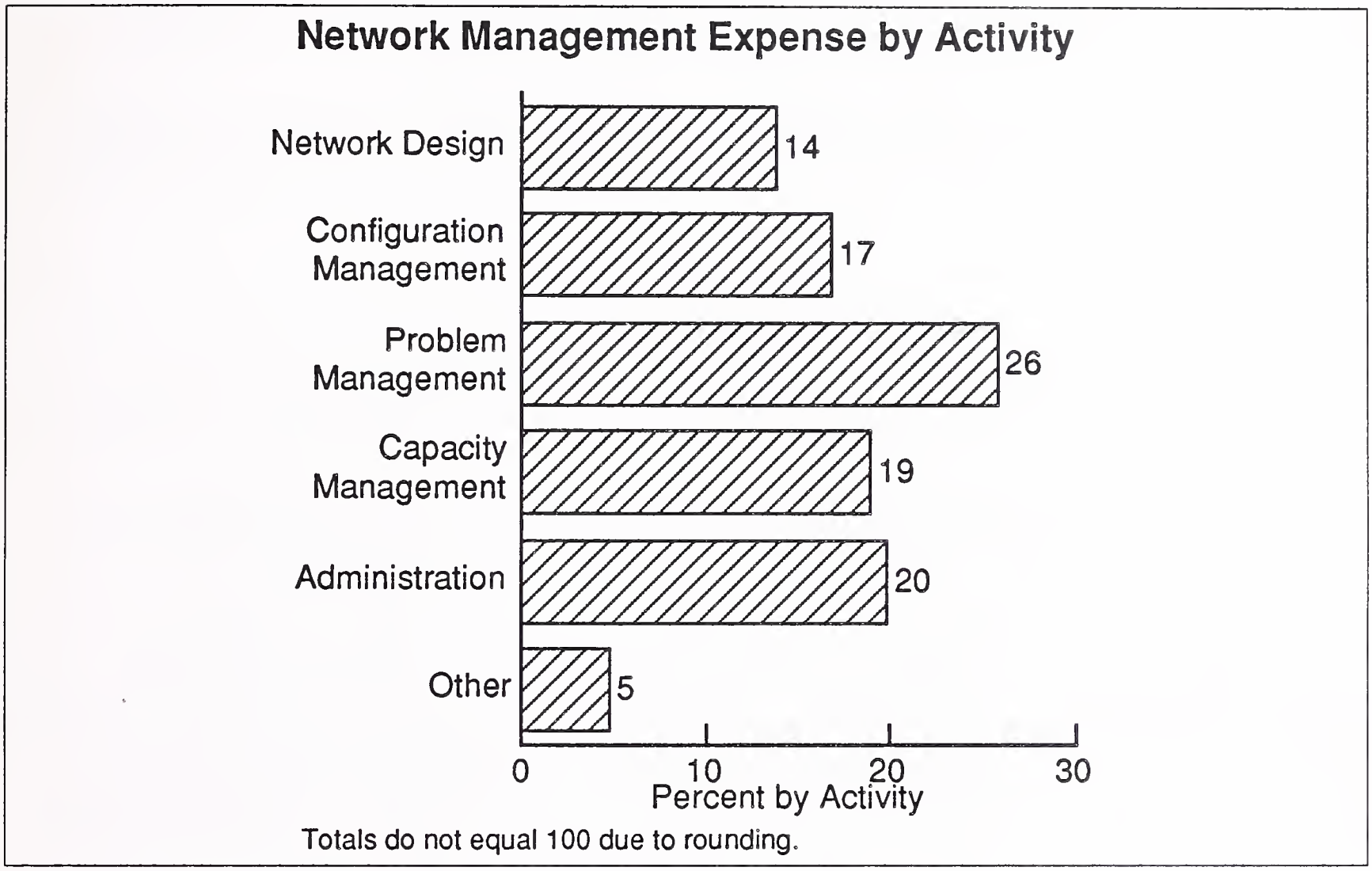
- Problem management, the process of identifying and correcting problems, represents an estimated 26% of the expenses. Though an increasing number of sophisticated tools are being applied, problem management remains a highly labour-intensive process.

- Problem management is also an area in which many users have the greatest concern regarding vendors. Many users believe that unless a vendor is pro-actively managed, it will not be as responsive to problem identification and correction. They believe, also, that proactive management can be lost when network management is outsourced.

In addition to the breakdown of internal expenses, users were asked to identify the percentage of their budget that is for external consulting services. On average, users indicated that they spend less than 2% of their network management budget for external consulting. The primary consulting services are shown in Exhibit VI-7.

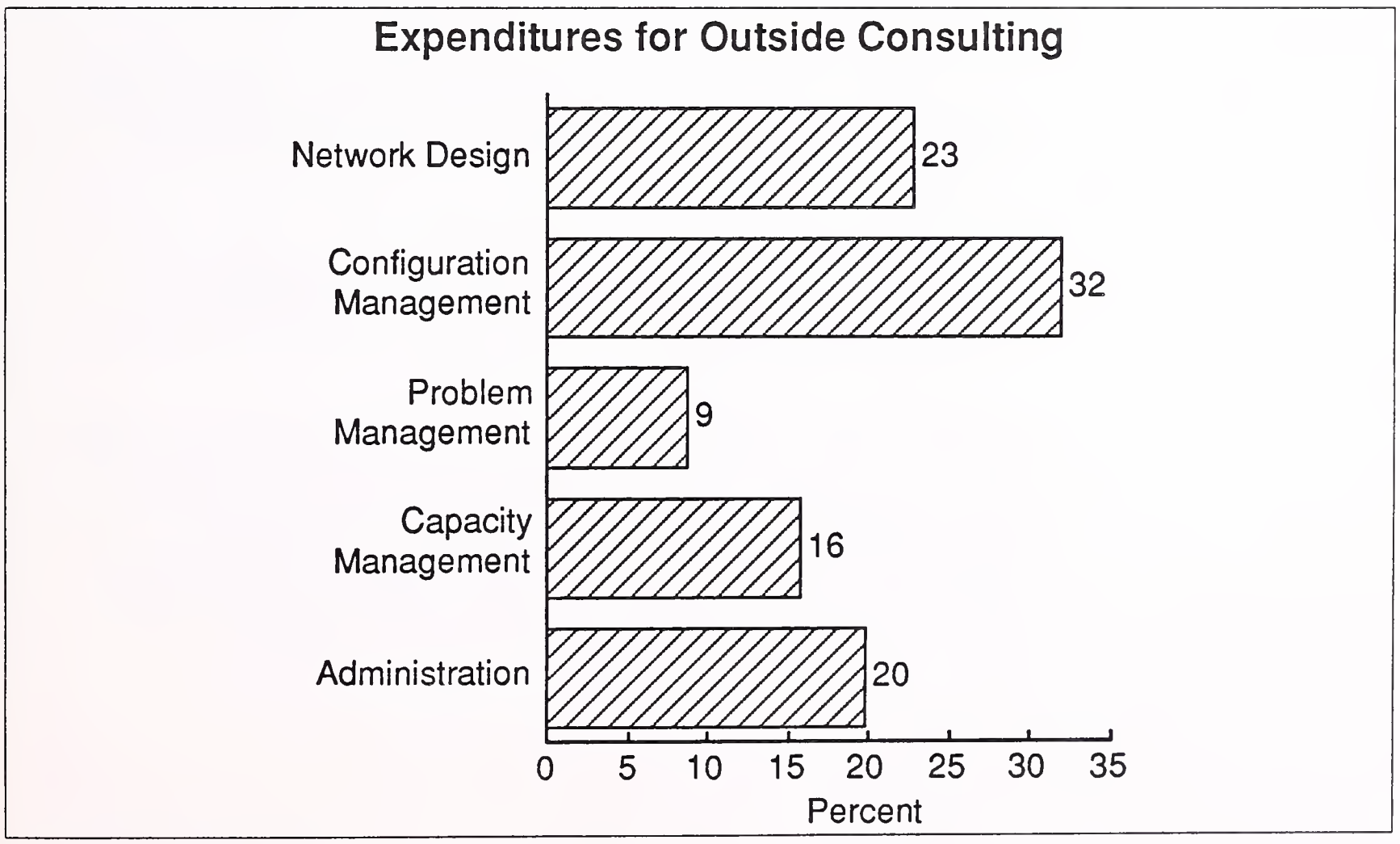
As indicated in the exhibit, configuration management and network design are the two areas of greatest expenditure. The 20% spent for administration is primarily for billing services and the cost to install and move equipment.

