NETWORKING SYSTEMS INTEGRATION
OPPORTUNITIES

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Networking Systems Integration Opportunities

Abstract

This report examines networking systems integration opportunities in a rapidly changing environment driven by technology, regulatory policies and global market business pressures. The report assesses the impact of fiber optics, wireless communications and network software/hardware on integrated network solutions. It presents a forecast of the size of the network integration market for the 1992-1997 period.

It also examines the impact of regulatory and economic reform on access to networks and the opportunity for network integration. The report provides a discussion of the business/market global trends and the increasing importance of integrated networks to business success.

The report concludes with a number of recommendations that will assist systems integration vendors in marketing network integration services more effectively.

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I

Introduction

This report examines networking systems integration opportunities in a rapidly changing environment driven by technology, regulatory policies and global market business pressures. The report assesses the impact of fiber optics, wireless communications and network software/hardware on integrated network solutions.

It also examines the impact of regulatory and economic reform on access to networks and the opportunity for network integration. The report provides a discussion of the business/market global trends and the increasing importance of integrated networks to business success.

The report concludes with a number of recommendations that will assist systems integration vendors in marketing network integration services more effectively.

A
Purpose

Business organizations are increasingly driven to change to meet the challenges of global competition. As businesses expand to address new global markets, the role of integrated networks is more and more critical to the efficient exchange of information, delivery of services and response to local markets. Management uses networks to "keep in touch" and "keep in control."

In a period of significant technological development, the flexibility to exchange information expands and transforms operating boundaries within companies, their industry partners and their customers. Providing more direct access, integrated networks enable operating efficiencies by combining resources and thus leveraging resource economies of scale without requiring those resources to be consolidated in a single location. Traditional procedures for the processing and transport of information are converging as the pressures to add value, reliability and quality grow. Pressures to constantly enhance the ability to compete increasingly position networks as strategic assets. Existing network resources form a base for

current operations. Significant integration challenges exist for networking within the company, with its industry partners, and with its customers to leverage existing network resources while balancing the trade-off of new technologies that have greater bandwidth, improved access, reliability and flexibility.

This report examines the need for integrated network solution opportunities, their implementation and their continued evolution as they transform the landscape of business operations. The report identifies the significant market pressures at play and examines the dynamics of technical innovation that will impact the network systems plans of organizations.

B
Scope and Use

To develop an understanding of network system integration opportunities, research included both subjective and objective questions.

The objective questions were designed to assess the importance of advanced technology, regulatory reforms and business/market competition in the evolution of network integration opportunities. Additional focus was placed on network systems integration opportunities by project size, network planned life and annual planned network expenditures.

The subjective questions focused on understanding the classes (local-area, wide-area, enterprise, narrow-band versus wide-band, global/international, advanced-mobile, value-added by operations and personal) of network systems. In addition, security was assessed as to its future importance in integration opportunities.

To develop a market forecast for network systems integration opportunities, INPUT took several factors into account:

* The percentage of companies that indicated they would favorably consider contracting for network integration services

* The number of companies that indicated they are planning network integration projects

* When projects would be started

C
Related INPUT Reports

Related INPUT reports of possible interest to the reader include the following:

- *U.S. Professional Services Market, 1992-1997*

- *U.S. IS Outsourcing Market Opportunities, 1992-1997*

- U.S. Information Services Industry Sector Reports, 1992-1997 (15 reports on all major industry sections, e.g., insurance)

- Market Analysis Program Cross-Industry Sector Reports, 1992-1997 (7 reports on information services markets that serve all vertical industry sectors, e.g., accounting)

- *Methods for Successful Systems Integration*

- *Network Integration A Growing Market, 1990-1995*

- *Systems Integration Trends and Forecast, 1992-1997*

- *Systems Operations Management Issues and Practices*

- *Electronic Image Processing, 1990-1995*

- *Federal Systems Integration Market, 1992-1997*

- *Systems Integration Market—Western Europe, 1991-1996*

- *Systems Integration Competitive Analysis*

- *Systems Integration Technology Trends*

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II
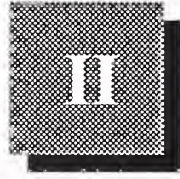
Executive Overview

A
Market Characteristics

Networks have for some time been considered the reflection of the business organization's operations and its geographic diversity. Today, networks are being recognized as systems for shaping organizations and their style of doing business. The flexibility to operate any place requires open access and provides the mobility to respond to market demands for service anywhere.

The elimination of Cold War barriers opens entire new markets to network integration opportunities. Eastern Europe, the Pacific Rim, the newly Independent States that formerly comprised the Soviet Union, and most of the Southern Hemisphere are turning wireless and fiber-optic technology into network systems to foster rapid economic development. Network infrastructure has become critical and also pervasive in modern market economies. Just as rivers were the gateways to economic development, network systems become information gateways for the expansion and development of global business.

Viewed as stepchildren to information systems only a few years ago, networks are increasingly recognized as critical to business success. For the past several years, INPUT asked respondents to rate the importance of networks to their businesses on a scale of 0 to 5, with 5 indicating greatest importance. As shown in Exhibit II-1, the average importance rating increases steadily through the years. Enterprise networks are following the same pattern. In general this integration of network resources enables business to keep in touch with customers and in control of network resources. As shown in Exhibit II-2, the importance of enterprise networks is recognized today and is anticipated to be even more significant in the future.

EXHIBIT II-1

Importance of Networks to Business

	1988	1990	1992	1995
Importance Rating*	3.8	4.2	4.3	4.7

*On a scale of 0-5; where 0=no importance, 5=greatest importance.

