Global Telecommunications: Myth or Reality?

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Program on Information Resources Policy

Harvard University

Center for Information Policy Research

Cambridge, Massachusetts

A publication of the Program on Information Resources Policy.

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June 1994, P-94-2

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ISBN 1-879716-06-2

Printing 5 4 3 2 1

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U.S. Media Group
Viacom Broadcasting
VideoSoft Solutions, Inc.
VISA International

Acknowledgements

The author gratefully acknowledges the following people who either provided information and helpful suggestions or reviewed and commented critically on drafts of this report. Without their consideration, input, and encouragement, this study could not have been completed.

David B. Allen
Manuel Barbero
Andy Block
James A. Bridges
Robert C. Devaney
John W. Faris
Edward M. Frazer
Ikuo Hasuike
Nobuhiko Kakizawa
Matashi Katsurayama
Taku Kawamoto
Jiro Kokuryo
Satoru Kuboshima
Rick Marchant
Louis Marchese
Thomas J. Marino
Charles H. McGlone
Charles F. Meyers
Peter C. Park
Takashi Suzuki
Atsushi Tsuchihashi
Masayuki Wakabayashi
Carol Weinhaus

These reviewers and the Program's affiliates are not, however, responsible for or necessarily in agreement with the views expressed here, nor should they be blamed for any errors of fact or interpretation.

Special thanks to Ellin Sarot, for editorial assistance.

Personal thanks go to my wife, Noriko Shimizu, and my daughters, Sayaka and Marika, for their support during this research.

Executive Summary

International telecommunications have developed greatly in recent years, both in serviceability and volume. Enhanced services to meet the needs of global corporations are the most typical development. Using case studies based on field research on global corporations leading the enhancement of international telecommunications, this paper examines the following themes:

- What kinds of necessities spurred these companies to build sophisticated global corporate networks?

- How do these companies see their networks developing in the future?

In analyzing global corporate activities in terms of the flow of data accompanying business activities, it becomes obvious that these global networks are in a period of transition. Their potential needs are for high-volume, real-time transmission, and multimedia communications, while in their current stage they generally use file transfer for data with relatively low-speed, voice-oriented communications.

Measured in terms of each company's use of global networks, four remarkable features are evaluated: sharing information resources that are managed independently at each different location by networking those resources (as in the banking industry); making information resources managed at headquarters available to overseas locations by using the global network as an information resource (as in the manufacturing industry); transmitting data in real time through global networks (in all of the industries examined but particularly in the transportation industry); and as a strategic tool, taking external information resources into the corporation.

In the current stage of a highly advanced information society, telecommunications users are becoming conscious that in addition to the importance of information itself, how information resources are handled will offer competitive advantages that give the corporation an edge over its competitors. Thus corporate users can expect that networking, as one of many information resources, will become a (fundamental) infrastructure and part of corporate strategy in the next century. Some corporations aware of this have begun construction of this type of network. In telecommunications, the twenty-first century has already set in.

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Chapter One

Introduction

In the United States and in Japan, large domestic corporations represented internationally by global corporations have carried out developments in telecommunications, especially international telecommunications. Owing to the increasing expansion overseas markets by those corporations, the international telecommunications market has grown, and formerly simple services such as telephone and telex have matured into such sophisticated services as digital leased circuits, the international virtual private network (IVPN), the international integrated services digital network (ISDN), and the international value-added network (IVAN). "Frame relay" technology has been developed to connect local area networks (LANs) on a global basis.

User needs also have changed, from simple ones such as a user's interoffice connection to meeting the complex and diverse demands for services with high reliability and expandability, while, needless to say, at low costs.

Since the advent of international digital circuit services, the trend for corporations involved in global communications by corporations has been toward construction of high-speed, high-capacity private networks. Since the mid-1980s, when construction of such networks began, concerns about international line costs have led corporations to focus on combining digitized voice and data transmissions into a single digital line. The early 1990s have seen the arrival of new, inexpensive services of public networks in the form of IVPN for voice transmission and ISDN for voice and data transmission, producing a quantum leap in the level of public network-based services.

This report, based on extensive research in the field, presents a survey of and explanation for the state of the users' global networks, focussed on primary manufacturing and service industries in the U.S. and Japan and examines the form users sense global communications will take in the future.

How will the need for and significance of global networks change in the context of the ongoing globalization of corporations? As economic activity becomes increasingly "borderless," with greater movement of people, goods, and money over national boundaries, the flow of data also might be expected to become borderless. Yet, the more globalized these activities become, the more it appears that people, goods and money will move primarily at the local level, as reflected in the trends toward corporate "localism" and local production.

Simultaneously the political trend in the 1990s is toward the formation of economic blocs. Member nations of the European Union (EU) moved closer toward unification, and 1993 saw the signing and ratification of the North America Free Trade Agreement (NAFTA). A Pacific Rim economic bloc consisting primarily of Asian nations has also been proposed. Corporations are beginning to formulate overseas strategies with "quasi trading blocks"[1] in mind. The establishment by Japanese auto manufacturers of a development base in Belgium and a production base in the U.K., thereby locating within EU nations all operations—research and development (R&D), production, distribution, and sales—required for corporate activity, is one such strategy for doing business in the EU.

In what direction will increasing globalization of user communication needs lead world telecommunications services? To respond to that question, this report bases an examination of the current state of networks used by global companies on case studies of corporate global communications in various industries—banking, manufacturing, and transportation—and, by estimating their future trends, suggests how telecommunications may develop in the future.

Chapter Two

Background

2.1 Development of Corporate Global Telecommunications

Global telecommunications have been developed extensively, particularly since 1980, both in volume and in enhancements. The number of international telephone calls has exploded—by a factor of ten; at the same time, increasing foreign direct investment appeared to drive the development of international communications.

Table 2-1

Foreign Direct Investments: The U.S. and Japan

	U.S. Investments Abroad ($U.S. billions)			Japan's Investments Abroad ($U.S. billions)		
	1980	**1985**	**1990**	**1980**	**1985**	**1990**
Foreign Direct Investments (FDI)	$19	$13	$33	$5	$12	$57
Total Assets	$385	$380	$598	$36	$84	$311

	Foreign Investments in the U.S. ($U.S. billions)			Foreign Investments in Japan ($U.S. billions)		
	1980	**1985**	**1990**	**1980**	**1985**	**1990**
Foreign Direct Investments (FDI)	$17	$19	$37	$0.3	$0.9	$2.8
Total Assets	$124	$227	$466	$3.0	$6.4	$18.4

*Data not currently available.

Sources: Data for the U.S. are based on U.S. Bureau of the Census, *Statistical Abstract of the United States* (112th ed., Washington, D.C., 1992), pp. 783, 785. Data for Japan are based on Ministry of Finance, *Zaiseikimyu-toukei Geppou* [Monthly Report of Financial Statistics], vol. 500, (Tokyo, Dec., 1993), pp. 24, 78-79.

Table 2-2

Number of Overseas Calls

Year	United States (Millions of Calls*)	Japan (Millions of Calls*)
1970	23.4	—
1980	199.6	23.4
1981	265.5	29.7
1982	310.8	37.1
1983	369.5	49.7
1984	427.6	68.9
1985	411.7	95.6
1986	477.6	134.6
1987	579.6	189.5
1988	705.7	255.5
1989	1,007.8	324.0
1990	1,200.7	388.9
1991	1,377.0	445.4

*Originating, incoming, and relayed.

Source: Data for the U.S. are based on U.S. Bureau of the Census, *Statistical Abstract of the United States* (113th ed., Washington, D.C., 1993), p. 562 and (107th ed., 1987), p. 532. Data for Japan are based on Ministry of Posts and Telecommunications, *Communications in Japan*, p. 30; 1981–1985 data are from InfoCom Research, *Information & Communications in Japan*, p. 81.

Given the growth of global communications, carriers developed technologies to meet user needs. For example, advancements in optical fiber technology have contributed to cost reductions in global telecommunications. In 1970, ten years after the invention of laser beam technology, 20 decibel per kilometer (dB/km) low-loss optical fiber opened the possibility for its practical use. Ten years later, 0.2 dB/km-loss commercial optical fiber had been introduced. As of the early 1990s, single mode marine optical fiber cable could transmit 120 km without a repeater.[2] These advances in technology allowed high maintenance ability at low cost: investment costs per one voice path of marine cable, which were $557,079 (by cable) in 1956 were reduced to $48,889 (by coaxial cable) in 1970, then $8,873 (by optical

fiber) in 1988.[3] As a result, while revenue from overseas calls has grown, the costs of global communications have been reduced.

Since international digital circuit services became commercial in the mid-1980s,* global corporations have strived to enhance their private networks, which have evolved greatly since the initial stages when they were tied to public switched telephone (PSTN) and telex networks. As the technology advanced, IVAN service was introduced in order to build computer networks, and now digital private circuits integrate voice and data.

Table 2-3

Cost Reduction of International Telephone Calls and International Leased Circuits

	U.S.		Japan	
Cost of International Telephone Call*	**1980**	$18.54	**1985**	¥1,530
	1988	$9.57	**1990**	¥670
Cost of International Leased Circuits	**1990**	$11,270	**1985**	¥1,530,000
	1992	$7,890	**1990**	¥670,000

*U.S. cost is an average; Japan's cost is based on a three-minute call.

Sources for international telephone call costs: Data for the U.S. are based on Robert A. Mosbacher, *U.S. Telecommunications in a Global Economy* (U.S. Department of Commerce, Washington, D.C., August 1990), p. 230; data for Japan are based on *Joho-tsusin Handobukku 1993* [Information Communications Handbook 1993] (Tokyo: InfoCom Research, 1993), p. 117. Sources for international leased circuit costs: Data for Japan are for voice-grade circuits and are based on Nihon Joho Tsushin Shinkou Kyokai [Japan Information and Communication Association], *New Media Hakusho* [White Paper on New Media] (Tokyo: Nikkan Kogyo Shinbunsba, 1992), p. 236. Data for the U.S. are based on MCI one-year contract tariff of 128 Kb/s digital half-circuits between the U.S. and Japan.