EXHIBIT VI-6



Totals do not equal 100 due to rounding.

EXHIBIT VI-7



D

Network Management Issues

Information contained in this section is derived from previous INPUT research into user needs and requirements for network management products and services.

This section explains many of the concerns that users have today about the quality of network management products and services, and indicates problems that many vendors need to address.

1. In-House Management Capability

A key determinant of how users manage their networks is their in-house capability. Generally speaking, the largest users tend to be the best equipped, primarily by having specialized and trained people available to work on network management tasks.

There are, however, several considerations that have a direct impact on the ability of users to successfully manage their networks.

- *Staff Levels*—Few organizations, even the largest, are adequately staffed to provide the comprehensive level of expertise necessary.

- *Training*—Though there are numerous technical classes dealing with network technology and design, few classes deal with the breadth of requirements for successfully managing a complex, integrated network. Most network managers have developed their skills through on-the-job training. Vendors do provide training, but their training is considered generally inadequate and orientated only to their own products.

  - There are no signs that user training will be expanded significantly in the near future. In addition to the lack of vendor or private courses, many managers are too busy solving problems to spend time on training.

  - The lack of training has significant implications for users and vendors of network management systems. Without comprehensive training, management tools go unused and networks operate at less than optimal performance.

- *Available Tools*—Most of the tools used to manage networks are either accessories to other network equipment, such as modems or multiplexers, or are technical test equipment. Though they are beginning to appear, few network management systems in use today address more than a narrow range of network problems. In addition, using sophisticated network equipment is frequently beyond the capability of user staffs.

- *Vendor Bias*—Users generally believe that support provided by most vendors is highly biased. Training and support is frequently made available prior to a sale, but may be seriously lacking after a sale. Users believe that support is provided only for the purpose of making a sale and that vendors have little true interest in management of a network.

2. Multinetwork Interface

Almost all users, even smaller ones, operate some form of multinetwork environment. The most common are hybrid technologies such as switched/private line, analog/digital, satellite/terrestrial, packet/circuit-switched, etc. Few users experience problems as a direct result of the interconnection of such varied technology.

In most cases, interconnection problems occur because of vendor interfaces and are at the level of people-to-people communications between vendors. Some examples of these problems are given in the user comments shown in Exhibit VI-8.

In many organizations, frustration with vendor support has caused users to take on increasing responsibility for network management functions. The frustration has also contributed to questions from users about vendor ability to successfully manage a user's network.

EXHIBIT VI-8

Network Interconnection Problems

- We leave connecting problems up to our vendors to solve.
- Vendor coordination. Lack of communication.
- Usually don't have problems in this area except if standards are lacking or nonexistent.
- We generally do not have problems except when there are no clear-cut standards; then there are problems in all areas.
- Interfacing between vendors.
- Security
- Physical connectively no problem. Protocols are problem.
- Problems in overall loss - especially in analogue systems. This is a system design problem.
- There are always problems and how you solve them depends on the situation.
- With the proper planning and detail work a great many problems can be avoided.
- The problems we find occur mostly on the vendor side.
- We've encountered most of our problems on the voice side.
- A vendor's engineer may inadvertently disconnect the equipment of another vendor.
- IBM software can control most of the elements but only if they are of IBM manufacturer.

3. Remote Maintenance

The nature of a network requires many remote functions. Historically, this has meant either significant training for personnel at remote locations or significant expense to send people to remote locations.

With the size and complexity of networks growing, the need for management at remote locations has also grown. The major change enabling remote operations to remain manageable is the growth of intelligence in network equipment.

There are three key results from the increasing intelligence that enables equipment to be successfully managed remotely:

- *Communications capability*—Networks have always communicated through remote equipment. What has changed is that networks can now communicate directly with remote equipment.

- *Controlability*—The ability to change transmission speeds, port types, connection paths, etc., remotely has opened new opportunities for flexibility in the management of networks.

- *Self diagnosis*—The ability to examine internal components and external interfaces and to collect the results for analysis makes remote devices not simply operating components of the network, but management tools.

Although many of these capabilities are not new, the rapid advances of chip-based intelligence have expanded the capabilities significantly.

4. Integrating Local-Area Networks (LANs)

Currently, few telecommunications organizations have responsibility for LANs or for their interconnection with other networking capabilities. In most cases, this function is handled by the department responsible for the LAN. However, this is beginning to change. In some organisations the responsibility for LANs which are interconnected with other remote LANs are managed centrally, leaving standalone LANs under local control.

As the need for integrated, enterprise-wide networks becomes more acute, responsibility for LANs will become the responsibility of telecommunications and information systems organizations, compounding already complex management responsibilities.

With the integration and the shift in responsibility, there will be a need for enhanced and broader expertise, increasing the costs of network management.