EXHIBIT II-2

Importance of Enterprise Networks

	Importance Rating*
Today	3.4
In 3 Years	4.3

*On a scale of 0-5; where 0=no importance, 5=greatest importance.
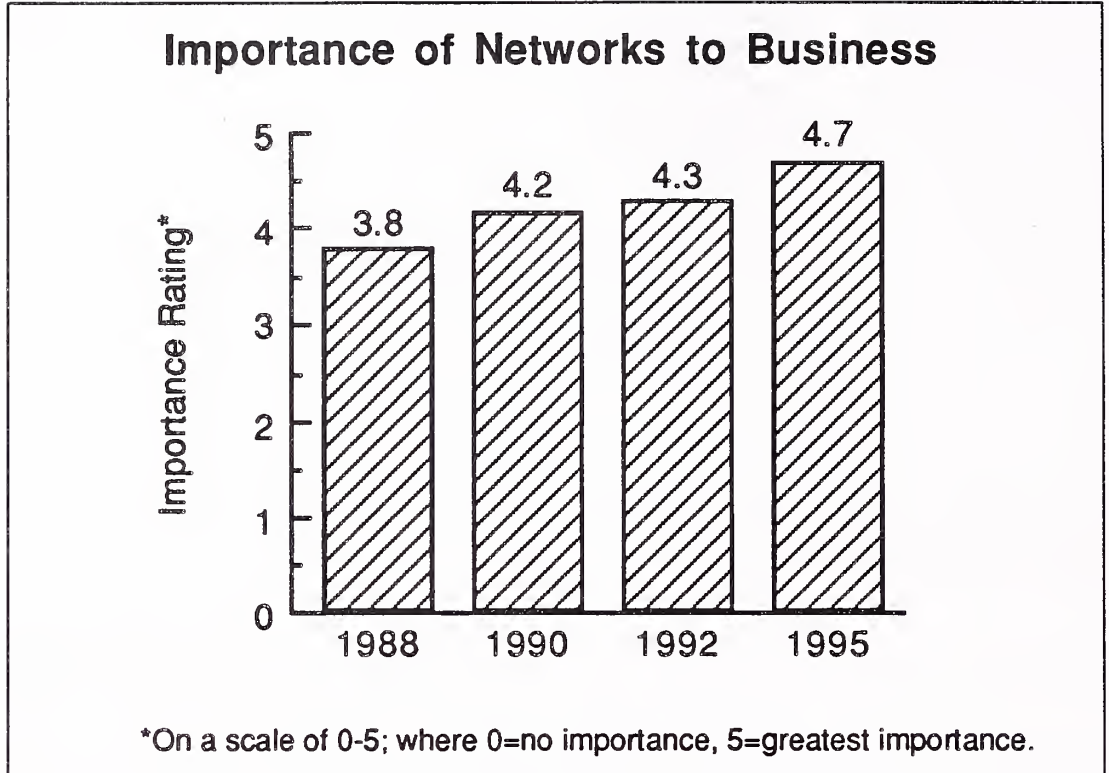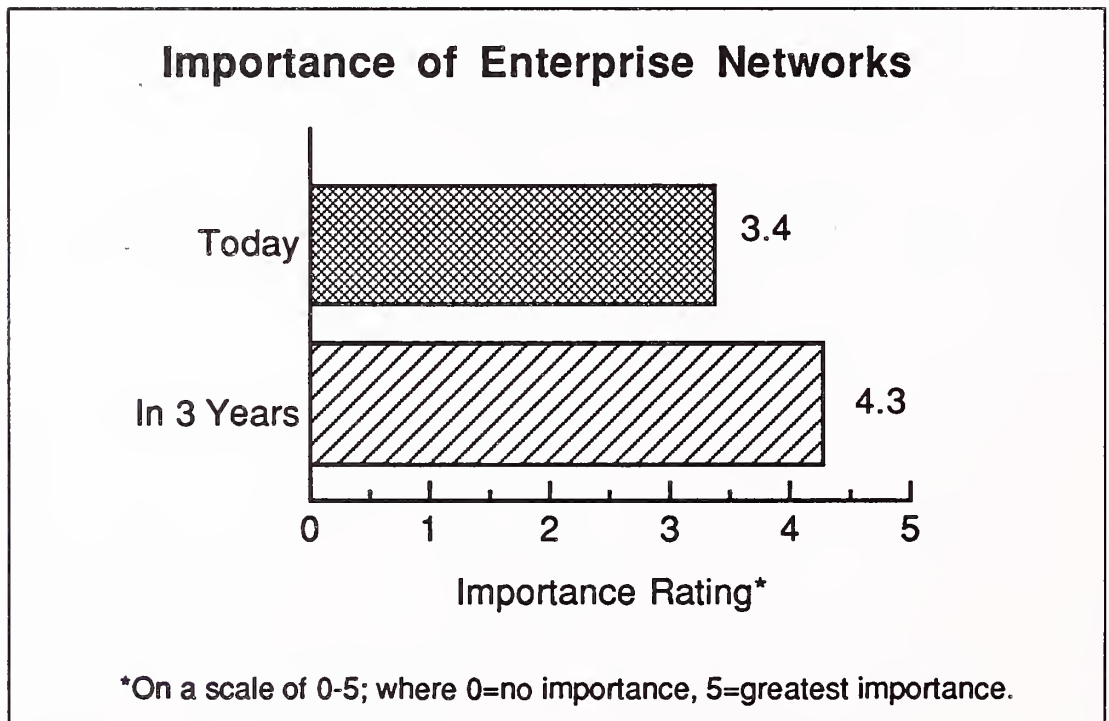
The evolution of networks from initial stages of operation has led to some basic objectives for network performance. Local-area networks improve the productivity of work groups, wide-area networks improve the efficiency of information distribution, and enterprise networks improve the strategic capability of businesses to compete by pulling resources together into an integrated system.

B
Vendor Perspectives

The trend in network integration is to use more software and network intelligence, and less hardware and personnel resources. More software and intelligence give networks the flexibility to reconfigure dynamically and to constantly maintain operating reliability. Less hardware and personnel give networks more mobile and more efficient operations. As is shown in Exhibit II-3, network software is recognized as very important today and will be even more important in the future.

EXHIBIT II-3

Importance of Network Software

Today: 3.7
In 3 Years: 4.3

Importance Rating*

0   1   2   3   4   5

*On a scale of 0-5; where 0=no importance, 5=greatest importance.
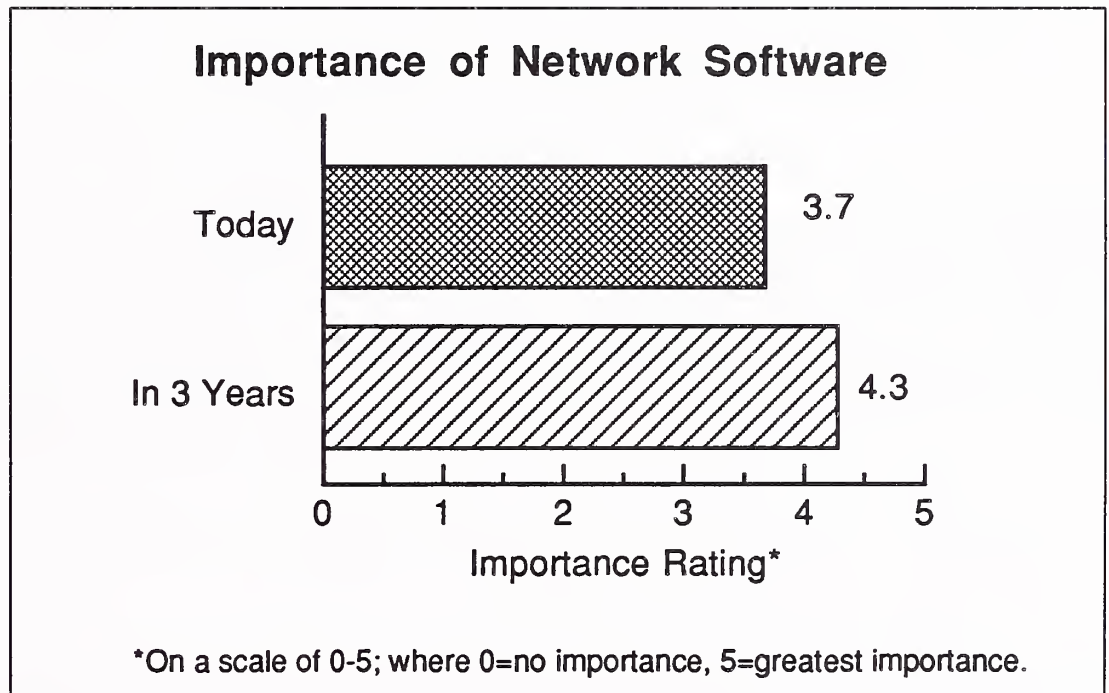
Network systems integrators are mostly the same organizations that do IS systems integration with one potential difference: the participation of regulated carriers for public switched networks. Regulatory reforms have generated more competition and the carriers have become more capable of providing enhanced network services. Thus, their strategy is to provide wide-area and enterprise-wide networks as an overlay to existing public networks.

Hardware suppliers are also approaching network systems with integrated, turnkey systems. Network management software and self-diagnostic systems are increasingly featured in intelligent network configurations. The fundamental strategy of network systems integrators is to provide a full range of services from:

• Network design, integration and implementation;
• To operations training, management and control;
• To network maintenance and administration.

The effort to provide a full set of services is driven by two converging factors: customer account control and continued availability of new technological advancements. Customer account control is established by providing one-stop shopping. It focuses the performance risk and value of communication management on the network integrator. This approach first establishes a strong relationship between vendor and customer and permits the customer to focus its limited resources on business performance. The network systems integrator keeps in touch and stays in control, while the customer sets the benchmark standard for network performance based upon a growing technical sophistication in the market.

With 90% of the technologists who ever lived alive today, technology is nurturing itself, bringing to the customer sophisticated products from new sources at a rapid pace. The next generation of a product will be in the market faster due to the network integrator being focused on managing performance risk and seeking the most effective tools. The customer, becoming more comfortable that technology is being carefully managed, accelerates the demand for more sophisticated products. The network integrator, in turn, deploys more sophisticated solutions. The more responsive the integrator, the stronger the account relationship. A vendor valued for reliability, technical performance and flexibility in network management systems has a full-service strategy. When this strategy is well-executed, the customer account provides a strategic business base that can be further leveraged.