In addition to such growth and enhancement of global telecommunications, current trends are toward diversification of services to meet user needs. As yet, few global corporations rely on public switched services such as international ISDN[4] and IVPN.[5] International ISDN

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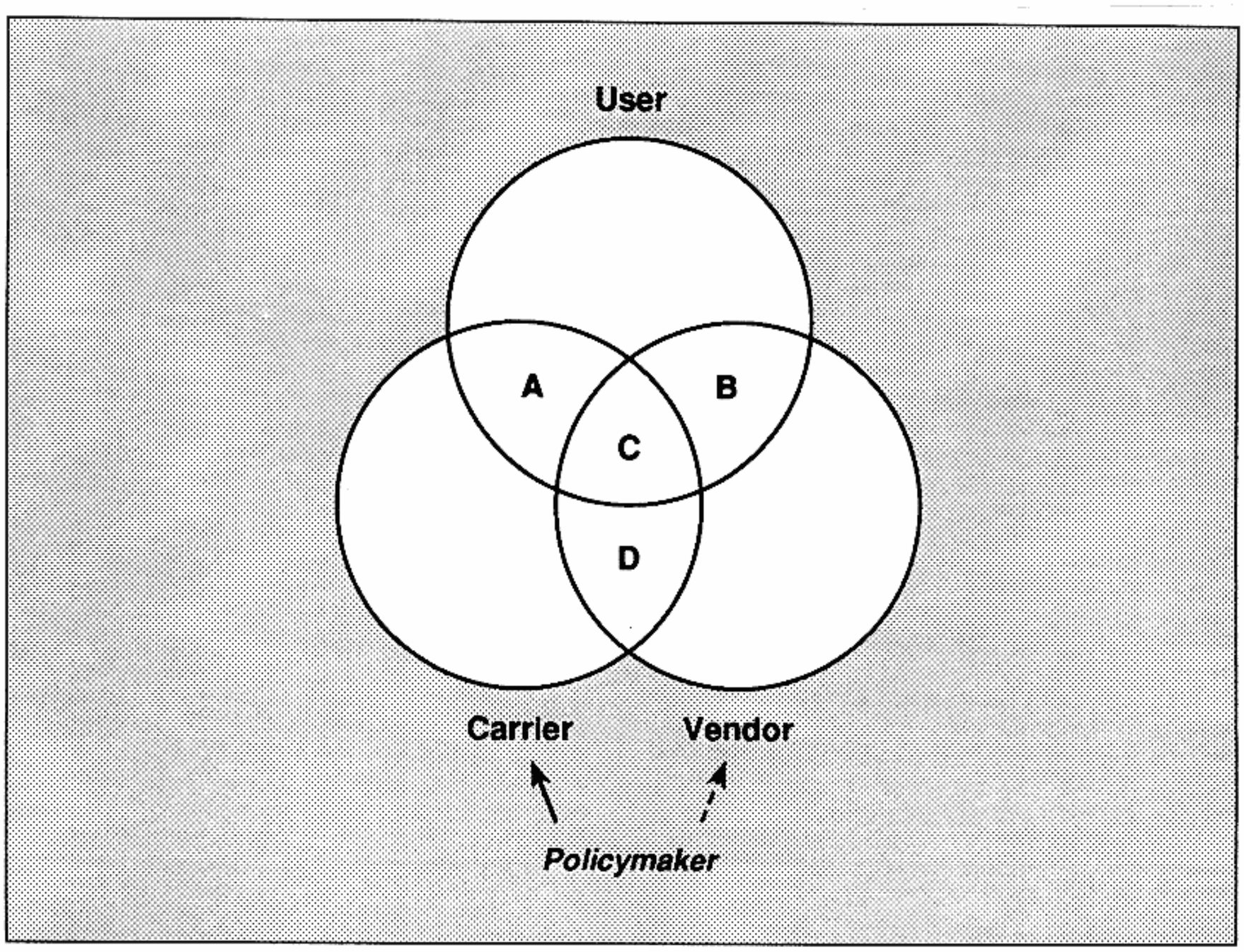
*Since international digital circuit service was introduced in Japan in 1984, leased circuits increased to 74 in the first three years and to 642 by 1990. Source data are based on Yuseisho Nettowaku-ka Suishin Kaigi [Ministry of Posts and Telecommunications (MPT) Network Advisory Board], *Nihon no Nettowaku 1992* [Japanese Network 1992] (Tokyo: Konpyuta Eiji, 1992), p. 45.

service, for example, has met user needs rapidly. Since becoming commercial in Japan in 1989, subscriber lines for this service reached 516 (in 1991).[6]



Overlapping relationships:

A Network services provided directly to users

B Customer Provided Equipment

C Network management and a part of systems integration provided by both carriers and vendors. Network management includes network operations and network integration for the design and construction of private networks.

D Interdependence: carriers provide network services to vendors and vendors provide network equipment to carriers.

Notes:

Carriers can also provide Customer Provided Equipment.

Regulations made by policymakers govern carriers more than vendors.

Figure 2-1

Players in Corporate Global Telecommunications

International frame-relay service was introduced in 1992 to target global corporations that need flexible global networks. Soon, switched multimegabit data service (SMDS), asynchronous transfer mode (ATM) service, and broadband ISDN (B-ISDN) service, which enable broadband transmission such as audio-visual information, will be available for commercial use.

2.2 Players in the Corporate Global Telecommunications Market

There are four major players in the corporate telecommunications field: (*i*) users, (*ii*) carriers, including VAN providers and resalers, (*iii*) equipment vendors and manufacturers, and (*iv*) policymakers. All of them interact with one another, as illustrated in **Figure 2-1**.

For the purposes of this study, the services and strategies of vendors and carriers are viewed as the components of corporate private networks.

Chapter Three

Case Studies: Methodology

3.1 Criteria for Case Studies

3.1.1 Selection of the Industries

The industries for the case studies were chosen on the basis of the current state of their global networks. In manufacturing, the automobile industry was selected because of its advancement of local production and the just-in-time inventory system on a global scale and the general consumer goods industry because its sales and production strategies target economic blocs. In the service industry, the banking and transportation industries were selected. The banking industry was chosen, because internationalization of financial markets has resulted in worldwide around-the-clock trading and corporate fund procurement has become international in scope. In the transportation industry, the study focuses on marine transportation, which handles worldwide distribution of goods and has served as the backbone of traditional import-export transactions. In addition, the international delivery service was selected because of its phenomenal growth.

3.1.2 Selection of Companies

The companies studied were selected from representative U.S. and Japanese corporations with a particular focus on the top three companies in each industry. Two main criteria were used for the selection:

- Companies either headquartered in the U.S. with major offices for overseas operations are in Japan or headquartered in Japan with major offices for overseas operations in the U.S.

- Companies whose overseas operations can be understood from the flow of data and business transactions between the U.S. and Japan

U.S.	Japan
CITICORP (CITIBANK)	The Fuji Bank, Limited (Fuji Bank)
Company X (major manufacturer)	Nissan Motor Co., Ltd. (Nissan)
DHL Worldwide Express (DHL)	Kawasaki Kisen Kaisha, Ltd. ("K" Line)

3.2 Survey Method

Each case study is divided into five sections:

(*i*) Industry trends

(*ii*) Overseas activities

(*iii*) Flow of data in connection with corporate activities

(*iv*) Features of the global network

(*v*) Importance of the global network

The first section is based on current research, and the second and third on interviews in which each interviewee responded to some questions; the fourth and fifth sections present an analysis of the first three sections. Much of the information used throughout was drawn from field research. Industry trends are included because they are expected to impact the future direction of global networks.

Overseas operations can be classified into two categories: (*i*) those exemplified by the banking and transportation industries, that is, some types of operations performed at each overseas location; and (*ii*) those exemplified by the manufacturing industries, in particular the automobile industry, that is, different operations performed at different locations. For cases that fit category (*i*), the report examines representative branch offices or local offices, or both, while for cases that fit category (*ii*) the report attempts to examine all of locations.

3.3 Interviews

The basic question posed in the interviews was, Why are companies building global private networks?

The objective of posing that question was less to understand the current shape networks are taking but, rather, to understand the why these particular shapes have developed. Therefore, in addition to interviews of network specialists about their overall network concept, senior managers intimately familiar with business operations were interviewed, in an effort to gain detailed information about operational flows necessary on a global scale. The following questions were posed to senior managers: What types of operations are necessary

between overseas locations? What types of information are exchanged? When information is viewed as data units, where is it generated? how does it flow? and where does it flow?

The questions were designed to identify the reasons for the current shape of their corporate global networks and to gain insight into how those corporate global networks may develop in the future. The point of the questions was to begin to identify potential needs of which even the users were not yet aware.

Chapter Four

Trends in Corporate Global Telecommunications

4.1 Flow of Data Accompanying Corporate Activities

The characteristics of the overseas operations and the flow of data accompanying corporate global activities of the companies examined in the case studies can be classified according to the particular industry and operation. **Table 4-1**, which supplements the case studies, summarizes that flow of data.

4.2 Connection to External Networks

Connections to external networks such as value-added networks (VANs) are used both as part of a private network and to expand corporate activity. The first type usually involves choosing between a VAN to optimize cost performance on PSTN or leased lines.[7] The second is typically an on-line connection to a private network.

The second type of connection enhances a corporation's ability to exploit linkages between activities both within and outside the company and expands the scope of a corporation's activities. A bank, for example, cannot perform settlement-of-accounts operations unless it is connected to the Belgian-based Society for Worldwide Interbank Financial Telecommunication (SWIFT). Through its connection to Double-Stack Trains (DST),* the Kawasaki Kisen Kaisha ("K" Line) has been able to bring in house operations previously left to a middleman. The current trend in both the U.S. and Japan is for a company to be connected to external networks associated with its business operations, although in the future, doubtless other purposes also will be served, for example, as a tool in the acquisition of outside resources needed for R&D.

By providing connections to these external networks and improving the efficiency of network operations, a private network functions as the backbone for all the networks to which a company may be connected. Current predictions are that external network connections will

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*Railway transport in the U.S. that uses special two-tier trains operated and controlled through a network system of rail transporters.

Company	Types of Data	Processed by:	Flow of Data	Transmitted by*	External Network	Definitions
CITIBANK	Accounting Accounting → MIS Global ATM Global CMS Settlement-of-accounts Basic data for dealing	Each market Each market Between markets Between markets Between markets Each market	Within market Market → HQ Market → Market Market → Market Market → Market Market → Market	NA Batch Real time Real time Real time Batch	Insufficient information Insufficient information NYCE, CIRRUS, etc. Insufficient information SWIFT, CHIPS, FedWire, etc. Insufficient information	Market: big financial market where a communications hub exists
Fuji Bank	Accounting Accounting → MIS Global CMS Settlement-of-accounts Basic data for dealing	Each market HQ Between markets Between markets Each market	Within market Market → HQ Market → Market Market → Market Market → Market	NA Batch Real time Real time Batch	Insufficient information Insufficient information Insufficient information NYCE, CIRRUS, etc. SWIFT, CHIPS, FedWire, etc.	Market: big financial market where a communications hub exists
Company X	Order entry Distribution and sales Production management R&D Database inquiry	Each market Each market Each bloc Each bloc Between blocs	Market → Market Within market Within bloc Bloc → Bloc Bloc → Bloc	Batch Batch Batch Batch Batch	EDI, etc. EDI, etc. EDI, etc. Patent networks Insufficient information	Bloc: regional group of markets
Nissan	Order entry Distribution and sales Production management R&D Database inquiry	HQ Each bloc HQ Each bloc Between blocs	Market → Market Market → Market Market → Market Market → Market Market → Market	Batch Batch Batch Batch Real time	Insufficient information EDI (dealer), etc. Parts manufacturers, etc. Insufficient information Insufficient information	Bloc: same as an economic bloc
DHL	Shipping Tracing Billing User inquiry	Between markets Between markets Between markets Between markets	Market → Market Market → Market Market → Market Market → Market	Real time Real time Real time Real time	Customs network Insufficient information Insufficient information Insufficient information	Market: individual regional area where a communications hub exists
"K" Line	Shipping Tracing Billing Container management	Between markets Between markets Between markets HQ	Market → Market Market → Market Market → Market Market → HQ	Real time Real time Real time Real time	Customs network Insufficient information Insufficient information Insufficient information	Market: individual regional area where a communications hub exists

*Real time here denotes transmission of data not awaiting accumulation.
NA: Not applicable for the global network.