5. User Requirements of Products and Services

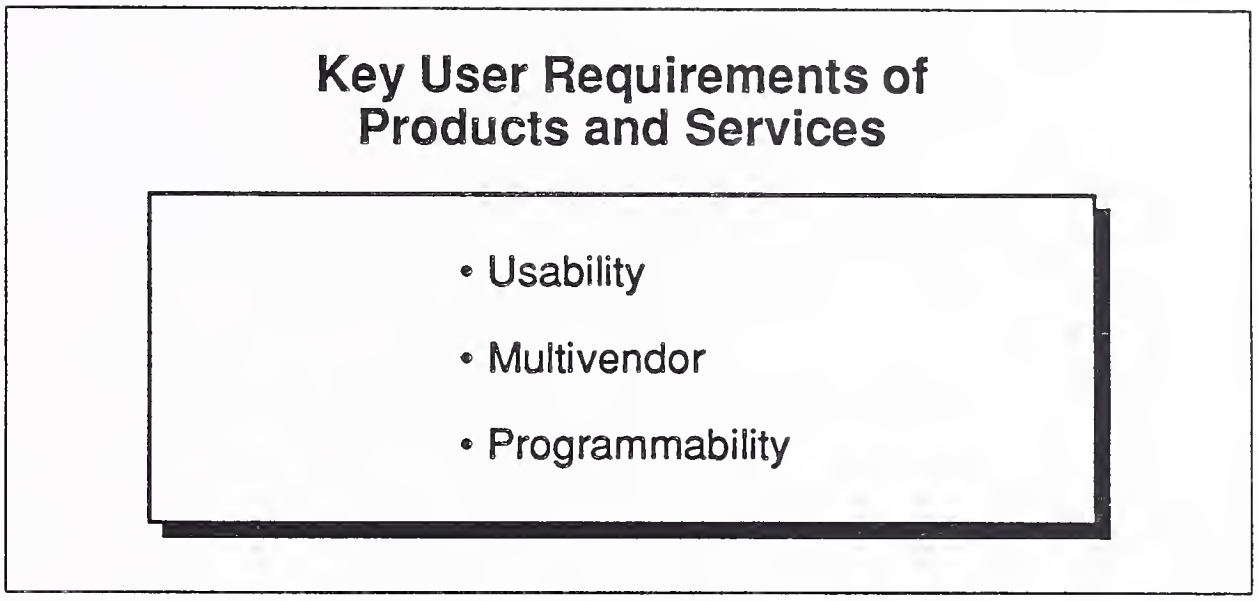
Users indicate three major requirements of products and services. Major requirements are shown in Exhibit VI-9.

- *Usability*—The greatest problem facing network managers is the issue of usability. Users have a wide variety of tools available, but in many cases are not able to use the tools effectively. There are three frequently cited reasons for such inability.
  - The tools are complex and difficult to understand.
  - Users have not been adequately trained in the use of the available tools.
  - The majority of the tools available address only a limited set of network problems.
- *Multivendor*—Most users are faced with a requirement to deal with multiple vendors. A user will almost always have relationships with at least an equipment vendor and a PTT. The average user deals with a dozen vendors. A large user may deal with one hundred or more vendors.
  - This creates two different network management problems. One is the logistical problem of knowing which vendor is responsible for each component of the network. The other is the more complex problem of knowing how each of these vendors' products work with the network.

Many network management system vendors are addressing the logistic problem with high-quality data base systems. Few are addressing the internetworking problem.

- *Programmability*—Programmability is a growing user issue. Only the large users are equipped or even interested in doing their own programming of network management operations.
  - Smaller users do not need or want the responsibility of programming their own network equipment. Smaller users will generally obtain services from vendors that deal with software problems as part of their service.

EXHIBIT VI-9



6. Simpler Products

In addition to identifying the functions that users require from their networking products, they strongly indicate that they need simpler products.

Though users recognize that network management is complex, they also do not have the time to train their staff in the complexities of using network equipment. The products that will be in the greatest demand in the future will be those that require the least amount of training.

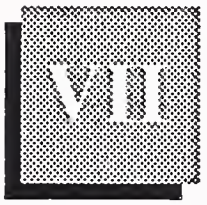
7. Vendor Support

Vendor support has always been necessary for some types of product, but in telecommunications, with products distributed over a wide geographic area, vendor support is absolutely essential.

This need becomes dramatically apparent with carrier services, where users are looking not only for high-quality services but for the carriers to tell them how well these services are operating.

Proactive support - advising the customer of the current status of operations and problems before being asked - can frequently be of greater importance than the actual time necessary to resolve a problem.

Conclusions and Recommendations



Conclusions and Recommendations

A Conclusions

This chapter provides a number of conclusions and recommendations about the market for network management services.

Numerous conclusions can be drawn from the research conducted for this report and from a review of recent industry data.

The following provides a number of conclusions that INPUT believes are most pertinent to vendors that are current providers of network management services or are considering entering this market area. The key conclusions are shown in Exhibit VII-1 and discussed below.

- The market for network operations management services is complex and can be viewed in several ways.
  - Viewed as discrete subsets (voice, data, etc.), there are already a large number of network management contracts. Over time, users have contracted for management of subsets of their networks, such as voice or LANs, when required.
  - Viewed in its totality, the market has had little activity to date. Research indicates that contracting for the management of integrated networks is just beginning.
- The market is only beginning to emerge. Fostered by the emergence of systems operations management, growing concern about management of large, integrated networks, and the increasing criticality of networks to the business, users are beginning to examine alternatives to ensure the best network management service.

- However, the rate of growth may be impacted by the emergence of improved network management products. Comments suggest that the market will grow because of a lack of in-house expertise in managing integrated networks. But if improved products are able to address many of the technical issues that exist today, the need for outside services may not be as great.

- There is a significant degree of user resistance to contracting for network management services. Network managers are not convinced that vendors have the breadth of expertise necessary to manage user networks. Users also believe that vendors will not view their network with the same degree of criticality that they do.

- Users generally do not think there are any leading vendors in network management services. Users identifying leaders generally qualified their responses, indicating that their selections were based on name recognition rather than demonstrated capability.

- The types of networks for which increased management emphasis is needed are local-, wide-, and metropolitan- area networks but particularly networks with an international or pan-European scope.