Network systems integration continues to evolve from the initial steps of connecting networks, to building a framework for enterprise operations and globally leveraged resources. Vendors continue to enhance the capability to provide a full set of network services to a customer base that is increasingly aware of the importance of networks to their organizations' performance.

C
Summary and Conclusions

Networks are key to an organization's success. Network integration must be flexible, reliable, intelligent, and improve the organization's strategic capability to compete. The average planned life of a network is seven years. The average network systems project size is $30 million. This reflects a

combination of project sizes below $5 million, some in the $5 to $20 million range, and some over $100 million in value.

Enterprise networks are becoming more important. Enterprise networks enhance the requirement for network systems integration by integrating islands of automation into true networked systems. Geographic separation requires electronic collocation and application transparency that is independent of physical location.

True network systems are more intelligent because they depend increasingly on parameter-driven software and less on hardware and personnel. Reliability has increased as most network operations now require 24-hour network services.

In manufacturing, the integration of islands of automation into flexible production processes that develop products faster, with higher quality, is an example of the strategic capability achieved by implementing an enterprise network in manufacturing. Integrated full-service banking that allows for national access to ATM machines and campuswide education network services that permit the university to electronically move the campus to where the students are really located are additional examples of enterprise networks changing the face of our society.

In the environment of regulatory reform, the boundaries between public and private networks are becoming virtually transparent to the user. The user's perspective of increased competition among carriers and the arrival of new services such as "bandwidth on demand" are indications of how the market is changing. Network software is becoming a discriminator for demonstrating a communication provider's flexibility to respond to the dynamics of business in an era of global competition.

Network systems integration opportunities are increasing in complexity and scope. The successful network systems integrator can provide skills to respond over the broad base of technologies available today. The system intregrator must be prepared to respond to demands for advanced mobile/wireless communication, improved network security, intelligence, bandwidth management, the use of recognition software, video, and other value-added services. By managing an integrated network throughout the business organization, the network integrator must be prepared to respond to the customer as a strategic partner contributing to that customer's business success.

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III
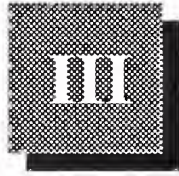
Market Characteristics

A
Market Forecast

To develop the forecast, several factors were taken into account:

* First, the number of organizations that would typically be involved in major projects was estimated. The total number of organizations was derived from the Department of Commerce's listing of companies having more than 1,000 employees.

    - Although organizations of nearly all sizes have requirements to integrate their network services, INPUT finds that the primary opportunities for vendor-provided network integration are in large companies.

    - The population of companies is generally the same as those that have potential requirements for systems integration. While opportunities do exist in smaller organizations, their networks are generally not of sufficient size and complexity to justify major contracted efforts.

* The second factor was the percentage of companies indicating that they would favorably consider contracting with outside vendors for network integration. This information was derived from interviews conducted with large and small organizations throughout the U.S. INPUT recognizes that the number for and against contracting will shift based on requirements and the demonstrated ability and knowledge of vendors.

* Third, the number of organizations that indicated they are planning network integration projects was estimated based on interview responses.

* The final factor was the number of organizations indicating they will begin network integration projects this year.

Using these considerations as a basis, the market for commercial network integration services is forecast to grow from $2.1 billion in 1991 to $5.7 billion in 1996, a compound growth rate of 22%. See Exhibit III-1.

EXHIBIT III-1A

Commercial Network Integration Expenditures
1991-1996

Network Integration

1.0

3.0

⬚ 1991

◨ 1996

Network Integration
as Part of
Systems Integration

1.1

2.7

| 0 | 1 | 2 | 3 |

Market Size ($ Billions)
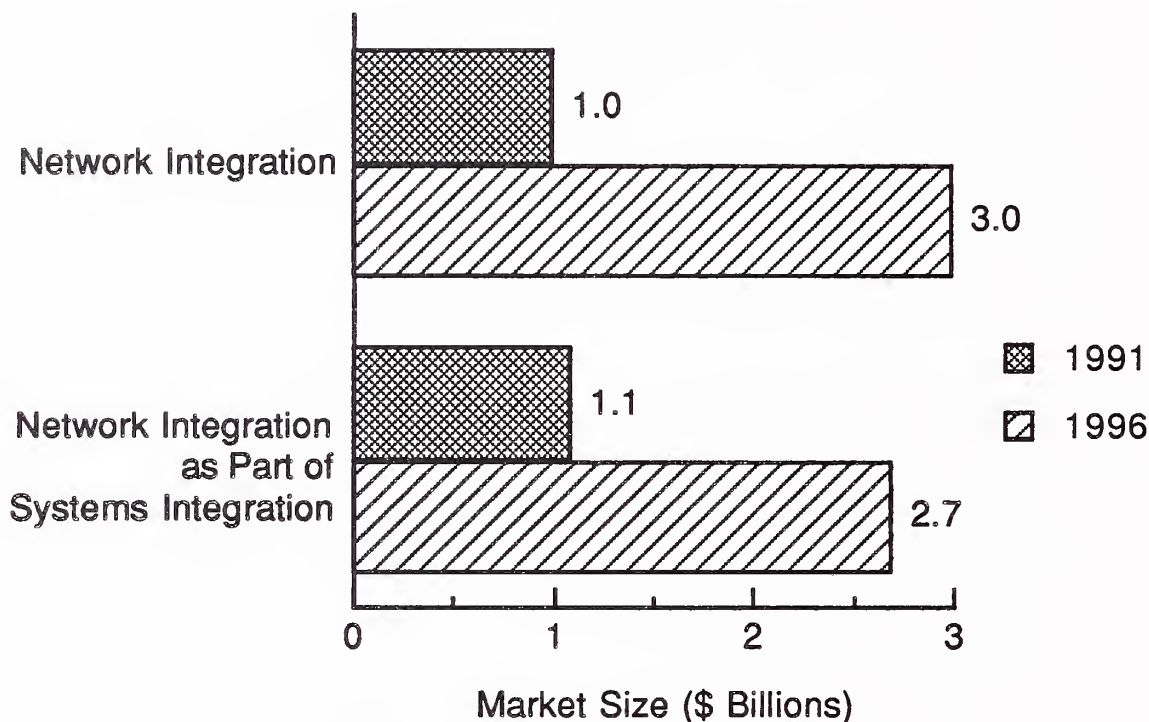
There are several factors to consider:

- The forecast is for commercial network integration services; data pertaining to the federal market is not included because the FTS2000 contract dominates this market and makes it atypical of the overall market.

- The forecast includes revenues that will be derived from network integration projects and those that will be derived as part of systems integration projects.

- The forecast excludes carrier revenues. The forecast includes expenditures for professional services and equipment, but excludes revenues, such as leased circuit costs or toll charges, derived by regulated and nonregulated service providers.