CMS: Cash Management Service **EDI**: Electronic Data Interchange **MIS**: Management Information Systems

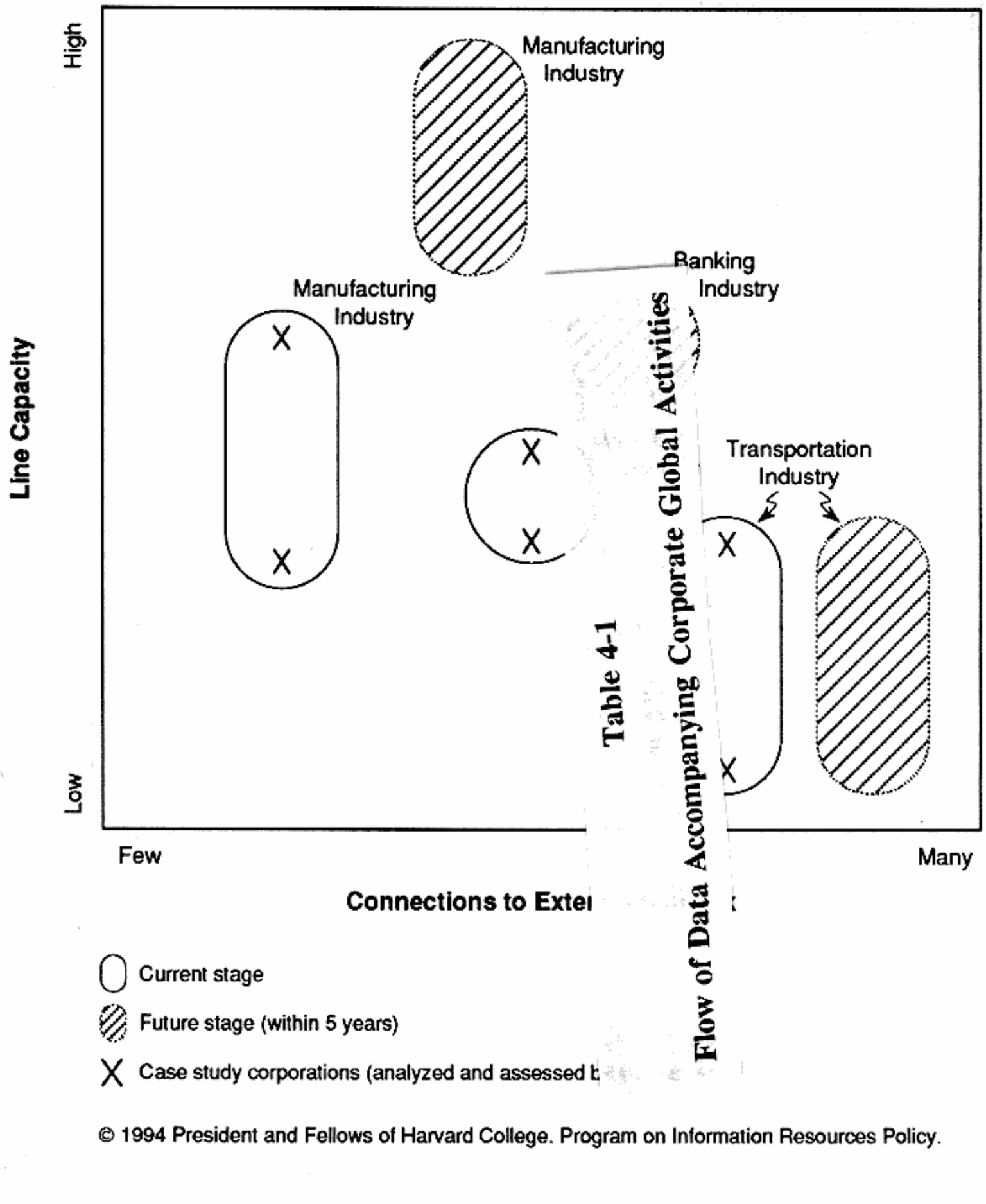

Figure 4-1

Map of Connections to External Networks

proliferate rapidly as a tool of corporate strategy and for creating a competitive advantage. Connections to private global networks are also expected to proliferate, as exemplified by those between corporations, as in the tie-up between Nissan and Ford.[8] Not only automobile manufacturing[9] but also other manufacturing industries are increasing forming these kinds of alliances.[10] In addition, Japanese automobile manufacturers are likewise moving ahead with plans to create affiliations with parts manufacturers in the U.S. According to Michael Porter, these networks create "new interrelationships among businesses, expanding the scope of industries in which a company must compete to achieve competitive advantage."[11]

4.3 Importance of On-Line Real-Time Network

If media that provide instant access, such as the telephone, are excluded, most data on global networks have not be accessed in real time. This is true of high-volume data such as Fuji Bank's account system data or data required by Nissan for computer-aided design (CAD) and analysis tasks. Why are global networks not real-time networks although most domestic corporate networks are? Are real-time operations unnecessary, as often claimed, because of time differences, particularly between Japan and the U.S., where eight o'clock a.m. Eastern Standard Time (8:00 EST) is ten o'clock p.m. Japanese Standard Time (22:00 JST) and five o'clock p.m. (17:00) EST is seven o'clock a.m. (7:00) JST? Are they unnecessary, because transborder data flow (TDF) regulations place restrictions on transborder data transfers involving information about individuals? Or, because of the cost of the capacity on international lines required by real-time transmission? An examination of specific operations performed by users indicates that real-time processing is not required in every instance, even though the general trend in every industry is toward real-time access, which in turn spurs development of higher speed, higher capacity networks. In the transportation industry, information on the movement of cargo is available in real time twenty-four hours a day worldwide. CITIBANK's global ATM service requires real-time processing of accounts data.* Company X, a major worldwide manufacturer of consumer goods, and Nissan perform database inquiry irrespective of time differences. By using networks to link information resources around the globe, corporations are able to use these resources as if they were located on site.

Thus, the trend toward real-time processing advances as necessity takes precedence over cost-related constraints. The banking industry will soon move in this direction, owing to the need for instant information on assets, including foreign assets, recognized as important because off-balance trading amount to $8 trillion (U.S.), exceeding the world trading on-balance total of $7.5 billion.[12] Worldwide risk management in real time is inevitable for global banks.[13]

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*Customer account information is stored in a database at each overseas facility, which transmits user authorization data and replacement data when the global ATM service is accessed from other facilities. (This does not conflict with TDF restrictions.)

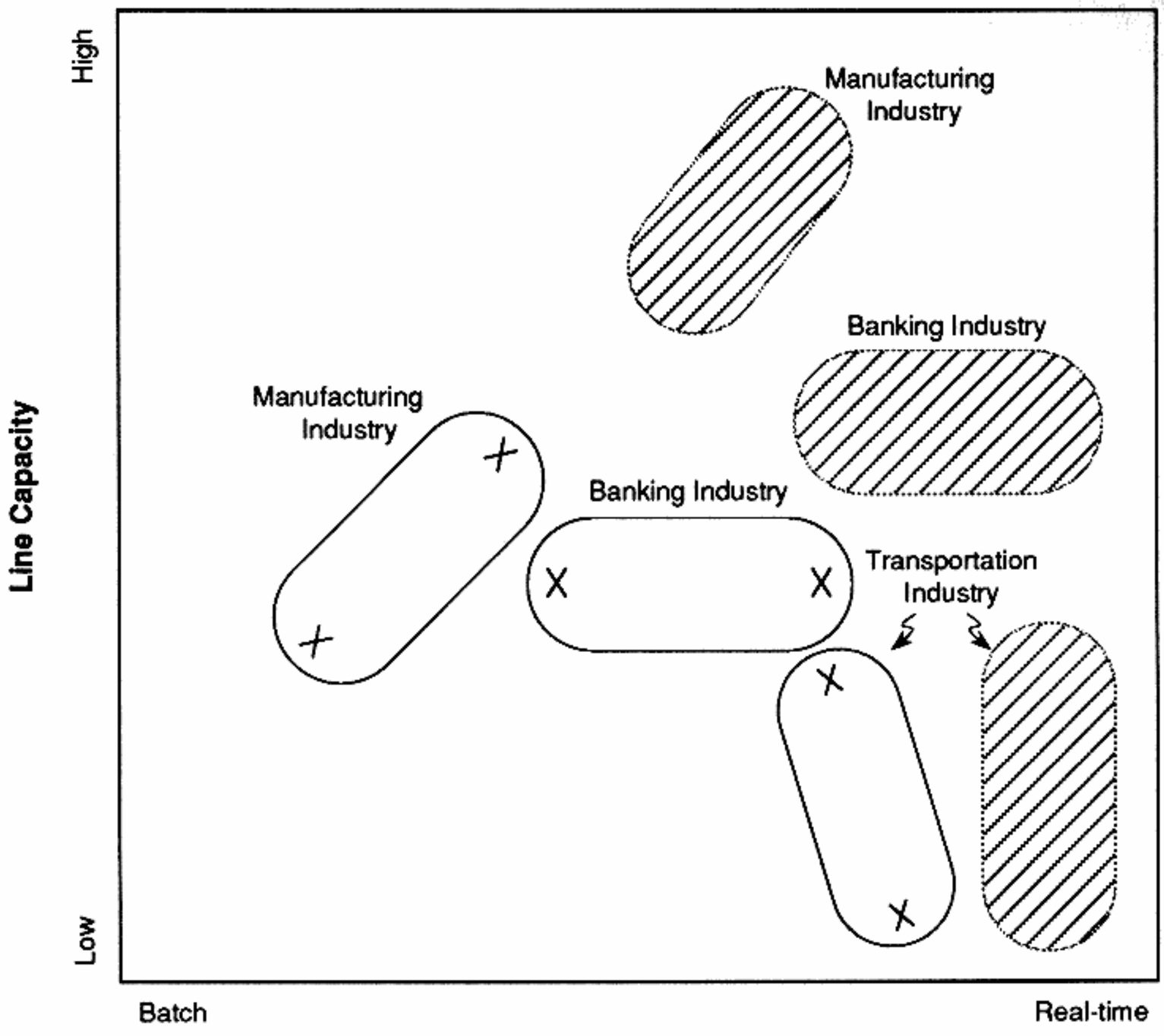


Figure 4-2

Map of Trends of Real-Time Global Networks

4.4 Trend toward Multimedia Communications

The trend toward multimedia communications promises to increase drastically the amount of data transmitted over global networks. Trunk networks used by all the users studied here consist of digital lines that integrate voice, facsimile (fax), and data; DHL uses the digitized backbone of a shared network (see section **4.6.3**). Although none of them actually used multimedia communications, in 1992 Company X introduced a videoconferencing system. This finding, however, does not mean that multimedia services are not needed for global

networks, only that there are currently many technical constraints against implementing them on a global basis, delaying the development of products that would make the technology available to users. Videoconferencing services were first offered a decade ago, yet international standards were not established until 1990. The standardization of ATM technology, which is believed to be a core technology for B-ISDN and expected to give a major boost to the proliferation of multimedia communications, is only now underway.