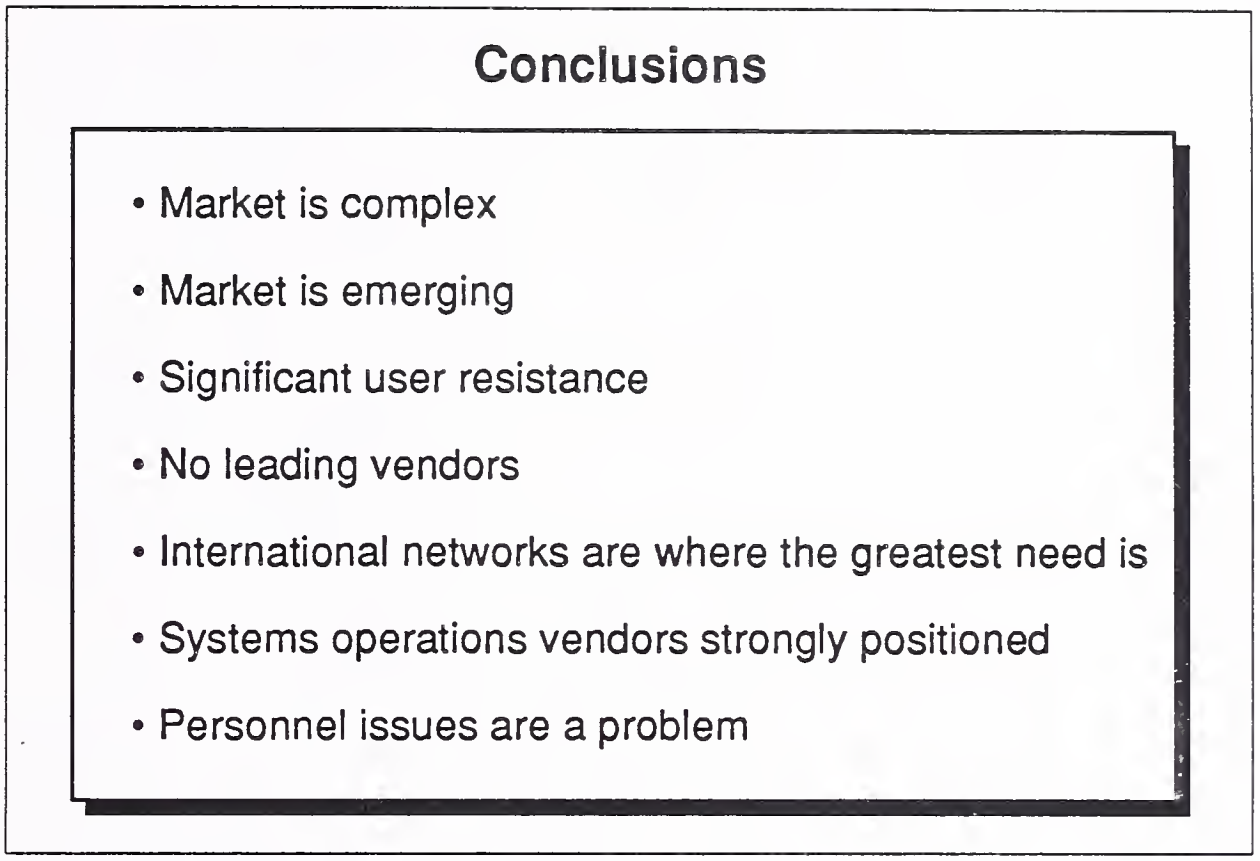
  - Users are increasingly concerned about how to manage these types of networks effectively when they become integrated.

  - Though there is general recognition that network management products are improving, there is concern about how effective they will be in an integrated environment.

  - Tools are currently designed to manage individual network elements. What is required now is a hierarchical "tool overseer" tool.

- There are indications that providers of systems operations vendors may be in a strong position to provide network management services. Vendors that have proven their ability to manage a user's information systems operations will have established a successful track record when the need for network management becomes apparent. This is particularly true in the public sector, where systems and network operations management are already more accepted.

EXHIBIT VII-1



B

Recommendations

As indicated in the conclusions, the market for network management services is just beginning to emerge. The recommendations are therefore orientated towards the vendor who wishes to become a leader in this emerging market. A summary of the recommendations is given in Exhibit VII-2 and discussed below.

- The need for vendors to broaden their base of skills was a frequently mentioned need in the surveys that supported this study. To be able to effectively manage large, integrated networks, vendors need to be able to demonstrate expertise in voice networks, local-area networks, and long-distance data networks. The technical expertise for each is different, and a vendor that is strong in one or two of the three areas may not be able to compete successfully for management of integrated networks.

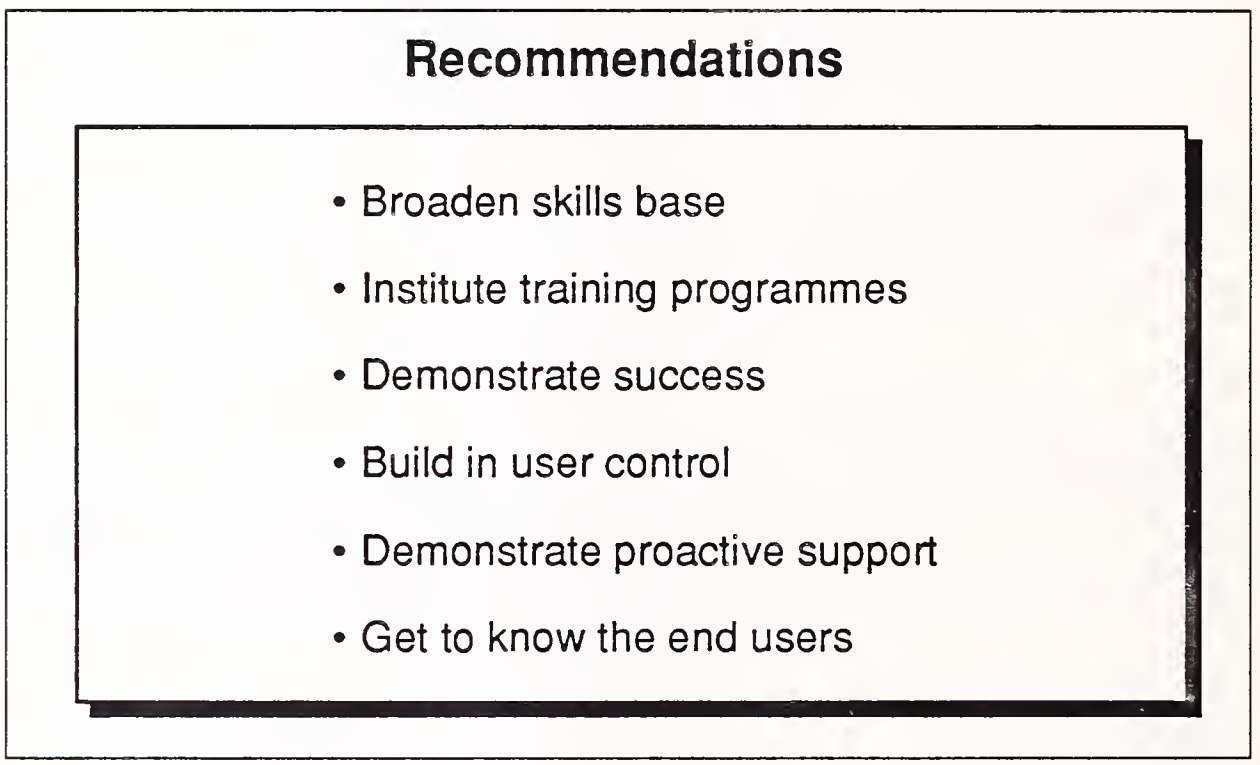
- Vendors must be able to demonstrate previous success. Users are concerned about vendors' ability to manage large, integrated networks. Those able to demonstrate success in managing comparable networks will be in a better position to compete for large contracts.