EXHIBIT III-1B

Commercial Network Integration Expenditures
1991-1996
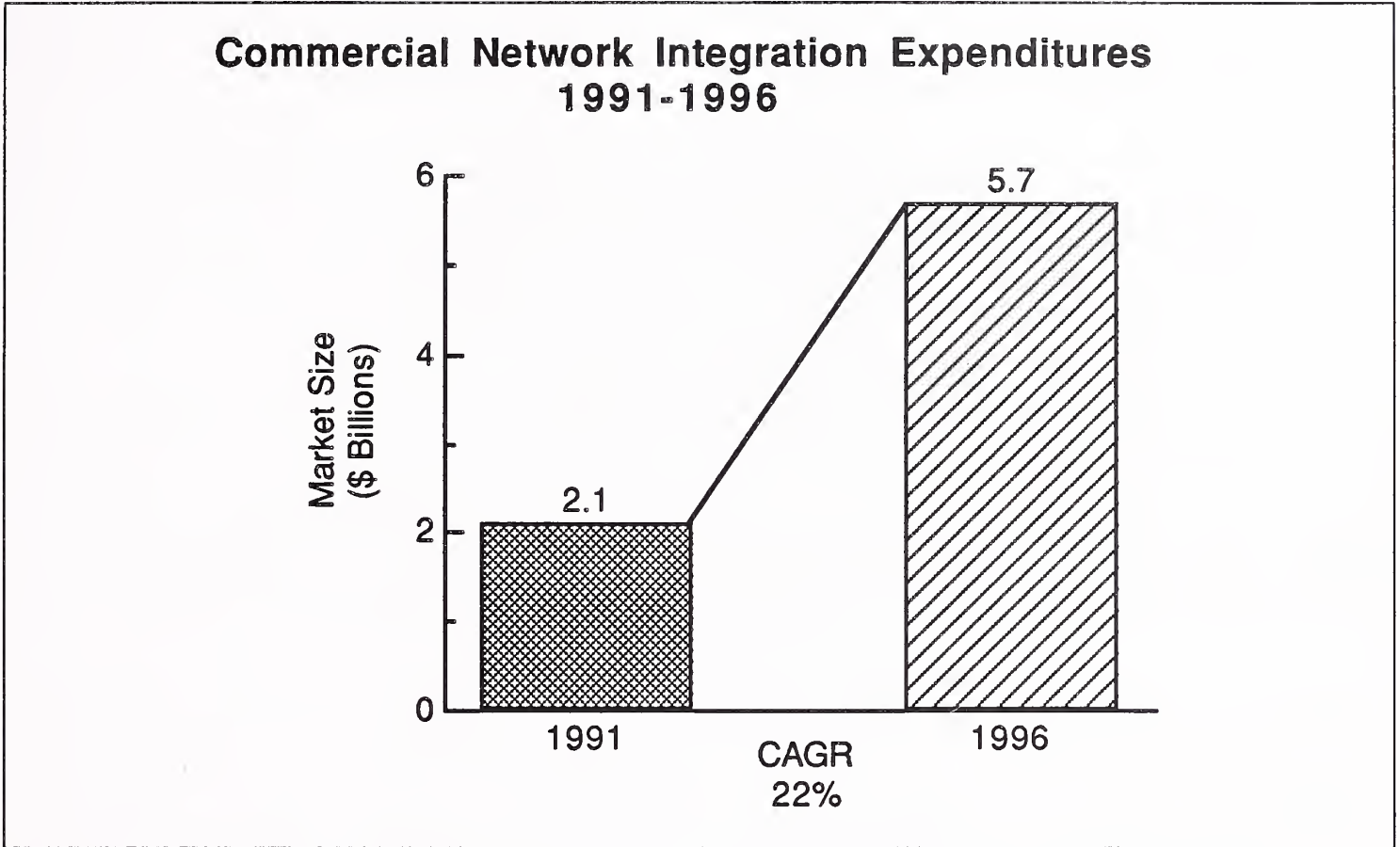
B

Types of SI Networking Opportunities

1. Industries with Systems Integration Projects Requiring Major Network Systems Integration

INPUT identified a number of industries in which network integration was a major consideration in the requirements for systems integration. These applications tend to be identified with business process engineering and employ enterprise networks to successfully integrate islands of automation. The network integration required is essential to the project to permit application transparency and electronic collocation. It is not uncommon that multimedia—such as voice, text, data and video—be integrated to permit true automation of functions. This creates bandwidth management considerations on the network that place a premium on shared resources and leads to virtual networking.

Exhibit III-2 illustrates the high ranking of network integration as an important technology for systems integration in several key industries.

EXHIBIT III-2

Importance of Network Integration as a Technology

Banking/Finance — 4.7 (Today), 4.8 (In 3 Years)

State and Local Government — 3.9 (Today), 4.4 (In 3 Years)

Manufacturing — 3.4 (Today), 4.3 (In 3 Years)

▨ Today

▨ In 3 Years

Importance Rating*
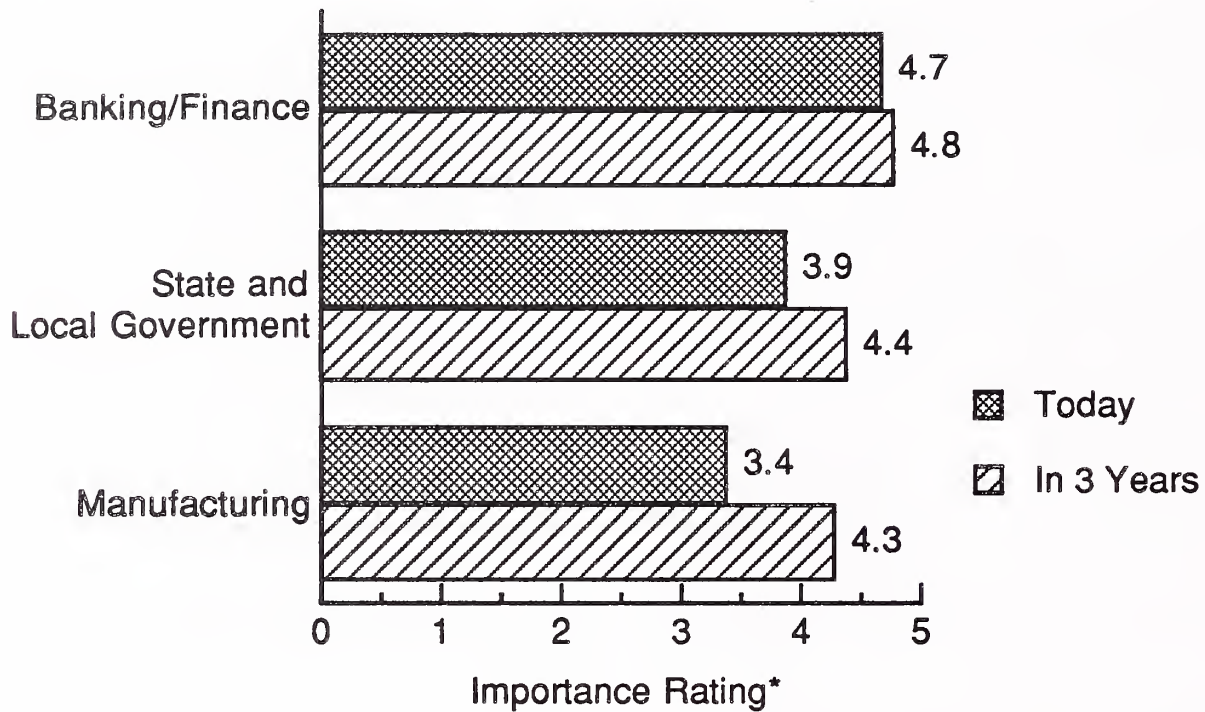
*On a scale of 0-5; where 0=no importance, 5=greatest importance.

The state and local governments category includes city, county, regional/district and state government bodies, particularly those involved with public safety, highways, welfare, education, health and social services, and sanitation.

One-quarter of state IT expenditures will be expended for network services requirements, according to reliable figures computed by state IS agencies. State governments are enhancing the communications capability of most replacement and new on-line systems. Network needs between state offices are greater in states having large geographic areas and/or populations. Larger states, such as New York, Michigan and Illinois, were the first to implement integrated statewide networks. State governments show great interest in technologies that permit integration of applications at the user level.

Automated techniques to provide public access to local government information and vital records are fueling needs for the application of multimedia technology. Many manual tasks can be easily automated using multimedia applications. Implementation of this technology has been

hindered by a lack of comprehensive network support. However, this will change as second-generation PC-based network systems, which have broader bandwidths, become more prolific in the market.

Automation of branch offices is among the leading priorities in banking. To provide full service, integrated customer files are needed along with networks to provide access. Rapid growth of new services at banks has resulted in a proliferation of standalone networks to support different applications. Branch offices were frequently connected to different networks. Until recently, one of the largest U.S. banks had 150 different networks supporting different applications and business processes to the same geographic area. Plans are being developed to consolidate these networks, and the bank has stated most of the network management will probably be outsourced.

The management of security is a critical issue in the banking industry. Validation/authentication of messages in transaction networks and prevention of network infiltration and tampering are now important aspects of systems development. National networks of automated teller machines (ATMs) and debit cards are a competitive necessity.