Marketing multimedia services for international networks that would meet cost performance requirements has been delayed by technical constraints. On global networks, such services will likely initially take the form of inquiries to multimedia database systems, which are less expensive because they place fewer on international line capacity, rather than videoconferencing systems.

4.5 Networking Information Resources

How a network is configured greatly affects corporate overseas base strategies. The corporations examined here define their business activities in terms of large markets or units here called market blocs. Although in the past global corporations profited by making inroads into markets at random, advanced globalization compels them to develop market- or bloc-oriented strategies.

The clearest examples of this trend can be seen in the manufacturing industry, where companies are establishing bases for R&D, production, and distribution and sales in market blocs in order to cover the entire range of business activities in each. As a bloc orientation comes to dominate overseas positioning, *intrabloc* communications appear likely to increase while *interbloc* communications decrease.

In practice, however, interbloc communications have increased, for reasons that can be seen in the automobile design process at Nissan. R&D depends on headquarters, which is outside the market bloc. Specifically, automobile manufacturers do not need to install at every base the kind of mainframe or supercomputer necessary for design and analysis tasks but can instead rely on networking to access that computer as if it were located on site. This approach both cuts plant and equipment investment costs and concentrates in one place the systems personnel needed for system maintenance and management. The purpose of Company X's

developing plan to link databases in various blocs through an on-line real-time network is to obtain maximum results from a minimum investment by using networking to share resources distributed around the world. Thus, a network can create the illusion of a physical space where information resources such as computers and databases appear present.

This paper examines, analyzes, and explores several trends characteristics of global networks—high speed and high capacity through real-time processing; multimedia communications; the role of private networks as backbones for connections to external networks; and bloc-oriented siting of overseas corporate bases. What direction will those trends impart to the development of networks by global corporations? On the basis of an analysis of several corporations, as well as of the mid- and long-term outlooks for business activities and network strategies voiced by the users interviewed, several network models were developed for individual industries.

4.6 Network Models

4.6.1 Banking Industry Network Model

In the banking industry market blocs were forged before economic blocs emerged as political entities. Such banking blocs are a product of the historical development of financial markets and of the monetary policies and legal systems of individual countries. Bloc bases were typically established in New York, London, Tokyo, Hong Kong, and Singapore, where mainframe computers allowed the bases to function as communications hubs. Backbone networks for global networks of the banking industry link the communications hubs.

With the exception of data processed to provide management information, the flow of data generated by banking operations shows no regular pattern. Settlement-of-accounts message data flow freely between markets, but not in any one specific direction. A network that allows data to move about freely with nothing more than the specification of an address is appropriate for this type of transmission. Its logical configuration for *interbloc* communication is likely to be a loop. When CITIBANK designed its global ATM service to allow free access to account information databases at each communications hub from any point in the world, the design was based on a concept of its global network as a LAN. This was only the beginning of the movement toward construction of global client-server LANs.

In contrast, an *intrabloc* network—in which settlement-of-accounts operations are centralized at the communications hub—will take the form of a star, with point-to-point connections between the hub and each neighboring base of operations. A star network is appropriate to the directions of the data, which flow between the separate bases and the hub. In practice, the configuration of the network would appear more like a mesh, with alternate routes to ensure network reliability. The communications hubs concentrate the communication and information resources, and because they connect to a number of external networks they also function as points of connection.

Figure 4-3 shows a future logical network model for the banking industry.

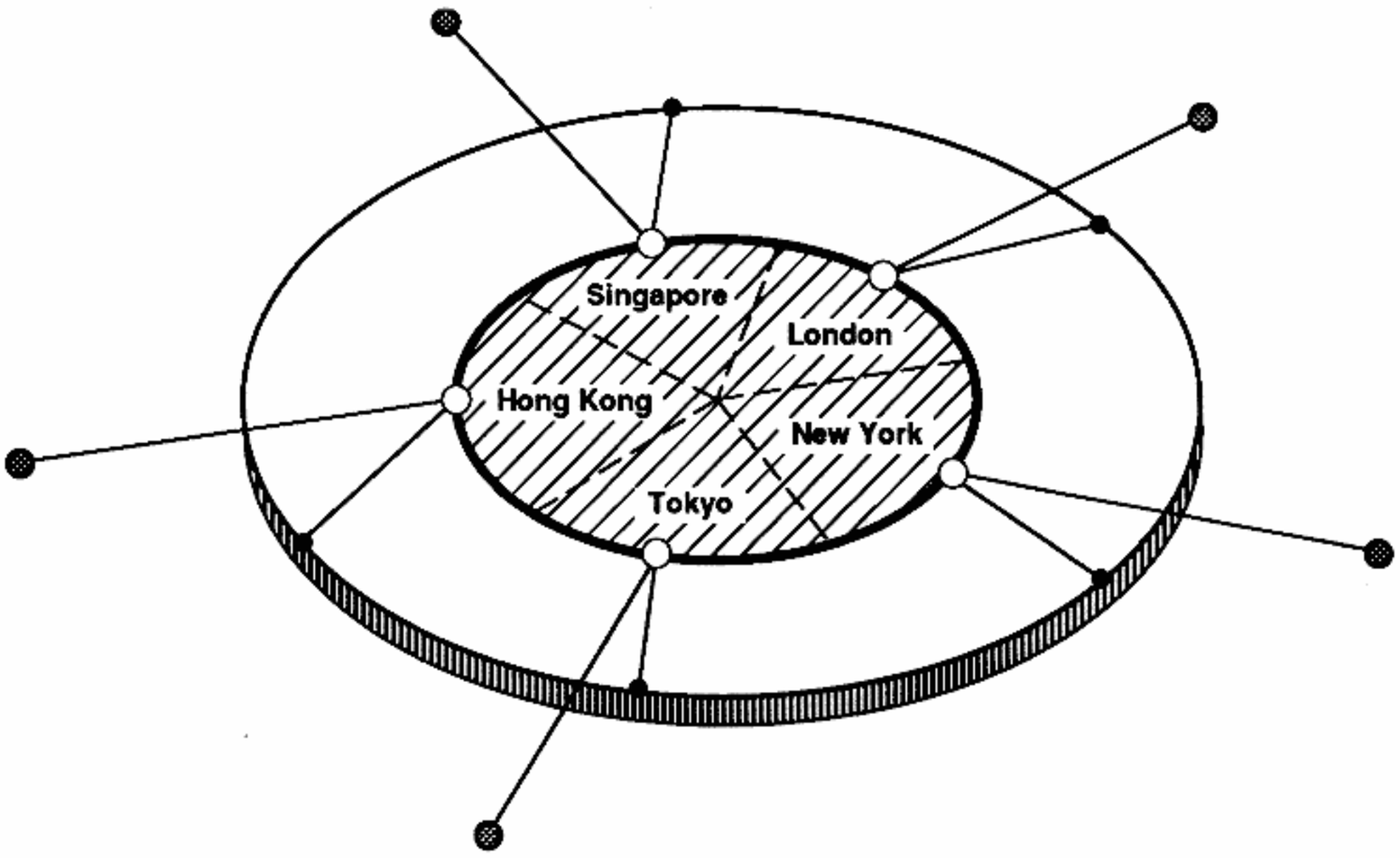
4.6.2 Manufacturing Industry Network Model

In the manufacturing industry, global corporations that have established bases for R&D, production, and distribution and sales in each market bloc use networking to access external resources to optimize operations at each base. The points where external resources are downloaded become the communications hub. Which bases will function as hubs is not necessarily preordained. Company X locates hubs at its R&D bases, while Nissan has them at its distribution and sales bases.

In the flow of data, R&D divisions access other R&D divisions, while sales bases access the sales division at headquarters. The frequency and flow of data conform to a fixed pattern. The network appropriate for such *interbloc* data flow is point-to-point, which may take the form of a triangle that links the market blocs of Europe, the U.S., and Asia (see **Figure 4-4**). Communications between hubs can be relayed technically through the headquarters hub, rather than in a triangular configuration, but as real-time communications proliferate and network reliability becomes increasingly critical, the triangular configuration will provide mutual backup routes. Because of the regular pattern of the flow of data, time differences can be exploited to provide routing over which traffic will be evenly distributed.

The logical configuration of *intrabloc* networks is a loop, because communications between R&D and production, production and distribution and sales, and R&D and marketing are urgent and because the data flow between these operations in both directions.

Connections to external networks will be established for each unit of operation at each base. For example, the distribution and sales bases of an automobile manufacturer must be connected to the dealers' networks, and its production bases must be connected to parts manufacturers.



Legend

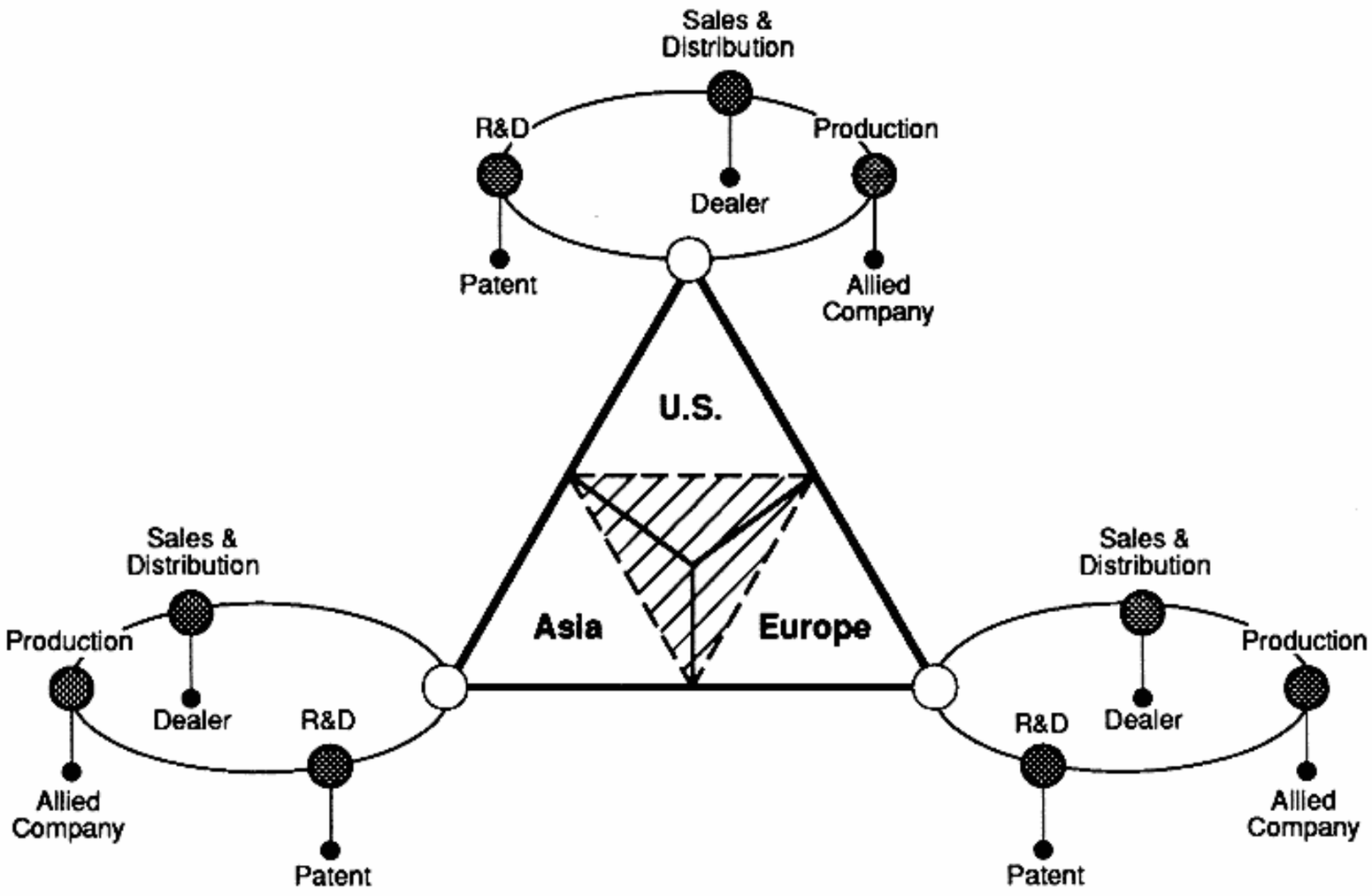
- Backbone network
- Information resources shared inside company
- Information resources outside company
- Communications hub
- Neighboring branches
- Connection to external networks (e.g., SWIFT)