- Users have significant concern about losing control of their networks. Successful vendors will be ones that can provide users with an understanding of how the network is being operated and can build user participation into the operational process. The issue is as much one of visibility and understanding as decision making.

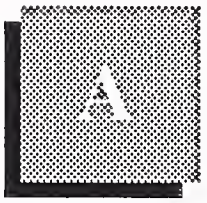
- Vendors need to demonstrate proactive support. Successful vendors will be ones that advise users of problems and keep them apprised of progress in resolving problems. User satisfaction with the vendor declines sharply when the user has to advise the vendor of a problem or has to follow up on problem resolution.

- Vendors should get to know the end user. End users are now more often in charge of expenditures and are in strong positions to influence the decision to contract as well as the vendor selection.

EXHIBIT VII-2



Appendixes



Definition of Terms

A

Introduction

INPUT's *Definition of Terms* provides the framework for all of INPUT's market analyses and forecasts of the information services industry. It is used for all U.S. programs. The structure defined in Exhibit 1 is also used in Europe and for the worldwide forecast.

One of the strengths of INPUT's market analysis services is the consistency of the underlying market sizing and forecast data. Each year INPUT reviews its industry structure and makes changes if they are required. When changes are made they are carefully documented and the new definitions and forecasts reconciled to the prior definitions and forecasts. INPUT clients have the benefit of being able to track market forecast data from year to year against a proven and consistent foundation of definitions.

The changes made in INPUT definitions this year are as follows:

- *Systems Operations Submodes* - the submodes of systems operations have been redefined from processing services and professional services to platform systems operations and applications systems operations.

- *Business Services Industry* - the industry sectors of business services and personal services have been combined into a single business services sector.

- *Transportation Industry* - the information services expenditures relating to airline reservation systems have been returned to the transportation sector where they resided prior to 1990.

B

Overall Definitions and Analytical Framework

1. Information Services

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

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

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

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

The analytical framework of the information services industry consists of the following interacting factors: overall and industry-specific business environment (trends, events and issues); technology environment; user

information system requirements; size and structure of information services markets; vendors and their products, services and revenues; distribution channels; and competitive issues.

2. Market Forecasts/User Expenditures

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

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

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

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

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

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

3. Delivery Modes

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

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

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

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

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

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

4. Market Sectors

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

- *Vertical Industry* markets, such as Banking, Transportation, Utilities, etc. These are called "industry-specific" markets.

- *Functional Application* markets, such as Human Resources, Accounting, etc. These are called "cross-industry" markets.

- *Other* markets, which are neither industry- nor application-specific, such as the market for systems software products and much of the on-line data base market.

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

5. Other

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

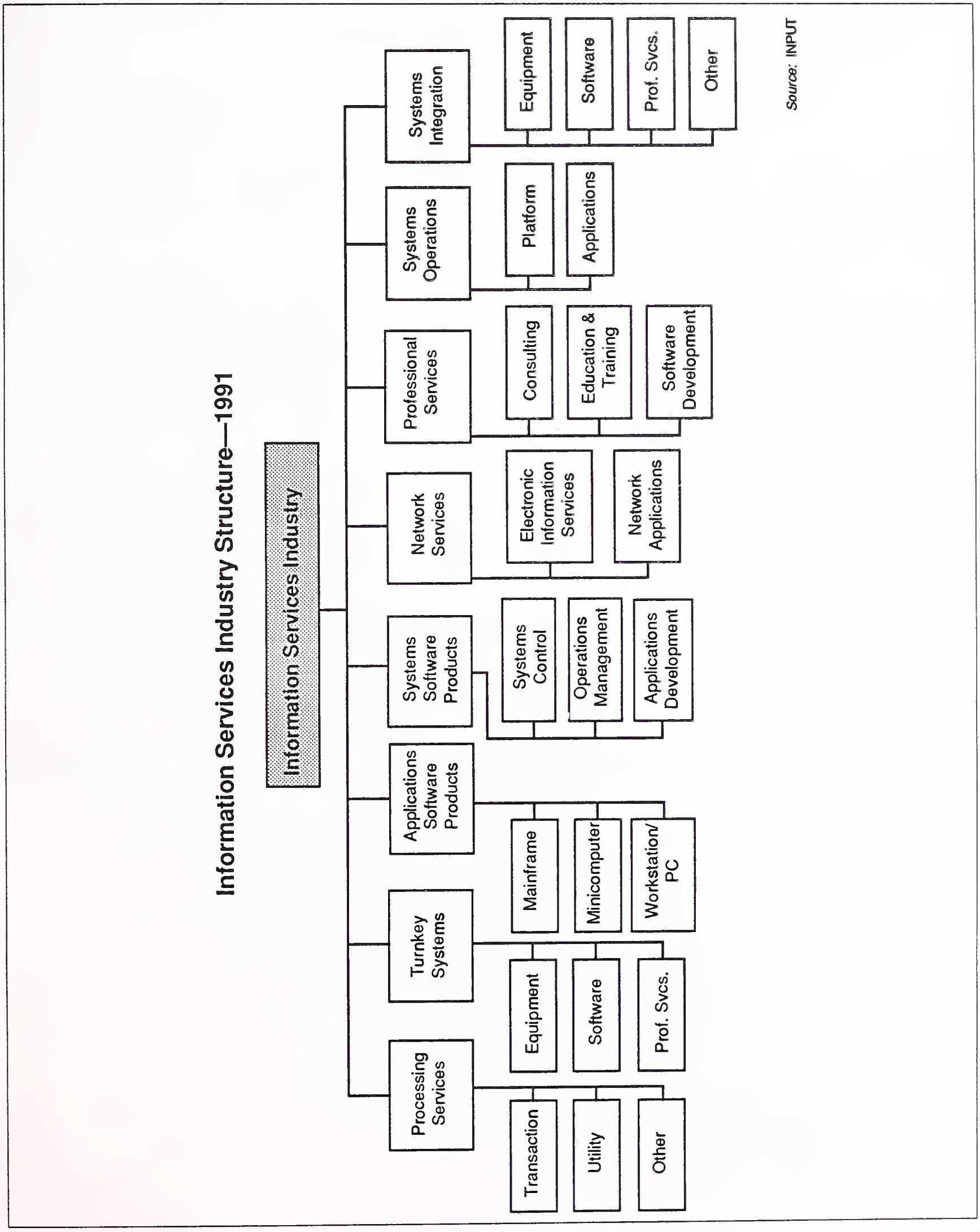
Information systems has always bought systems software, as it is infeasible for companies to develop it internally. However, all other delivery modes represent functions or products that information systems management could choose to perform or develop in-house. Viewed this way, outsourcing is the result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