A primary focus of the manufacturing industry is on technology that will contribute to integrated production processes. The push to automate manufacturing processes has created a large base of mostly incompatible and unconnected process control and automation equipment. Materials handling equipment, CAD/CAE systems and process controllers to assembly robots and automated guidance vehicles for parts retrieval from stores are just some examples of factory automation resources that are targets for integration.

One of the critical skills for SI vendors operating in the manufacturing market is network integration. Most in-house IS staffs are lacking in this area. The SI projects often involve integrating legacy equipment and software from numerous vendors. The complexity of such a task can be a critical factor in causing a company to decide to contract with a vendor.

There are only 800 large retailers among the more than one million retail companies. The emphasis of these large retailers will be on improving and integrating external and internal communications. Externally, communications with customers is very important. Better communication links facilitate the flow between customers, outlets, retailers and wholesalers. Internally, closely monitoring finances is still the primary use of automation.

Increasing expenditures to support broader networks are viewed as the only way to simultaneously control costs, track customer buying patterns, manage inventory and match merchandise to changing demographic buyer interests. Broader networks are extending in two directions:

- The first direction is to the point of sale (POS). Real-time analysis of credit and POS data ensures the steady flow of funds while monitoring inventory.

- The second direction is to major suppliers and customers. The use of EDI to link key accounts is characteristic of the 80:20 rule. Twenty percent of the customers generate 80% of the business. In many cases where the products are clearly defined (standard product coding and terms), the retailer may require suppliers to support EDI or lose business to a competitor that will support EDI. In many cases this approach eliminates several layers of product distribution.

From a functional point of view, retail organizations are seeking outside help for communications network integration, voice/data integration, client/server integration and office information systems integration. Specific skills required relate particularly to network design and complex project management.

Success and customer acceptance is based on confidence in the vendor's track record in the customer's industry. Therefore, to be successful, vendors must develop focused strategies for each vertical market they choose to address.

2. Network Integration (Standalone)

Network integration whose primary objective is to transport information within an enterprise is another category of projects included in this study. Communications networks in this category started typically as large, internally managed corporate resources, justified to increase cost savings and to leverage the organization's buying power as a function of size with the communications services providers.

The importance of network integration has continued to increase. Networks are labeled by the area they serve and their bandwidth. The most common networks are local-area networks, wide-area networks, and, in large organizations, enterprise networks. Network bandwidth was examined by narrow (under 64kb) and wide (over 64kb). As illustrated in Exhibit III-3, each of these types of networks are recognized today and are increasing in importance in the future, except for narrow-band networks, which held its level of importance.

EXHIBIT III-3
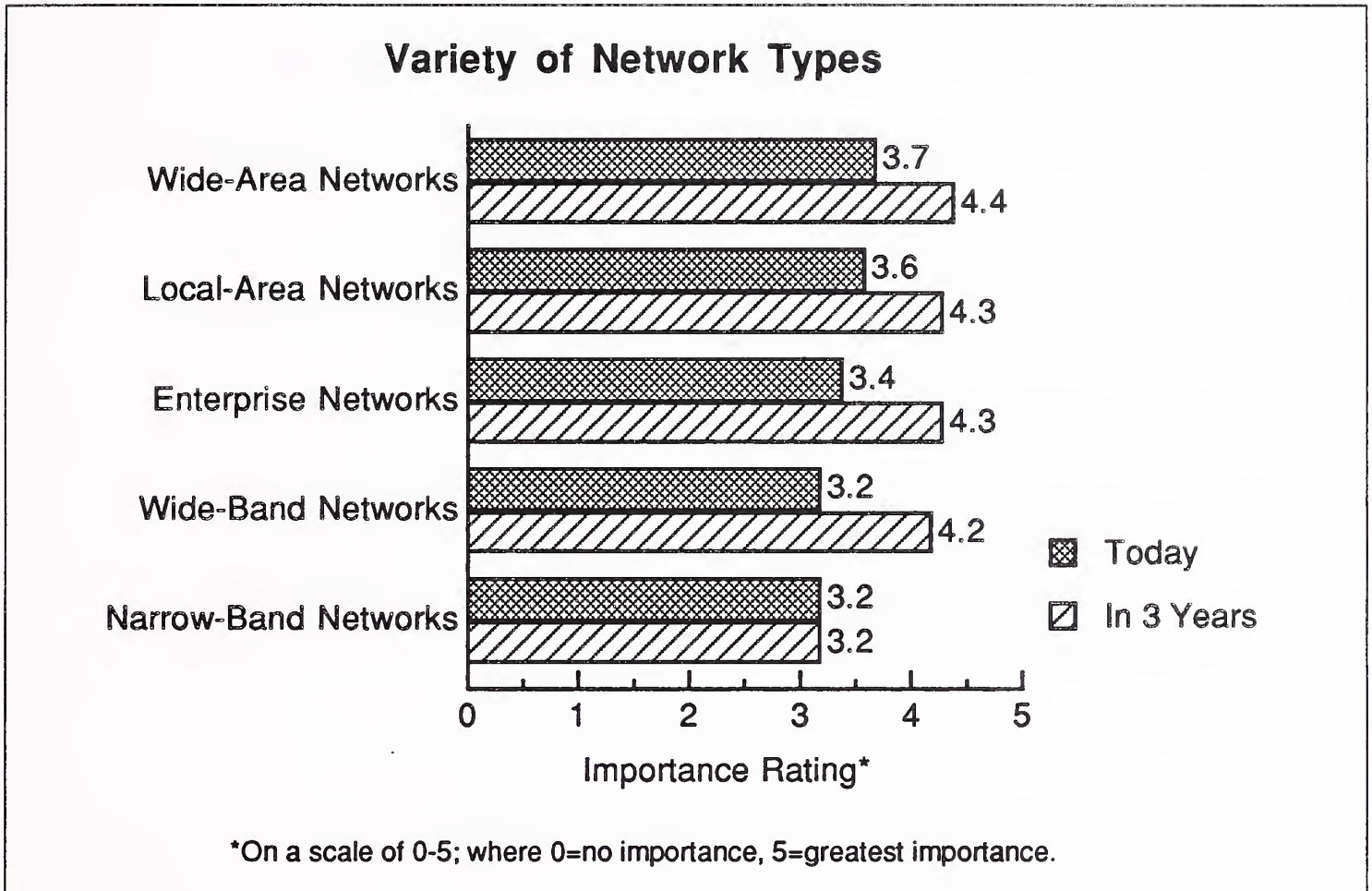
Variety of Network Types

*On a scale of 0-5; where 0=no importance, 5=greatest importance.

Local-area networks (LANs) and wide-area networks (WANs) are recognized today as the most common project for initial implementation. Enterprise networks are more important in large organizations and represent significant network integration opportunities.

The contrast between narrow-band and wide-band networks illustrates the significant trend in network integration to the larger bandwidths required by multimedia applications.

The trend for network integration is to more intelligence and software, fewer personnel and less hardware. Exhibit III-4 demonstrates that the importance in network software is recognized today and will be more significant in three years. Fiber-optic cable is recognized as a means of transporting wide bandwidths and is increasing in importance consistent with increasing demand for wide-band networks. Advanced mobile/wireless is not as well recognized for reducing hardware costs, but will increase in the next three years as the savings possible with wireless office networks become evident. The use of radio-frequency (RF) technology for paging and operations is more common where operations are mobile or require emergency dispatch.