Notes:

The logical configuration of the backbone network is a kind of loop.
Connections between a communications hub and its neighboring branches are point-to-point; sometimes these are mesh configurations, if back-ups are taken into consideration.
Information resources both inside and outside the company are concentrated into hubs, then shared with branches.
Although each communications hub manages accounting data, access by neighboring branches is allowed to share information resources.
Interbloc: for example, communications between New York and Tokyo.
Intrabloc: for example, communications among New York bloc branches.

Figure 4-3

Future Logical Network Model for the Banking Industry



Legend

Backbone network

Information resources shared inside company

Communications hub

Other regional bases

Connection to external networks

Notes:
The logical configuration of the backbone network is a kind of triangle.
The logical configuration of an intrabloc network is a kind of loop.
A part of the information resources is shared with each bloc. Each regional base has connection points to external networks to access information on demand.
Interbloc: for example, communications between the U.S. and Asia market blocs.
Intrabloc: for example, communications among U.S. bases.

Figure 4-4

Future Logical Network Model for the Manufacturing Industry

4.6.3 Transportation Industry Network Model

Given the nature of operations in the transportation industry, the most effective network would be a shared one, such as the international packet-switched network used by DHL for air transportation. This type of network is characterized by linkage of various points around the world in a mesh configuration that permits free routing as well as by provision of numerous access points. Another advantage of the shared network is that an individual corporation does not need to provide all personnel and equipment required for its operation.

The Japanese marine transportation industry has made no movement toward construction of a shared network, allegedly because companies regard building private networks as a business strategy that sets each firm apart from the others, a means of differentiation that a shared network would eliminate.

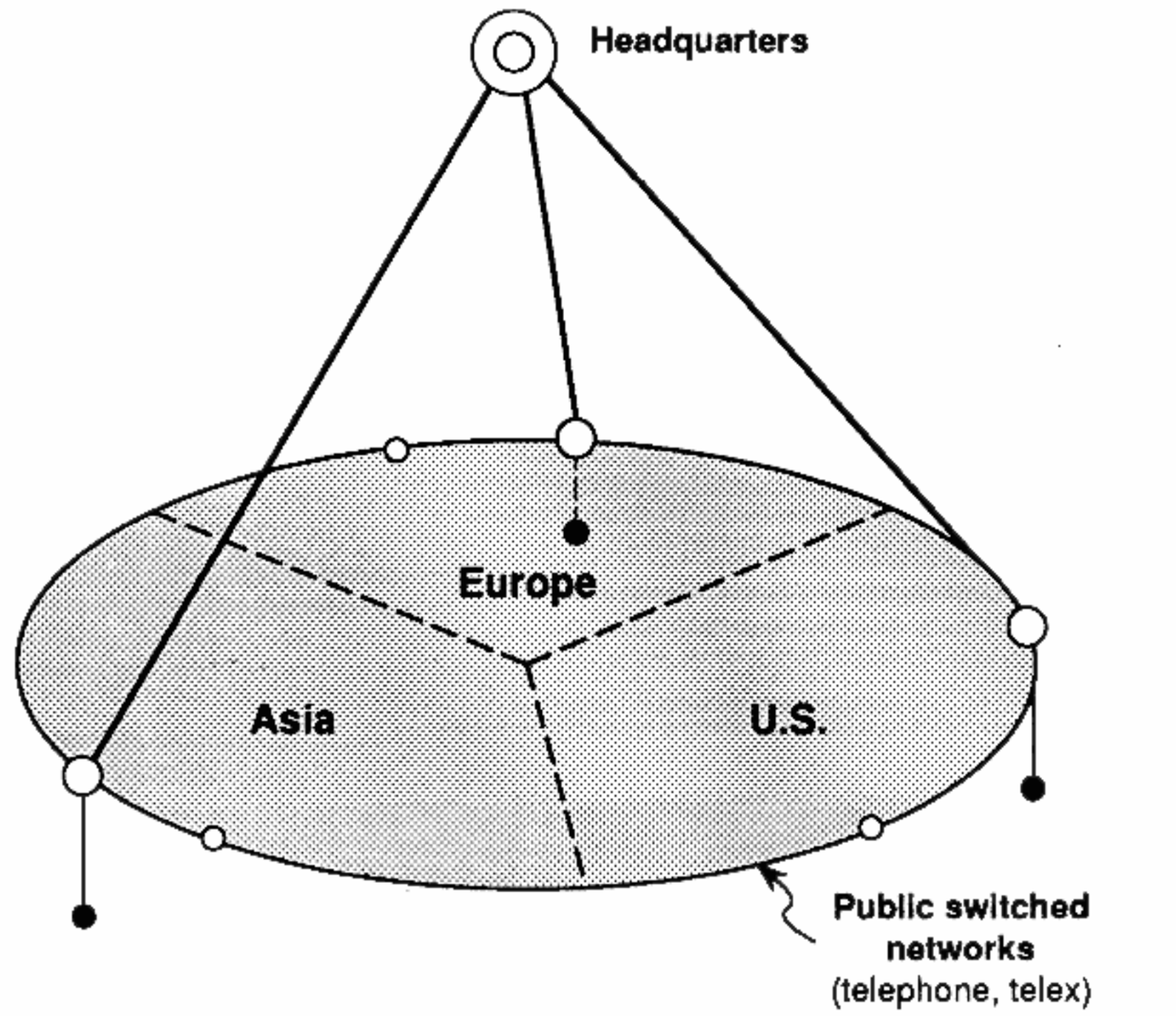


Figure 4-5

Future Logical Network Model for the Marine Transportation Industry

At present, the Japanese marine transportation industry shows no evidence of bloc orientation. Most of its users are Japanese companies and most shipments are between Japan and points overseas, with a few instances within a given bloc. Basically, then, the

configuration of a network to link Japan with bases of operation located in large markets is point-to-point. With data flowing over them in real time, backup routes will be needed to ensure reliability. Since the number of bases requiring backup routes is large, backups will be provided on public switched networks (see **Figure 4-5**). Connections to external networks will be established for each unit of operation at each base.

Chapter Five

Case Studies of Corporate Global Telecommunications

5.1 U.S. Banking (CITIBANK)

5.1.1 Trends in the U.S. Commercial Banking Industry

The brisk business in commercial-property loans that accompanied the construction boom of the 1980's in the U.S. gave way when the recession struck in 1990 and 1991 to a massive wave of bad debts, creating serious problems for the management of commercial banks. According to an analysis in *The Economist*, "Commercial-property values probably halved, since the peak of the market in 1987, and at the end of September 1992, bad nonperforming commercial-property loans amounted $59 billion."[14] Faced with this business environment, banks disposed of bad debts by writing them off, foreclosing on real estate mortgages, and similar measures. They have also undergone internal restructuring, making drastic personnel cuts and selling off divisions no longer considered strategic.

According to aggregate year-end figures reported on 9 March 1993 by the Federal Deposit Insurance Corporation (FDIC),[15] in 1992 U.S. commercial banks earned a total of $32.25 billion, 30 percent above the previous record in 1988 of $24.81 billion.[16*] "The average capital-to-assets ratio in the industry improved to 7.52% at yearend 1992 from 6.75% at yearend 1991. That's the best ratio since 1965."[17] This capital-to-asset ratio, based on the capital adequacy guidelines of the Bank for International Standards (BIS),[18] including subordinated debentures and other supplementary owned capital, is reported to have exceeded 12 percent,[19] far above the BIS standard of 8 percent.

Because the banking industry exerts a powerful influence on a nation's economy and its citizens, it is more strictly regulated and supervised than other industries. Regulation F of the Federal Reserve,[20] passed by the 102nd Congress and published in final form on 19 December 1992, was formulated to ensure the healthy growth of the American banking industry and to keep it on a competitive footing with foreign banks. This regulation, which

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*Total assets of U.S. commercial banks were estimated at $3,642 billion in 1992 (U.S. Department of Commerce, *U.S. Industrial Outlook '93: Business Forecasts for 350 Industries* [Washington, DC: U.S. Government Printing Office, January 1992], p. 45-3).

implements section 308 of the FDIC Improvement Act (FDICIA) of 1991, and the Foreign Bank Supervision Enhancement Act,[21] provides:

> for FDIC authority to borrow from the Treasury enough to bail out the Bank Insurance Fund, for instituting a number of reforms to the deposit insurance system, for restricting Federal Reserve ability to extend credit to undercapitalized banks, and for increasing the authority of the Federal Reserve Board to approve, terminate, supervise, and examine branches and agencies of foreign banks.[22]

Despite a predicted increase in "off-balance" transactions that do not appear on balance sheets, fortification of the banking industry's safety net through increased authority of its regulatory and supervisory agencies is expected to continue apace, "Yet it is unlikely that any single agency will soon monitor the complete array of interrelated credit risks."[23]

Table 5-1

The Five Hundred Largest Banks in the World

Year	Number of Banks			Total Deposits ($U.S. billions)		
	U.S.	Europe*	Japan	U.S.	Europe*	Japan
1970	185	108	71	$296	$242	$151
1980	93	127	78	$754	$1,725	$1,131
1990	96	111	106	$1,329	$4,559	$5,888

*Only the U.K., Germany, France, and Italy.

Source: Data for the U.S. are based on U.S. Bureau of the Census, *Statistical Abstract of the United States* (112th ed., Washington, D.C., 1992), p. 496.