C

Delivery Modes and Submodes

Exhibit A-1 provides the overall structure of the information services industry as defined and used by INPUT. This section of *Definition of Terms* provides definitions for each of the delivery modes and their submodes or components.

EXHIBIT A-1



1. Software Products

INPUT divides the software products market into two delivery modes: systems software and applications software.

The two delivery modes have many similarities. Both involve user purchases of software packages for in-house computer systems. Included are both lease and purchase expenditures, as well as expenditures for work performed by the vendor to implement or maintain the package at the user's sites. Vendor-provided training or support in operation and use of the package, if bundled in the software pricing, is also included here.

Expenditures for work performed by organizations other than the package vendor are counted in the professional services delivery mode. Fees for work related to education, consulting, and/or custom modification of software products are counted as professional services, provided such fees are charged separately from the price of the software product itself.

a. Systems Software Products

Systems software products enable the computer/communications system to perform basic machine-oriented or user interface functions. INPUT divides systems software products into three submodes.

- *Systems Control Products* - Software programs that function during application program execution to manage computer system resources and control the execution of the application program. These products include operating systems, emulators, network control, library control, windowing, access control, and spoolers.

- *Operations Management Tools* - Software programs used by operations personnel to manage the computer system and/or network resources and personnel more effectively. Included are performance measurement, job accounting, computer operation scheduling, disk management utilities, and capacity management.

- *Applications Development Tools* - Software programs used to prepare applications for execution by assisting in designing, programming, testing, and related functions. Included are traditional programming languages, 4GLs, data dictionaries, data base management systems, report writers, project control systems, CASE systems and other development productivity aids. Also included are system utilities (e.g., sorts) which are directly invoked by an applications program.

INPUT also forecasts the systems software products delivery mode by platform level: mainframe, minicomputer and workstation/PC.

b. Applications Software Products

Applications software products enable a user or group of users to support an operational or administrative process within an organization. Examples include accounts payable, order entry, project management and office systems. INPUT categorizes applications software products into two submodes.

- *Industry-Specific Applications Software Products* - Software products that perform functions related to fulfilling business or organizational needs unique to a specific industry (vertical) market and sold to that market only. Examples include demand deposit accounting, MRPII, medical record keeping, automobile dealer parts inventory, etc.

- *Cross-Industry Applications Software Products* - Software products that perform a specific function that is applicable to a wide range of industry sectors. Examples include payroll and human resource systems, accounting systems, word processing and graphics systems, spreadsheets, etc.

INPUT also forecasts the applications software products delivery mode by platform level: mainframe, minicomputer and workstation/PC.

2. Turnkey Systems

A turnkey system is an integration of equipment (CPU, peripherals, etc.), systems software, and packaged or custom application software into a single product developed to meet a specific set of user requirements. Value added by the turnkey system vendor is primarily in the software and support services provided. Most CAD/CAM systems and many small business systems are turnkey systems. Turnkey systems utilize standard computers and do not include specialized hardware such as word processors, cash registers, process control systems, or embedded computer systems for military applications.

Computer manufacturers (e.g., IBM or DEC) that combine software with their own general-purpose hardware are not classified by INPUT as turnkey vendors. Their software revenues are included in the appropriate software category.

Most turnkey systems are sold through channels known as value-added resellers.

- *Value-Added Reseller (VAR):* A VAR adds value to computer hardware and/or software and then resells it to an end user. The major value added is usually applications software for a vertical or cross-industry market, but also includes many of the other components of a turnkey systems solution, such as professional services.

Turnkey systems have three components:

- Equipment - computer hardware supplied as part of the turnkey system
- Software products - prepackaged systems and applications software products
- Professional services - services to install or customize the system or train the user, provided as part of the turnkey system sale

3. Processing Services

This delivery mode includes three submodes: transaction processing, utility processing, and "other" processing services.

- *Transaction Processing* - Client uses vendor-provided information systems—including hardware, software and/or data networks—at the vendor site or customer site to process transactions and update client data bases. Transactions may be entered in one of four modes:
  - *Interactive* - Characterized by the interaction of the user with the system for data entry, transaction processing, problem solving and report preparation: the user is on-line to the programs/files stored on the vendor's system.
  - *Remote Batch* - Where the user transmits batches of transaction data to the vendor's system, allowing the vendor to schedule job execution according to overall client priorities and resource requirements.
  - *Distributed Services* - Where users maintain portions of an application data base and enter or process some transaction data at their own site, while also being connected through communications networks to the vendor's central systems for processing other parts of the application.
  - *Carry-in Batch* - Where users physically deliver work to a processing services vendor.
- *Utility Processing* - Vendor provides basic software tools (language compilers, assemblers, DBMSs, graphics packages, mathematical models, scientific library routines, etc.), generic applications programs and/or data bases, enabling clients to develop their own programs or process data on the vendor's system.
- *Other Processing Services* - Vendor provides service—usually at the vendor site—such as scanning and other data entry services, laser printing, computer output microfilm (COM), CD preparation and other data output services, backup and disaster recovery, etc.

4. Systems Operations

Systems operations was a new delivery mode introduced in the 1990 Market Analysis and Systems Operations programs. It was created by taking the Systems Operations submode out of both Processing Services and Professional Services. For 1991 the submodes have been redefined as indicated below.

Systems operations involves the operation and management of all or a significant part of the user's information systems functions under a long-term contract. These services can be provided in either of two distinct submodes where the difference is whether the support of applications, as well as data center operations, is included.

- *Platform systems operations* - the vendor manages and operates the computer systems, often including telecommunications networks, without taking responsibility for the user's application systems.