EXHIBIT III-4

Elements of Network Integration Technology

Network Security — 3.4 / 4.4
Network Software — 3.7 / 4.3
Fiber-Optic Cable — 3.4 / 4.1
Global/International Networks — 3.1 / 3.7
Advanced Mobile/Wireless — 2.2 / 3.0

▨ Today
▨ In 3 Years
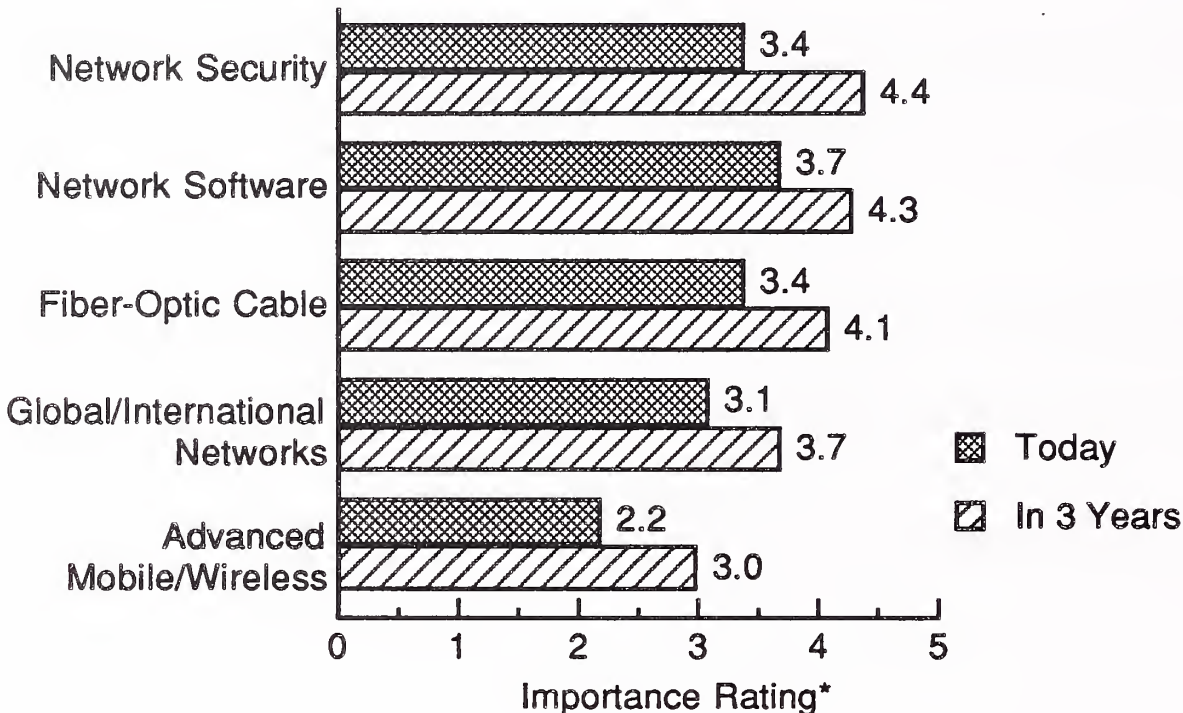
Importance Rating*

*On a scale of 0-5; where 0=no importance, 5=greatest importance.

Global/international networks are increasing in importance in organizations with international operations. The use of virtual networks and enhanced public-switched services may impact the configuration of global/international networks.

Network security is already recognized today as vital and will increase in importance during the next three years. As network access becomes more open, the need to preserve network security becomes more acute.

Viewing the network as an information pipe, several technologies are identified in Exhibit III-5 that indicate which trends will be most important in using this information pipe. PBX/switching is recognized for the additional value it can bring to voice networks and is gradually increasing. The use of video in information networks is increasing, as added bandwidth, better compression techniques and improved network support become readily available.

EXHIBIT III-5

Importance of Network Integration Applications

Application	Today	In 3 Years
PBX/Switching	3.1	3.6
Document Management	2.6	3.6
Video	2.5	3.4
Recognition Software	2.2	2.8
Personal (PCSs and PDAs)	1.9	2.7

Importance Rating*
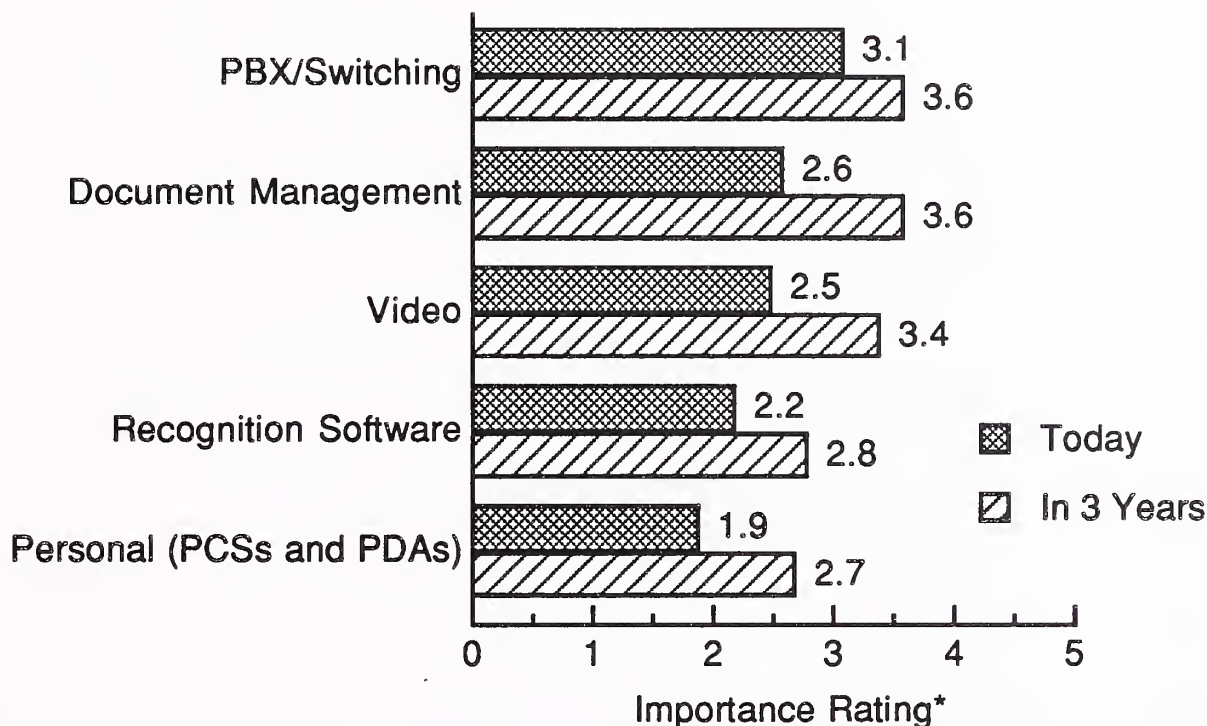
*On a scale of 0-5; where 0=no importance, 5=greatest importance.

Document management is emerging as a significant use of networks. Text and image (fax) are increasingly transported electronically both internally and externally. Recognition software is still in the experimental stages for voice and image (fax) interfaces that will convert these entries into the network to text on the user's desk.

Personal communications (PCSs and PDAs) is an emerging communications vehicle that will eventually lead to assigning an access number to each individual for communications access any place. As is reflected in Exhibit III-5, this technology will be gaining additional prominence in the next three years. It is projected by industry pundits that there will be over 200 million subscribers worldwide by the year 2000.

C
Key Marketplace Factors

This section explores the key advantages and obstacles—current and future to vendors, from the perspectives of both clients and vendors, as shown in Exhibit III-6.

The importance of network integration technology is increasing. Just as the redwoods, the tallest trees in the world, have a network of roots for support, network systems integration has become the information highway system that transports business information. Networks are viewed as the business tool to reach the expanding market and build stronger business relationships electronically.

The value of networks to business is increasing. Networks are now considered strategic assets of a business. This has increased the value to an organization significantly. Network systems integration can pay clear dividends in exploiting this high-value strategic asset by linking the islands of automation that have grown up in so many business organizations. Business process engineering provides the stimulus to develop new travel plans for navigating the information highways traveled by the organization more effectively. These travel plans provide for the electronic transport of data to expedite the functioning of business processes. Business can more aggressively address the marketplace and develop strategic advantage with the new information more readily available by enhanced networks connecting their diverse units.

With regulatory reform, competition and network services are expanding. In response to questions about the impact of regulatory reform, increased competition was identified as the most significant effect. No longer operating in a regulated monopoly environment, competition has heightened among vendors to enhance service and market network capabilities to new clients. In an effort to develop discriminators, focus is shifting away from plain old telephone service (POTS). Virtual networking, for example, now provides "bandwidth on demand." Additional network services and competition among providers are accelerated by open network architecture (ONA). ONA provides for user-transparent access to the local exchange carrier, irrespective of the gateway to that common carrier.