A look at the global banking industry shows that European and Japanese banks are the strongest in the world, in part because they have been nurtured by protective government policies. Of fifty of *Fortune*'s hundred largest commercial banks in 1992,[24] twenty-four were European and twenty Japanese. Typically, these banks are capable of expanding overseas

because of their tremendous financial resources at home.* In contrast, the U.S. banking industry has been defined by fierce battles among too many banks under the flag of the principle of competition. The result has been a cycle of failure and the establishment of a large number of banks, leaving the U.S. banking industry in a relatively weak position in the international market.

The current move toward increased regulation is bringing about a reorganization of the U.S. commercial banking industry.** Banks with capital ratios below 2 percent will probably be closed by regulators[25]: "That law [FDICIA], which forces regulators to shut down financial institutions before they become insolvent, will encourage weaker-capitalized banks to merge with stronger partners."[26]

The largest U.S. banks, having successfully weathered the recession of 1990 and 1991, now aim to enhance their competitiveness by increasing their size through mergers and acquisitions (M&A). Simultaneous with the move toward regulation, deliberations on reform of the financial system are underway to permit new business activities, such as interstate banking and insurance and securities businesses.***

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*The overseas strategy of Japanese banks focuses on establishing a presence to reinforce their role as the main bank for their affiliates. This approach differs in character from the strategy of U.S. banks, which is to establish themselves in highly profitable overseas markets. Japanese banks are often in a position of strength because of their stable business base. As of July 1990, the total assets of Japanese banks in the U.S. amounted to $409 billion, 12 percent of the total assets of U.S. commercial banks, with 137 offices, increased from 83 in 1987 ("No.781. U.S. Banking Offices of Foreign Banks—Summary: 1975 to 1990," U.S. Bureau of the Census, *Statistical Abstract of the United States 1992* [112th edition, Washington, D.C., 1992], p. 498; total assets of the U.S. banks are $3,389 billion in 1990. See "No.776. Insured Commercial Banks—Assets and Liabilities: 1980 to 1991" [p. 496]). In contrast, the total foreign assets of U.S. commercial banks amounted to $264 billion in 1989 (*U.S. Industrial Outlook '91*).

**The number of commercial banks, 12,819 in the end of 1990, decreased almost 3,000 from 1984 ("No.774. Changes in Numbers of Operating Banking Offices: 1970 to 1990," *Statistical Abstract of the United States: 1992*, 495). Recent trends showed the number of failed banks decreasing, from 206 in 1989 to 168 in 1990 and 124 in 1991 ("Failures and Problem Banks," *U.S. Industrial Outlook '93*, pp. 45-2), and the number of M&As increasing, from 222 in 1990 to 214 in 1991 and 242 in 1992 ("M&A Activity Slacks Off Following 1991's Big Deals," "M&A Activity by Quarter" [table], *Bank Management* [January 1993], vol. 69, no. 1, p. 35).

***Financial industries in the U.S. are regulated by three principal banking laws: (*i*) the McFadden Act of 1927, which "prevents interstate deployment of bank branches and gives states authority to set branching standards for banks within their jurisdictions"; (*ii*) the Bank Holding Company Act of 1956, known as the Douglas Amendment, which "prohibits multibank holding companies and one-bank holding companies from acquiring a bank in another state, unless the law of the state in which the bank to be acquired is domiciled affirmatively provides for such entry"; and (*iii*) the National Banking Act of 1933, known as the Glass-Steagall Act, which "bans affiliations between banks and securities firms, and generally prevents banks from engaging in the issue, flotation, underwriting, public sale, or distribution of stocks, bonds, debentures, notes, or other securities" ("Types of Foreign Banks in U.S.," "Commercial Banking," *U.S. Industrial Outlook '93*, p. 45-3).

On the global front, major U.S. commercial banks are venturing into operations in Asia, drawn by the potential for high earnings. CITIBANK, which in 1991 posted an $894 million loss in the U.S., still made a $400 million profit owing to its Asia earnings.[27]

5.1.2 Overseas Activities

CITIBANK does business in ninety-two foreign countries, including branches of its affiliates.[28] In 1991, "just under 45% of both its revenues and its assets were outside the United States."[29]

The company is aggressively expanding its retail banking activities, especially as its Asian operations become increasingly important, in spite of the numerous regulations imposed by each country on banks that restrict the number of branches, business operations, and so on. "Since 1983 Citicorp's Asian consumer deposits have grown six-fold, loans eight-fold, revenue seven-fold and net income almost ten-fold."[30]

The company arrived in Japan in 1902, when it opened a trade-finance house in Yokohama.[31] Ninety years later, it has twenty branches in Japan and is the only foreign bank in that country engaged in retail business. In April 1993, when the company started 24-hour automatic teller machine (ATM) service, it was the only bank providing this service in Japan.

5.1.3 Flow of Data Accompanying Business Activities at Overseas Offices

CITIBANK, which provides uniform services worldwide around the clock, engages in a variety of business activities on a global scale[32] which can be broken into four broad categories: (*i*) retail businesses aimed at general customers; (*ii*) loans, fund management, custody, and other businesses aimed at corporate clients; (*iii*) settlement-of-accounts operations in connection with trade, import/export, and other global business activities of corporations; (*iv*) and interbanking activities carried out by the company as an investor in financial markets.

As a rule, savings, loan and foreign exchange data, continuously generated in connection with customer transactions, is processed on host computers installed at each office and incorporated into databases. Smaller offices, insofar as the financial systems of their

respective countries allow it,* consolidate their information at data centers established as communications hubs in larger offices located in neighboring countries. Basically, the authority to act as a communications hub and to process business activities has been transferred to the data centers. Thus, the information required for management decisions is processed and managed largely at each data center, with information necessary for company-wide operations sent by file transfer to the headquarters in New York either daily or on each closing day.**

Flow of data accompanying retail businesses aimed at general customers. *Global ATM service*. ATM services are being developed worldwide for the company's account holders. CITI-card holders with accounts in their own countries can take advantage of ATM services at overseas locations.*** The host computer at the overseas location accesses the computer at the customer's home bank to verify the account and, on receiving an approval, commences processing. This international data processing is carried out on a real-time basis over a global network, and, to support the global ATM service, ATM systems capable of 24-hour-a-day operation are being constructed as part of CITIBANK's global network.[33]

Flow of data accompanying fund management and other businesses for corporate clients. *Global cash management service (CMS)*. Global CMS for the efficient management of corporate funds on a global scale offers clients contracting for it an on-line real-time network system capable of responding to inquiries from anywhere in the world around the clock. This user inquiry service is carried out by clients who can access customer files managed in each data center while the network system combines client data in each file through the global network. Clients can make inquiries using personal computers (PCs).

Savings and loan limit management. Immediate ascertainment of corporate clients' outstanding loans is vital to contain the risk of bad debt. The ability to ascertain worldwide

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*For example, because of the strict TDF regulations in Singapore, the Singapore office of CITIBANK does not consolidate all its information at the Hong Kong data center but maintains a separate data center of its own.

**Data, generated from each transaction necessary for the management of customers savings and loan balances is added to the database in the order in which it is generated, using Management Information System (MIS) applications of accounting systems.

***To enhance customer convenience, the CITIBANK network is linked to the NYCE and CIRRUS shared ATM networks in the U.S. and the MICS system in Japan. Multilanguage ATMs are being developed to meet the demands of globalization.

the credit limits imposed by each office improves customer service by making it possible to extend loans in excess of the credit limits of a particular office. An on-line real-time network system for savings and loan management is being designed to update the database of each office with each transaction, so that real-time inquiries can be made from offices around the world.

To provide complete support for corporate clients who are developing their global operations, CITIBANK is constructing a network system capable of responding instantly to clients' requests through its offices anywhere in the world. For example, network linkups between the customer database and the services-related database are of course essential for an analysis of services most effective for efficient management of the client's funds, yet access to information regarding numerous other factors is necessary to manage various risks involved. For this purpose, the global network would link the information resources throughout the world.

Global custody services, whereby the company acts as a client's agent for buying and selling securities, is another example of an around-the-clock on-line real-time network-based service.

Flow of data in global transactions of corporations. Settlement of accounts accompany global economic activities (such as trade and import/export activities) is carried out throughout the world. Because this operation extends beyond a single bank to include others, the exchange of data necessary for settlements requires a uniform format. This exchange is performed over external settlement-of-accounts networks such as SWIFT. Access to such external networks is through fault-tolerant computers that serve as switching nodes, installed at data centers acting as communications hubs. Data for settlement-of-accounts operations are transmitted to the nodes over the global network and then from them to their destination by an external settlement-of-accounts network.

Flow of data accompanying interbank transactions. *24-hour dealing*. Dealing rooms are open around the clock to handle 24-hour-a-day dealing. The following are essential to dealing and other trading that involve financial markets: quick gathering of a broad range of market information; analysis of this information, taking into account internal factors, such as market-

position management; and making appropriate predictions for purposes of dealing. A source of highly accurate market information can attract many investment customers. The company gathers basic data related to market information by voice and data circuits from external resources, such as Reuters and Telerate, and collects information on each day's transactions in other financial markets by voice channels established on its global network.

Data related to dealing consist of basic information as well as that arising from actual dealing. Dealing involves transactions conducted by telephone among banks and between banks and corporate investors.* At the close of dealing, settlements of transactions are carried out through external networks (such as SWIFT), access to which is provided by switching nodes installed at communications hubs.

Communications tool. The company equipped every employee with a PC, so that E-mail has become a means of interoffice communication. For daily business operations, communication by telephone is indispensable. In addition to general use, telephones are frequently used by dealers to collect information from other financial markets. To cut the costs of the global network, digitally compressed voice technology was introduced.

5.1.4 Features of the Global Network

Host computer networks, PC networks, and voice networks, logically existing separately, are incorporated into a digital backbone network architecture. The logical network architecture of the company's PC terminals can be said to have a LAN topology, which allows database management through PCs connected with a variety of databases all over the world.

Digitized backbone networks. Currently international high-speed digital circuits are used between major hubs:

New York–London	2 megabits per second (Mb/s)
New York–Hong Kong	2 Mb/s
New Jersey**–Hong Kong	128 Kb/s

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*In addition to telephone-oriented transactions, the Chicago Mercantile Exchange has introduced an automatic on-line commodities transaction system called GLOBEX, to promote 24-hour international transactions.

**Parsippany, New Jersey.

New York–Tokyo	384 kilobits per second (Kb/s)
Hong Kong–Tokyo	384 Kb/s
Hong Kong–Singapore	1.5 Mb/s x 2

The hubs and the offices in the neighborhood are connected by analog circuits.

Cost strategy. The cost strategy used depends on the following factors: digitally compressed voice technology; PSTN-leased circuits connection; packetized technology; and so on.

Network reliability and security. The reliability and security of the network depend on: triangular networking between major hubs; the encryptor; security control by identification code (ID); the disaster contingency plan and recovery plan.

Maintenance and operation. A subsidiary is established at headquarters in New York for maintenance, operations, network supervision, and network management.