- *Applications systems operations* - the vendor manages and operates the computer systems, often including telecommunications networks, and is also responsible for maintaining, or developing and maintaining, the user's application systems.

In the federal government market. systems operation services are also defined by equipment ownership with the terms "COCO" (Contractor-Owned, Contractor-Operated), and "GOCO" (Government-Owned, Contractor-Operated).

The ownership of the equipment, which was the previous basis for the systems operations submodes, is no longer considered critical to the commercial market. Most of the market consists of systems operations relationships using vendor-owned hardware. What is now critical is the breadth of the vendor/client relationship as it expands beyond data center management to applications management.

Systems operations vendors now provide a wide variety of services in support of existing information systems. The vendor can plan, control, provide, operate, maintain and manage any or all components of the user's information systems (equipment, networks, systems and/or application software), either at the client's site or the vendor's site. Systems operations can also be referred to as "resource management" or "facilities management."

5. Systems Integration (SI)

Systems integration is a vendor service that provides a complete solution to an information system, networking or automation requirement through the custom selection and implementation of a variety of information

system products and services. A systems integrator is responsible for the overall management of a systems integration contract and is the single point of contact and responsibility to the buyer for the delivery of the specified system function, on schedule and at the contracted price.

To be included in the information services market, systems integration projects must involve some application processing component. In addition, the majority of cost must be associated with information systems products and/or services.

- *Equipment* - information processing and communications equipment required to build the systems solution. This component may include custom as well as off-the-shelf equipment to meet the unique needs of the project. The systems integration equipment category excludes turnkey systems by definition.

- *Software products* - prepackaged applications and systems software products.

- *Professional services* - the value-added component that adapts the equipment and develops, assembles, or modifies the software and hardware to meet the system's requirements. It includes all of the professional services activities required to develop, and if included in the contract, operate an information system, including consulting, program/project management, design and integration, software development, education and training, documentation, and systems operations and maintenance.

- *Other services* - most systems integration contracts include other services and product expenditures that are not easily classified elsewhere. This category includes miscellaneous items such as engineering services, automation equipment, computer supplies, business support services and supplies, and other items required for a smooth development effort.

Systems integrators perform, or manage others who perform, most or all of the following functions:

- Program management, including subcontractor management
- Needs analysis
- Specification development
- Conceptual and detailed systems design and architecture
- System component selection, modification, integration and customization
- Custom software design and development
- Custom hardware design and development
- Systems implementation, including testing, conversion and post-implementation evaluation and tuning

- Life cycle support, including
  - System documentation and user training
  - Systems operations during development
  - Systems maintenance

6. Professional Services

This category includes three submodes: consulting, education and training, and software development.

- *Consulting:* Services include management consulting (related to information systems), information systems consulting, feasibility analysis and cost-effectiveness studies, and project management assistance. Services may be related to any aspect of the information system, including equipment, software, networks and systems operations.

- *Education and Training:* Products and services related to information systems and services for the professional and end user, including computer-aided instruction, computer-based education, and vendor instruction of user personnel in operations, design, programming, and documentation.

- *Software Development:* Services include user requirements definition, systems design, contract programming, documentation, and implementation of software performed on a custom basis. Conversion and maintenance services are also included.

7. Network Services

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

a. Electronic Information Services

Electronic information services are data bases that provide specific information via terminal- or computer-based inquiry, including items such as stock prices, legal precedents, economic indicators, periodical literature, medical diagnosis, airline schedules, automobile valuations, etc. The terminals used may be computers themselves, such as communications servers or personal computers. Users typically inquire into and extract information from the data bases. Although users may load extracted data into their own computer systems, the electronic information

vendor provides no data processing or manipulation capability and the users cannot update the vendor's data bases.

The two kinds of electronic information services are:

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

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

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

b. Network Applications

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

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

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

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

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

TWX, and other messaging services. This also includes bulletin board services.

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

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

D

Sector Definitions

1. Industry Sector Definitions

INPUT has structured the information services market into 15 generic industry sectors, such as process manufacturing, insurance, transportation, etc. The definitions of these sectors are based on the 1987 revision of the Standard Industrial Classification (SIC) Code system. The specific industries (and their SIC Codes) included under these generic industry sectors are detailed in Exhibit A-2.

EXHIBIT A-2

Industry Sector Definitions

Industry Sector	SIC Code	Description
Discrete Manufacturing	23xx	Apparel and other finished products
	25xx	Furniture and fixtures
	27xx	Printing, publishing and allied industries
	31xx	Leather and leather products
	34xx	Fabricated metal products, except machinery and transportation equipment
	35xx	Industrial and commercial machinery and computer equipment
	36xx	Electronic and other electrical equipment and components, except computer equipment
	37xx	Transportation equipment
	38xx	Instruments; photo/med/optical goods; watches/clocks
	39xx	Miscellaneous manufacturing industry
Process Manufacturing	10xx	Metal mining
	12xx	Coal mining
	13xx	Oil and gas extraction
	14xx	Mining/quarrying nonmetalic minerals
	20xx	Food and kindred products
	21xx	Tobacco products
	22xx	Textile mill products
	24xx	Lumber and wood products, except furniture
	26xx	Paper and allied products
	28xx	Chemicals and allied products
	29xx	Petroleum refining and related industries
	30xx	Rubber and miscellaneous plastic products
	32xx	Stone, clay, glass and concrete products
	33xx	Primary metal industries
Transportation Services	40xx	Railroad transport
	41xx	Public transit/transport
	42xx	Motor freight transport/warehousing
	43xx	U.S. Postal Service
	44xx	Water transportation
	45xx	Air transportation (including airline reservation services in 4512)
	46xx	Pipelines, except natural gas
	47xx	Transportation services (including 472x, arrangement of passenger transportation)

EXHIBIT A-2 (CONT.)

Industry Sector Definitions

Industry Sector	SIC Code	Description
Utilities	49xx	Electric, gas and sanitary services
Telecommunications	48xx	Communications
Retail Distribution	52xx	Building materials
	53xx	General merchandise stores
	54xx	Food stores
	55xx	Automotive dealers, gas stations
	56xx	Apparel and accessory stores
	57xx	Home furniture, furnishings and accessory stores
	58xx	Eating and drinking places
	59xx	Miscellaneous retail
Wholesale Distribution	50xx	Wholesale trade - durable goods
	51xx	Wholesale trade - nondurable goods
Banking and Finance	60xx	Depositary institutions
	61xx	Nondepositary institutions
	62xx	Security and commodity brokers, dealers, exchanges and services
	67xx	Holding and other investment offices
Insurance	63xx	Insurance carriers
	64xx	Insurance agents, brokers and services
Health Services	80xx	Health services
Education	82xx	Educational services

EXHIBIT A-2 (CONT.)