EXHIBIT III-6

Key Commercial Network Integration Factors

- Positive

  - Importance of network integration technology is increasing.

  - Value of networks to business is increasing.

  - Competition for network services is expanding.

  - Developing enterprise networks provide electronic collocation and application transparency.

  - Network access to customers and suppliers is being used as a competitive strategy.

- Negative

  - Infrastructure investment is slowed by poor economy.

  - In-house competitive threat is strong.

  - Measuring a network's value is difficult.

  - Organizational instability limits the size of projects.

Enterprise networks with electronic collocation and application transparency are emerging as business tools. Geographic dispersion used to require a consolidation of resources implemented by a project team or relocation of staff and equipment to a specific project site. As the costs of transfer or travel increase, the network technology to provide electronic collocation continues to improve. Uses of networks range from:

- A large corporation using electronic means to network a project team into a virtual office

- To video, used by a large paper products manufacturer to review capital projects

- To a network hardware manufacturer using remote diagnostics and network management software to improve response for the customer service department.

Enhanced network access to customers and suppliers is viewed increasingly as a strategy to beat the competition. EDI has become a requirement to transact business with key customers or key vendors in both manufacturing and distribution industries. Frequently this approach is the only way to manage the large volume of transactions generated daily. Networking also is an important tool in reducing inventory floats. In many cases, both the customer and the vendor realize administrative and cost savings that ultimately lower pricing by the vendor and influence the customer's choice of communications vendor.

The strength of these positive factors is to some extent mitigated by understanding the negative threats to network systems integration.

The stagnant economy is still slowing infrastructure investment. The cash infusion needed to achieve network systems integration in an organization and in the communication infrastructure in general may be blocked by budget freezes at the public sector and private level. For example, because of poor business performance, corporations may be planning divestiture of portions of the organization and thus not see the investment as appropriate until cash from the divestiture is available or economic conditions change, whichever comes first.

The in-house competitive threat is strong. Corporations, adept in their own technology, believe they can develop and manage their own network systems. Internal technical resources are recognized members of the corporate team. The IS department is generally required to provide approval on decisions to use a network systems integrator by a user department.

The value of a network is difficult to measure. Individual network systems integration projects tend to be evaluated as capital projects using return-on-investment (ROI) criteria. Specific cost savings or cost avoidance is quantified and used as the basis for forecasting the payback. The value of the integrated network as a whole is often done in the same manner as evaluating product unit costs of a production plant that produces several products. The unit costs of each network service is assigned a specific unit cost benchmark to demonstrate the value of an integrated network.

Strategic benefits of network systems integration projects are much more important than cost factors. Benefits such as product-time-to-market (the length of time it takes to develop a product, start up production and enter target market), just in time (JIT) (response to suppliers), and one-stop branch banking make setting baseline values before and after network systems integration important but very difficult.

Network ownership is perhaps the most difficult barrier to the setting of a value. Is the network a shared resource owned by the enterprise, or a dedicated resource embedded in an integrated system owned by the user? Shared network resources are typically justified by cost reduction and economies of scale; dedicated resources are typically justified by the value the user gains. Thus, network systems integration must balance both value perspectives to assure the value to the user and to the manager of shared network resources is significant.

Organizational instability limits the size of projects. The average planned life of a network project is seven years. The average value of a network systems integration project is $30 million. Implementing an integrated network system is a strategic commitment. During a period of organizational instability, the organization shortens the planned life to a level of strategic commitment that is prudent. This limits the size and degree of integration (shared resources) that can be addressed by a network systems integration project. In some situations, the size of headquarters is being downsized, and the desire to support an integrated network itself is at risk.

Each integrated network system requires that its users have a clear understanding of its value and how it will be managed to increase that value in the future.

D
Technological Directions

Technology in the 1990s will drive network convergence. Classical distinctions between voice, data and video will fade or disappear entirely. Distinction between hardware and software, between information transport and information processing, will evaporate as more capacity and the sophisticated tools to manage it grow. Greater bandwidths, virtual offices, electronic collocation, application transparency and increased user control over network services fundamentally transform the role of communications networks in the business enterprise. Technology enables truly integrated network systems to be deployed.

Networks historically were a composite of electronic hardware and cable or wire. The use of fiber optics, radio-access technologies and software are changing the way networks operate and what components make up the network.

Fiber optics offers enormous bandwidths and high transmission fidelity, removing a major transmission capacity bottleneck that has been present for years. The use of fiber optics will enable high-speed data applications and drive users toward more multimedia applications, including video and image transmission.

Radio-access technologies will supplant the expensive hard-wired facility associated with existing office networks. Integration of personal communication services (PCSs) and personal digital assistants (PDAs) will form a base for the wireless office. Global communications are being further accelerated with the opening of the former Soviet Union states. RF technology combined with low earth orbitals (LEOs) are being aggressively installed and are now even more feasible with the availability of reliable Russian launch operations and the ability of these launch operations to orbit increased payloads.

Software replaces hardware control of network operations and enables electronic collocation, application transparency, dynamic bandwidth management, intelligent network deployment, voice/image recognition and document management, to name a few enhanced network services that depend on software to control and deploy them.

The change to network providers will bring more value to the user, with software control and enhanced services. It will bring more efficient network systems using fiber optics with substantial bandwidth capacity. It will add RF-access technologies to eliminate wiring costs and the inherent inflexibility of a wired system.

E

Impact on SI Market

It used to be that a business card only displayed a telephone number. Now you are surprised not to find a fax number also.

Network systems integration will become a major aspect of the systems integration market because the requirements to communicate voice, data and images have been greatly expanded and extended. What started as data or voice has been expanded by multimedia applications into media including voice, fax, data, text, image and video. What started as data access within applications or voice access to key sites within an organization has been extended to application transparency and virtual office networks that include customers and vendors within the same network.

Network systems integration focuses on the information highways of a business. Business is challenged to address global markets and integrate islands of automation. Integrated network systems solutions are so important that they are considered a strategic asset of the organization. This means that corporate management is changing its perspective on networks and will be very receptive to a proven approach.

Network systems integration and systems integration demonstrate that information technologies are indeed converging. This convergence is clearly demonstrated when:

- Gigabytes of information are managed in an integrated environment in a user's desktop in a virtual office that has links to other desktops at the organization's remote branch sites

- A retailer's point-of-sale terminal has the ability to instantly check the customer's credit rating

- A design workstation on a product engineer desktop can access images stored at the corporation's central engineering repository and can manipulate the images interactively

- A dispatch workstation for 911 emergency services identifies the caller's name and street number instantly, then retrieves a utilities inventory of the site

This powerful convergence of data with hardware and communications technology will breed new opportunities to manage information resources in current integrated environments and in environments where a technology "leap frog" is required.

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IV
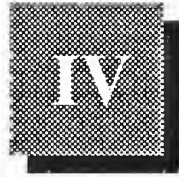
SI Vendor Perspectives

A
Current Strategies and Plans

Network systems integrators must first define the market segments to be addressed and then identify the set of customers operating in that segment. Systems integrators merely need to target a set of customers to be addressed. A typical systems integrator thinks of market segmentation as defined by a vertical industry and the size of the business. A typical network integrator deals with shared resources to gain efficiencies and dedicated network systems focused or user productivity. The client also demands that the network integrator be readily recognized by other members of the same industry.

Another consideration is defining the functional expertise needed to address the target customers. A full-service integrator needs to present a capability for life-cycle management of the integrated network system. It is critical to the corporation's ability to manage risk that the functional expertise of the network vendor be evident, particularly in network management software and security.

The most important step in executing a successful network integration strategy is to define performance milestones and strategic benchmarks based on requirements.

As shown in Exhibit IV-1, a composite strategy and plan for addressing the network systems integration market contain these fundamental elements.

The fundamental insertion of new relevant technologies can be a significant discriminator, but only if it has impact on the functional performance of the integrator or delivers more robust services to the customer.