Multivendors. Computers, applications, and systems are purchased from various vendors. Host computers chosen according to function are from IBM, Stratus, DEC, Hewlett–Packard (HP); packet switch, Telenet; time division multiplexers (TDM), GDC; E-Mail, British Telecommunications plc.'s (BT) Tymnet; and so on.

5.1.5 Importance of the Global Network

CITIBANK's global strengths, according to Michael Porter,[34] lie in its overwhelming number of offices in countries the world over and its ability to target a broad spectrum of customers, from international corporations to general consumers, with its multitude of services. Among other factors that differentiate this bank from others are such services as an "ability to serve buyer needs anywhere" and a "single point for customer service,"[35] which first became possible with the realization of a global network infrastructure.

As one of the leaders in the information industry, the bank's ability to collect accurate information quickly and globally is important, both for securing customers and for increasing revenues, and of utmost importance is how best to link information resources (starting with

the computers and databases operated in CITIBANK offices around the world) to optimize the value of this information.

5.2 U.S. Manufacturing Industry (Company X)

5.2.1 Trends in the U.S. Manufacturing Industry

Company X, a large worldwide manufacturer of consumer goods, must cope with large volumes of bulky items at low unit prices. As a result, it produces and distributes its products at locations in or near its markets. Because the unit prices of these products are low, physical distribution costs incurred in the transportation of both raw materials and finished goods must be kept to a minimum.

Corporations that operate on a global scale manage overseas bases to maximize the efficiency and effectiveness of regionally based production and distribution. R&D arms are established in regions of their markets, so that products can be developed with the characteristics of that market in mind. In other words, in the manufacturing industry a company will locate its entire range of operations—product development, production, distribution and sales—in a region it perceives as a market.

In practice, markets vary slightly from product to product, as do methods of materials procurement, production, and development. Corporations will employ a base-oriented business strategy that optimizes all corporate operations by using common components in a variety of products.* Company X treats the U.S., Europe, and Asia as markets in the broad sense, doing business in a manner suited to the characteristics of each. It seeks to manufacture products that take into account the climate, physical environment, culture, and national traits of each market.

To accomplish this end in Europe, the company has established R&D arms in the U.K., Germany, and Belgium, and its production planning anticipated the EU by treating all of Europe as a single market without regard to national boundaries. In Asia, the company has

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*According to Porter, in the case of Company X: "Certain raw materials can be procured and handled jointly, the development of technology on products and processes is shared, a joint sales force sells both products to supermarket buyers, and both products are shipped to buyers via the same physical distribution system."

located its R&D arm in Japan, while its development and production plans treat the Asian-Pacific region as one market. These regional markets might appropriately be labeled the American bloc, the European bloc, and the Asian-Pacific bloc.

5.2.2 Overseas Activities

Company X is a global corporation, with overseas sales comprising about 50 percent of its total sales.[36] It has bases of operation in forty-six foreign countries and a sales network extending over 140 countries.[37] Among its overseas operations, those in Europe have the longest history; European sales currently account for about 30 percent of the company's net sales.[38] it entered Japan in 1972; Company X Far East, Inc., is a strategic base for its operations in Asia and the Pacific.

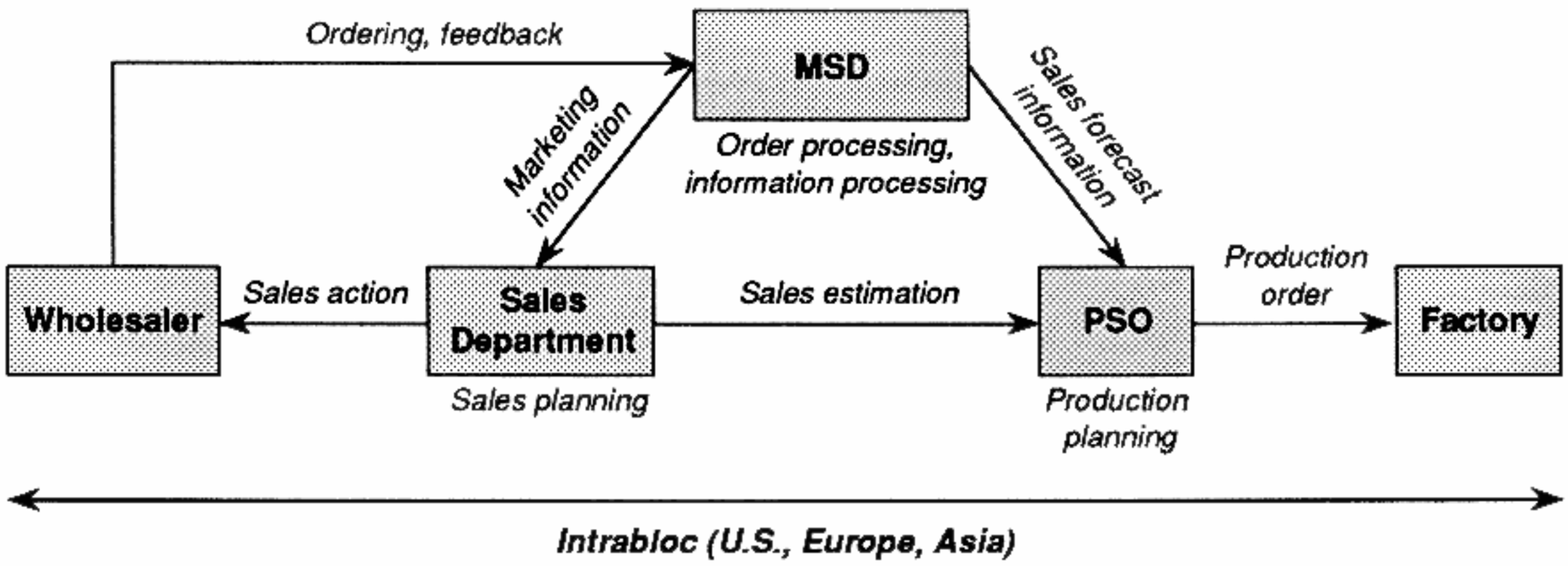
Together with its operations at each base, Company X is aggressively broadening its range of activity. In 1991 it bought a major cosmetics firm, a leading brand, simultaneously enhancing its position in the cosmetics field and expanding its market by acquiring the cosmetics firm's worldwide sales network. Laundry and cleaning products combined comprise about 30 percent of the company's net sales, personal care and cosmetics about 50 percent, with the remaining about 20 percent shared by other products.[39]

5.2.3 Flow of Data Accompanying Business Activities

Flow of data accompanying manufacturing and sales. Company X sells its products to retailers in the U.S. and to wholesalers in Japan. The company requires marketing feedback data from both retailers and wholesalers about the goods sold to retailers, specifically how much is sold, to which store, at what price, and so on. In Japan the feedback from wholesalers is obtained through an external distribution VAN called "COINS," while in the U.S. it is transmitted by electronic data interchange (EDI) and PSTN lines.

Data on shipments and from the feedback that make up marketing information are sent to a management systems division (MSD) at each market bloc. Using data received daily from each market in the bloc, the MSD uses a production management computer to generate sales forecasts and then issues production directives to the factories in the bloc (see **Figure 5-1**). Thus, the flow of data accompanying manufacturing and sales is *intrabloc*, because the most

cost-effective approach for low-cost products that involve both high-volume manufacture and transportation is production near the point of consumption.



MSD Management Systems Division

PSO Product Supply Operation

Source: Based on chart of Company X.

Figure 5-1

Intrabloc Data Flow Accompanying Manufacturing and Sales

Flow of data accompanying R&D. For a company to make products suited to a given market, product development take into account differences in climate, physical environment, culture, and national traits of each market. For example, to meet local needs a new product might be developed at an overseas development base by modifying some specifications of an existing product. The overseas base must first obtain information about the components and formula of the product from the database at the U.S. headquarters, which it requests by E-mail. The data are downloaded from the database at headquarters to the PC which converts them into PC files that are sent by E-mail to the overseas office. The development facilities at headquarters subject the trial product to composition and performance tests and forward the results overseas, again by E-mail. Communications between headquarters and the overseas base are continued until the product is finished and ready for production.

The databases at R&D bases are referenced to check whether the company can patent the newly developed product or whether that would infringe on another company's patent. Currently, access to the databases is off-line by E-Mail, but on-line access to databases at the company's worldwide R&D locations is in preparation. Communications associated with product development are transmitted *interbloc* over the company's global network.

Communications tool. In addition to the use of an E-Mail system as an authorized company-wide communications tool, the company uses a videoconferencing system to improve the quality of corporate communications by facilitating discussions between remote sites.

5.2.4 Features of the Global Network

The company uses international digital leased circuits to provide a digitized backbone network between R&D arms:

Cincinnati–London	256 Kb/s	Cincinnati–Brussels	256 Kb/s
Cincinnati–Frankfurt	256 Kb/s	Cincinnati–Tokyo	256 Kb/s

Cost strategy. The company's cost strategy includes the use of: digitally compressed voice technology; packetized technology (X.25); and dynamic allocation technology of voice and data channels.

Network security. Security controlled by periodic changes in the ID password.

Maintenance and operation. Maintenance and operation are performed by systems divisions within the company.

Multivendors. Host computer: IBM; packet switch: BBN, Dynatec, Codex; TDM: Timeplex; E-Mail: Tymnet.

5.2.5 Importance of the Global Network

The two major directions for data flow *intrabloc* and *interbloc*, have different purposes. Intrabloc communication of marketing data is reflected in production processes and uses public switched services, such as VANs, which can be said to be part of the global network supporting the companies borderless activities. Interbloc communication, as shown in R&D

conducted on a global scale, is a tool for linking corporate resources that separately exist in each market bloc.

5.3 U.S. Transportation (DHL)

5.3.1 Trends in the U.S. Air Cargo Industry

International air transportation comprises air and ground transportation and customs. Door-to-door service, from pick-up to ultimate delivery, is carried out as shown in **Figure 5-2**:

Figure 5-2

International Door-to-Door Air Transportation

The Federal Express Corporation (FedEx)[40] and DHL Worldwide Express[41] operate their own airlines, carry out customs clearance procedures, and retain delivery vehicles used as forwarders. A definition of the international delivery services market, which extends across various kinds and categories of businesses, is difficult, but in 1991 revenue from the air cargo market in the U.S. airline industry was around $7.1 billion.[42]

Traditionally, importing and exporting, the bulk of international transportation, have been carried out by sea, but "Now advances in telecommunications, computers, and air transportation have led to a logistics revolution where global sourcing is possible."[43] For multinational corporations with worldwide production activities, a just-in-time inventory system that functions globally is vital, and air cargo transportation has became an increasingly important support for that system. "In the traditional business paradigm, quality and cost were the pivotal considerations for goods and services. With new technical innovations, the quality of goods and services is now assumed. As a consequence, competitive advantages must be sought elsewhere—through delivery and service."[44]

To maintain a competitive advantage worldwide, a company must optimize locations for its sorting hubs,[45] which serve as transit points between aircraft and ground vehicles and ensure smooth transfer of cargo. Hubs serve also as administrative bases for cargo information. To guarantee error-free delivery, information must be consolidated through interhub networking.