Industry Sector Definitions

Industry Sector	SIC Code	Description
Business Services	65xx	Real estate
	70xx	Hotels, rooming houses, camps, and other lodging places
	72xx	Personal services
	73xx	Business services (except hotel reservation services in 7389)
	7389x	Hotel reservation services
	75xx	Automotive repair, services and parking
	76xx	Miscellaneous repair services
	78xx	Motion pictures
	79xx	Amusement and recreation services
	81xx	Legal services
	83xx	Social services
	84xx	Museums, art galleries, and botanical/zoological gardens
	86xx	Membership organizations
	87xx	Engineering, accounting, research, management, and related services
	89xx	Miscellaneous services
Federal Government	9xxx	
State and Local Government	9xxx	
Miscellaneous Industries	01xx	Agricultural production - crops
	02xx	Agricultural production - livestock/animals
	07xx	Agricultural services
	08xx	Forestry
	09xx	Fishing, hunting and trapping
	15xx	Building construction - general contractors, operative builders
	16xx	Heavy construction - contractors
	17xx	Construction - special trade contractors

2. Cross-Industry Sector Definitions

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

Accounting - consists of applications software products and information services that serve such functions as:

- General ledger
- Accounts payable
- Accounts receivable
- Billing/invoicing
- Fixed assets
- International accounting
- Purchasing
- Taxation
- Financial consolidation

- Excluded are accounting products and services directed to a specific industry, such as tax processing services for CPAs and accountants within the business services industry sector.

Human Resources - consists of application solutions purchased by multiple industry sectors to serve the functions of human resources management and payroll. Examples of specific applications within these two major functions are:

- Employee relations
- Benefits administration
- Government compliance
- Manpower planning
- Compensation administration
- Applicant tracking
- Position control
- Payroll processing

Education and Training - consists of education and training for information systems professionals and users of information systems, as well as the use of computer-based training tools for the training of any employee on any subject.

- The education and training cross-industry sector only considers education and training offered for a noncaptive market; in other words, this sector does not include educational services provided by information services vendors to their customers for training on their own products.

- Education and training that is provided in a classroom setting, live, is not included in this cross-industry sector. This sector is not to be confused with the education industry-specific sector, the subject of another MAP report, which addresses primary and secondary education as a vertical market for IS services.

Office Systems consists of the following:

- Integrated office systems (IOS)
- Word processing
- Desktop publishing
- Graphics

- IOSs—such as IBM's OfficeVision, HP's NewWave Office and DEC's All-In-1—typically include the following core functions, all of which are accessed from the same desktop: electronic mail, decision support systems, time management and filing systems.

- Office systems graphics include presentation graphics (which represent the bulk of office systems graphics), paint and line art, page description languages, and electronic form programs.

Engineering and Scientific encompasses the following applications:

- Computer-aided design and engineering (CAD and CAE)
- Structural analysis
- Statistics/mathematics/operations research
- Mapping

- Computer-aided manufacturing (CAM) or CAD that is integrated with CAM is excluded from the cross-industry sector as it is specific to the manufacturing industries. CAD or CAE that is dedicated to integrated circuit design is also excluded because it is specific to the semiconductor industry.

Planning and Analysis consists of software products and information services in four application areas:

- Executive Information Systems (EIS)
- Financial modeling or planning systems
- Spreadsheets
- Project management

Other encompasses marketing/sales and electronic publishing application solutions.

- Sales and marketing includes:

  - Sales analysis
  - Marketing management
  - Demographic market planning models

- The fundamental difference between electronic publishing and desktop publishing (within the office systems sector) is that electronic publishing encompasses a method of document management and control from a single point—regardless of how many authors/locations work on a document—whereas desktop publishing is a personal productivity tool and is generally a lower end product residing on a personal computer.

- Electronic or computer publishing systems that are sold strictly and specifically to commercial publishers, printers, and typesetters are excluded from cross-industry consideration and are included in the discrete manufacturing industry.

3. Delivery Mode Reporting by Sector

This section describes how the delivery mode forecasts relate to the market sector forecasts. Exhibit A-3 summarizes the relationships.

- *Processing services* - the transaction processing services submode is forecasted for each industry and cross-industry market sector. The utility and other processing services submodes are not considered industry or cross-industry specific and are only forecasted for the total market.

- *Turnkey systems* - all of the turnkey systems delivery mode is considered either industry or cross-industry specific and is forecasted for the 15 industry and 7 cross-industry sectors. Each component of turnkey systems (equipment, software products and professional services) is forecasted by market sector.

- *Applications software products* - all of the applications software products delivery mode is considered either industry or cross-industry specific and is forecasted for the 15 industry and 7 cross-industry sectors. In addition, each forecast is broken down by platform level: mainframe, minicomputer and workstation/PC.

- *Systems operations* - all of systems operations is considered industry specific. Each of the submodes (platform and applications systems operations) is forecasted for each of the 15 industry sectors.

EXHIBIT A-3

Delivery Mode versus Market Sector Forecast Content

Delivery Mode	Submode	Market Sectors		
		Industry Sectors	Cross-Industry Sectors	Other
Processing Services	Transaction Utility Other	X	X	 X X
Turnkey Systems		X	X	
Applications Software Products		X	X	
Systems Operations	Platform Applications	X X		
Systems Integration		X		
Professional Services		X		
Network Services	Network Applications Electronic Information Services	X X		 X
Systems Software Products				X

- *Systems integration* - all of systems integration is considered industry specific. Each of the components of systems integration (equipment, software products, professional services and other services) is forecasted for each of the 15 industry sectors.

- *Professional services* - all of professional services is considered industry specific. Each of the submodes (consulting, education and training, and software development) is forecasted for each of the 15 industry sectors.

- *Network services* - all of the network applications submode of network services is considered industry specific and is forecasted for each of the 15 industry sectors. The electronic information services submode is considered to have both industry-specific and non-specific elements.

The forecast for electronic information systems includes forecasts for the 15 industry sectors as well as an additional forecast component that applies to the market as a whole.

- *Systems software products* - All of the submodes (systems control, operations management, applications development) are considered neither industry- nor cross-industry specific. They are only forecasted in total. In addition, each submode forecast is broken down by platform level: mainframe, minicomputer and workstation/PC.

E

Vendor Revenue and User Expenditure Conversion

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

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

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

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

Exhibit A-4 summarizes the net effect of the various ratios used by INPUT to convert vendor revenues to end-user expenditure (market size) figures for each delivery mode.

EXHIBIT A-4

Vendor Revenue to User Expenditure Conversion

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