EXHIBIT IV-1

Fundamental Strategies and Plans

Step 1 Target customer segment where a market presence exists or an entry plan is clear

Step 2 Define full service expertise to address customer requirements; use alliances/teaming as necessary

Step 3 Identify relevant technologies

Step 4 Develop performance milestones/benchmarks based on requirements

B
Future Market Strategies

The relationship between the network system integrator and the business organization may change dramatically. The network system may become virtual, with the integrator dynamically allocating network services. In this case, the capacity of the integrated network system would be enhanced by buying bandwidth and other services as demanded. In this scenario, the enterprise network could operate like to a virtual processor in which requirements for more bandwidth would exist in some segment of the network and excess capacity would exist in another. The development of a spot market for bandwidth, or more probably the integrator developing a strategic partnership with a carrier, would permit more-efficient capacity planning and lower costs for all participants.

C
Competitive Environment

With the emphasis on global communications, network systems integrators have had some foreign competition, frequently through a joint venture, a consortium of many multinational common carriers or a domestic subsidiary of a large international firm such as BT Telecom.

The RBOCs and other carriers, such as GTE, have pursued network integration as a natural extension of their operations experience. Perceived as the nonregulated portion of the business, the network integration organization usually is dwarfed by the telephone operations and cellular

portions of the business. The breadth of the technology addressed and the complexity of contract performance require an aggressive management approach to be successful.

Hardware manufacturers have the same stigma attached to them in networks as in systems integration; namely, the need to leverage hardware sales. Focus is on providing a complete and reliable solution, with account relationship being key. INPUT believes that equipment vendors will find it necessary to spin off subsidiary companies defined by their NSI activities. Advantis is the first such example of such a spin off.

Professional service firms have had some difficulty in network systems integration activities. It is difficult to build a legacy of expertise in network design and development. EDS gains some leverage from the years of experience it has in the facilities management business. For this reason, the best approach for professional services firms is to enter the network integration market fields from a business process engineering approach. This approach will lead to an enterprise network requirement that can be implemented as an additional engagement.

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V
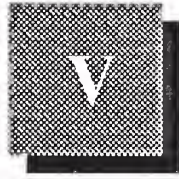
Summary and Recommendations

A
Summary

A summary of the INPUT findings based on extensive vendor interviews lead naturally to a set of recommendations for system integration vendors or others that are seeking to benefit from opportunities in the network systems integration market. Exhibit V-1 presents major conclusions.

Integration of network systems is important to business. Networks are the reflection of the business organization's operations. Today networks are being recognized as systems capable of shaping organizations and changing their style of doing business. The flexibility to operate any place requires open access and mobility to respond to market demands for service.

Enterprise networks are application transparent; virtual, i.e., create a virtual office, provide electronic collocation; and are growing in importance. Enterprise networks are more important in large organizations and represent significant network integration opportunities.

LANs and WANs will remain important. Local-area networks (LANs) and wide-area networks (WANs) are recognized today as the most common element for initial network integration project implementation and will continue to be a basic building block for network projects in the future.

Network software is important to manage networks. Software has replaced hardware control for network operations. Templates and parameter tables built into communications software enable electronic collocation, application transparency, dynamic bandwidth management, intelligent network deployment, voice/image recognition and document management.

EXHIBIT V-1

V-2

Summary

- Enterprise Networks:

  - Are application transparent

  - Result in a virtual office environment

  - Provide electronic collocation

  - Are growing in importance

- LANs and WANs will remain important

- Network software is important to manage networks

- Network security is fundamental

- Fiber optic delivers enormous bandwidth

- Bandwidth is increasing in network systems

Network security is fundamental. Network security is recognized today as a recurrent problem and will increase in importance during the next three years. As network access becomes more open, the need to preserve network security becomes more acute.

Fiber optics offer enormous bandwidths and high transmission fidelity, thus, removing a major transmission capacity bottleneck that has existed for years. Fiber usage will encompass high-speed data applications and provide the ability to adopt multimedia applications, including video.

Bandwidth is increasing in network systems. Greater bandwidths, virtual offices environments, electronic collocation of data, application transparency and increased user control over network services has fundamentally transformed the network's role in business organizations. The contrast between narrow-band, whose relative importance is projected as staying the same, and wide-band, whose importance is still increasing, illustrates the significant trend in network integration to larger bandwidths and the capacity for multimedia communications.

The wireless office is coming. Radio-access technologies will supplant expensive facilities wiring associated with existing office networks. Integration of personal communication services (PCSs) and personal digital assistants (PDAs) will form a base for the wireless office. No longer will the office have to be rewired every time there is an organizational shift.

The value of networks is different because:

- A shared resource network is based on efficiency
- A dedicated network is based on application value to the user

Network ownership is perhaps the most difficult barrier to the setting of a value. Is the network a shared resource owned by the enterprise or a dedicated resource embedded in an integrated system owned by the user? Shared network resources are typically justified by cost reduction and economies of scale; dedicated networks are typically justified by the value the user gains from the system. Thus, network systems integration must balance value perspectives of the organization to assure the value to both the user and to the manager of shared network resources is significant.

B
Recommendations

The following recommendations, listed in Exhibit V-2, are the result of discussing the market characteristics with network integration vendors, analyzing market needs and assessing the impact of the emerging technologies.

Vendors should focus on target market segments. Network systems integrators should first define the market segments to be addressed. These segments may include organizations from several industries. Systems integrators need only target a set of customers in a given industry whose needs must be addressed.

Network systems can have impact in a variety of environments. Local-area networks improve the productivity of work groups, wide-area networks improve the efficiency of information distribution throughout an organization, and enterprise networks improve the strategic capability of business to compete by pulling resources together into an integrated system.

EXHIBIT V-2

Recommendations

- Focus on target market segments:

    - Where network systems can have impact

    - Where market presence/experience can be leveraged

- Be a full service integrator

- Select relevant technologies and use as discriminators:

    - Network software

    - Fiber optics

    - Advanced mobile/wireless

Market presence/functional experience must be leveraged. Presence in the marketplace is a significant position factor for a vendor. If the vendor's experience and success is not readily recognized by firms of the vertical industry, entry may be extremely difficult for a vendor of network systems integration services even though it has excellent telecommunications experience.

The average planned life of a network project is seven years. The average value of a network systems integration project is $30 million. Implementing an integrated network system is a strategic commitment. Network systems integrators' strategy is to provide a full range of services, from:

- Providing network design, integration and implementation;
- To operations training, management and control;
- To network maintenance and administration.

The vendor that can demonstrate a full range of capabilities is best positioned to add new business in a given market.

Vendors should be functional experts of target market segments. Recognized functional expertise is needed to address the targeted organization. A full-service integrator needs to present a capability for life-cycle management of the integrated network system. It is critical to the client organization's ability to manage risk with the vendor that the functional expertise be demonstrable, particularly in network management software and security.

Vendors should select relevant technologies and use them as discriminators. The fundamental insertion of new relevant technologies will be a discriminator for the network systems integration vendor, but only if it impacts the functional performance of the integrator's product or delivers more robust services to the customer at an acceptable cost to the client.

Network software, fiber optics and advanced mobile/wireless are technologies of the 1990s that will drive network convergence; obscure classical distinctions between voice, data and video; shift emphasis from hardware to software; and differentiate between information transport and information processing. Greater bandwidths, virtual offices, electronic collocation, application transparency and increased user control over network services fundamentally transform network's role in business.

Network systems integration and systems integration convergence demonstrate that information technologies are indeed converging. This convergence is clearly demonstrated when:

- Gigabytes of information are managed in an integrated environment in a user's desktop in a virtual office that has links to other desktops at the organization's remote branch sites

- A retailer's point-of-sale terminal has the ability to instantly check the customer's credit ratings; a design workstation on a product engineer desktop can access images stored at the corporation's central engineering repository and can manipulate the images interactively

- A dispatch workstation for 911 emergency services identifies the caller's name and street number instantly, then retrieves a utilities inventory of the site

This powerful convergence will breed new opportunities to manage information resources in current integrated environments and in environments where a technology "leap frog" is desired.

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