Some cargo companies have formed partnerships for the purpose of designing shared networks to improve their competitive capabilities. Integrated Interline Systems (IIS),[46] such as the Hi-Tech Forwarder Network (HTFN),[47] were built by customs brokers and airlines with the aim of creating a seamless transportation system. International delivery service users currently have a choice between integrated carriers or IIS.[48]

5.3.2 Overseas Activities

DHL service centers are located in more than 200 countries and link 80,000 cities.[49] Area headquarters are set up in principal bases of operation, such as Brussels, Hong Kong, and San Francisco. The freight handled by the company consists mainly of small business packages and documents, the latter making up nearly 70 percent of the total.[50]

5.3.3 Flow of Data Accompanying Business Activities

Flow of data accompanying freight transportation. Quality international delivery service means delivering freight as quickly as possible.[51] The quick and smooth performance of all operations from the time the package is collected, goes through customs procedures, and is delivered to its destination is essential. For example, in Japan and several other countries, as soon as the user's pick-up request is received and booked in the computer system, the pick-up information is automatically sent to the host computer that manages pick-up and delivery automotive service, and pick-up instructions are sent to the nearest vehicle over multichannel access (MCA) radio.* Once freight is picked, information about it is entered into the computer** and sent to the receiving side in real time through the DHL global network, a corporate network whose backbone is an international packet-switched network. Tracing

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*The user's name, address, and other information is displayed on a liquid crystal display (LCD) aboard a ground vehicle. The trucking system was introduced to increase the speed and efficiency of freight collection (*Nikkei Communications*, 27 Feb. 1989, no. 60, p. 76).

**To eliminate input errors, a hand-held scanner is used to read the barcode on the package, and after the freight is collected, barcode data are loaded into the computer.

freight and inputting freight information necessary for tracking are performed through the DHL network.

On the receiving side, the procedures for clearing customs are accomplished in advance,* on the basis of the information sent. On arrival at the receiving side, the freight is first verified at a checkpoint, to make sure it has been correctly routed. Verification is carried out by scanning the barcode on the package and comparing it to data on the distributed freight information databases through the company's on-line real-time network. At the checkpoint, the freight is confirmed as correctly routed; information pertaining to its movement (time, place, etc.) is entered for tracking purposes. Accuracy is guaranteed by the number of checkpoints the freight must pass through before it is delivered to the destination required by the sender. Once delivery has been completed, a "delivery completed" notation is entered into the computer on the receiving side and a "completed" message is sent to the sender through the DHL network.

Flow of data accompanying tracking. Tracking begins when information about the picked-up freight is entered into the computer. Thereafter, for each movement of the freight there is a checkpoint, and information about the time, place, and other necessary data are inputted in real time into the freight information database on both the sending and receiving sides. Access to the database is by the DHL network; in the few places where direct access is not possible, access is obtained by sending a telex to the nearest headquarters, which is a communications hub of the network.

Flow of data concerning charges. Information about the charges for individual items of freight is processed in real time at the originating country office, along with the freight information. The freight information systems, while in the past predominantly IBM, are migrating to UNIX-based platforms. Within individual countries, the specific vendors may vary, on the basis of product availability.

Customer inquiry system. To provide shipment information to customers, the company has developed special application programs that allow customers who own PCs to retrieve or

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*Depending on the country, customs clearance may include off-line procedures such as preparation of documents (and sometimes diskettes) or on-line access to an EDI-based clearance system, as in the U.S.

enter information about their shipments. This access gives "customers complete control over their shipment processing."[52] Shipping reports and invoicing are also available by this system.

Flow of sales data. Sales information is summed up on a batch basis at each center. Extracts are shared with other areas as needed.

Communications tool. For the most part, instead of fax or telex, the company uses E-mail as the authorized tool for interpersonnel communication, including administrative correspondence. Even flight schedules are available on E-mail, as well as correction information pertaining to misloaded freight and other errors.

5.3.4 Features of the Global Network

As noted (section **5.3.3**), a global packet-switched network provides the backbone of the DHL network, connected by an X.25 interface packet assembly/disassembly (PAD). Where there is no point of access to the network, then, first the nearest headquarters is accessed by either telex or PSTN and the global network accessed from there.

Because the enterprises that comprise the DHL group are independent in character, often different hardware and software resources are used. Thus, to put together an efficient network, the company uses network devices (selected and designed by its own company-wide information systems division, Global Telecommunications Group of DHL Systems, Inc.) to connect the different resources on-line to the DHL network.

5.3.5 Importance of the Global Network

A worldwide network is essential for running an international door-to-door express transportation business. In addition to basic package delivery service, a company is differentiated from competitors by its ability to deliver more accurately and more quickly than they. Simply having a worldwide network is not enough: the point is to optimize its ability. By combining a freight information system with a trucking system for freight collection, the DHL network ensures accuracy and speed.

5.4 Japanese Banking (Fuji Bank)

5.4.1 Trends in the Japanese Commercial Banking Industry

The securitization of financial markets in recent years has prompted commercial banks in Japan to move beyond such traditional commercial banking functions as savings, loans, and foreign exchange to participate aggressively in the securities-related business. Strict regulations govern the buying and selling of stocks. As one step in the liberalization of financial markets, the Financial System Reform Act was put into effect in Japan on 1 April 1993. Under its provisions, commercial banks are now allowed to operate securities subsidiary companies and investment trust subsidiary companies.[53]

Taking advantage of their tremendous financial resources at home, commercial banks—in particular, the top eleven commercial banks, known as city banks[54]-have actively pursued a course of internationalization. The city banks undertook full-scale operation of overseas offices simultaneous with strengthening their own position as the "main banks"[55] for the Japanese trading companies and manufacturing companies that in the 1970s had moved into foreign markets. Foreign direct investment in the U.S. has been accelerated from $229 million in 1970,[56] to $4,723 million in 1980,[57] and $83,498 million in 1990.[58] Facilities of Japanese banks in the U.S. have doubled from seventy-five in 1983[59] to 150 in 1990.[60]

The speculative investment in the stock market and in real estate that marked the 1980s, however, resulted in an economy swelled far beyond its actual worth, and with the dramatic fall in stock values, the economy headed precipitously toward collapse. While Japanese banks continue at the top of *Fortune*'s "100 largest commercial banking companies,"[61] ranked by total assets, according to *Euromoney*'s ranking of "the world's 100 best banks" only two Japanese banks were in the top fifty (forty-three and forty-seven).[62] Such rankings by total assets illustrate that improvement in management and financial make-up have become pressing concerns for Japanese banks.

By the end of March 1993, Japan's eleven city banks had achieved 9 percent[63] of the capital-to-assets ratio prescribed by BIS international standards.[64] According to the standards of the newly enacted U.S. Regulation F (section **5.1.1**),[65] for these banks to be classified as top-class banks in order to qualify to engage in a broad spectrum of business activities in the

U.S., including operation of securities subsidiary companies, they must achieve a capital-to-assets ratio of 10 percent.[66]

Faced with the need to adjust their emphasis from quantity to quality, Japanese banks have begun a full-scale withdrawal or reorganization of their overseas offices. At the same time, they have also begun to focus on internal restructuring, including expansion of their profitable operations in Asia. As of the end of June 1992, the number of offices of Japanese banks in Asia totaled 328, surpassing their number in either the U.S. (277) or Europe (281).[67]

Bubble Economy. During the 1980s, investment in real estate grew rapidly, and real estate investment by banks swelled from ¥17 trillion in 1984 to ¥43 trillion in 1989.[68] Not only banks but also general companies made speculative stock and real estate investments based on the so-called "land myth," the popularly held belief that nothing beats land as a lucrative asset.[69] Through these investments and financial engineering, they hoped to earn a more effective return than could be achieved through normal business operations.

Analysis by *The Economist* shows that shares of the Japanese banks loans to manufacturing decreased from half in 1970 to 16 percent in 1990; that is, many manufacturing firms used funds raised through equity finance and other direct financing methods, which they had traditionally channeled into investment in plant and equipment, for investment in various nontraditional financial engineering techniques.[70] "In the late 1980s manufacturers used their issues of securities not only to pay down their bank borrowing and invest in new machinery, but also to buy financial assets."[71] The result was a shift in the fund procurement methods employed by companies and a concomitant increase in equity finance. "In 1981–85 issues of equities and equity-related instruments, such as convertible and warrant bonds, accounted for a quarter of manufacturing companies' sources of funds; in 1989 they accounted for more than 70%."[72]

The Nikkei 225 Stock Average had tripled in four years, from ¥13,113 at the end of 1985 to ¥38,915 at the end of 1989. The economy, swollen like bubble, headed precipitously toward collapse with the fall in stock prices (¥20,221 1 October 1991),[73] and the aggregate market value of both shares and land dramatically decreased. The stock market value

dwindled from ¥600 trillion to ¥280 trillion, and total land values decreased from ¥2,100 trillion to ¥1,200 trillion.[74]

5.4.2 Overseas Activities

Fuji Bank drives overseas business by subsidiaries or branches in accordance with the regulations in each country. Its primary business activities in the U.S. are divided broadly into two areas: customer service, including deposit-taking accounts and lending, for individuals as well as businesses, and interbank dealing. Fuji Bank and Trust Company (FBTC), a local corporation, was established to handle customer service for retail business within the U.S. FBTC also does business with Japanese-owned corporations, and Fuji bank's New York branch is developing business with U.S. corporations.

5.4.3 Flow of Data Accompanying Corporate Activities

Flow of data accompanying customer service transactions. Account operations, which include daily deposit-taking and lending transactions, are handled independently by host computers installed at each office,* and the resultant data from these operations are input into a database and managed at each location. A grasp of this kind of deposit and lending information on a global basis is increasingly necessary. For example, in setting credit limits for a corporation developing its business globally, risk management to avoid bad debts presupposes the collection of data on a global basis. The collection of customer account information on a global basis supports such services as showing a customer where it stands with respect to its total transactions. To ascertain this kind of information, the data for management decisions are automatically extracted from the computer transactions and sent to the head office in Japan by file transfer after on conclusion of account operations.**

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*Account operations not are handled by the host computer in the head office but, rather, independently at each office, because of the high cost of international private lines necessary to transmit account data to Japan and because of TDF regulations, which may differ in different countries, restricting transmission of data pertaining to individuals.

**These data are currently handled as file transfers. Real-time data transfer is not considered necessary, because so long as they are within lending limits, which were adopted to give each office flexibility in its business operations, risk can be avoided. Another reason is that unless the data are organized to some extent, they will not serve as material on which to base management decisions. Clearly, without real-time processing changes in the situation overseas cannot be responded to quickly. In general, the ability to obtain very quickly detailed data on overseas operations and transactions will increasingly be necessary, because in the neighborhood of 30 percent of the total assets of city banks is in foreign currency denominations.

Global Management Information System (GMIS). GMIS, an administrative system for management decisions, which supports collecting, transacting, and processing relevant information. Management information for all of a customer's transactions, including credit balance and profitability, is managed through the database. The portion of the information necessary for overseas transactions is fed back to the overseas branches. Assets and Liabilities Management (ALM) also is simulated on GMIS.

Cash Management Service. The data extracted for management decisions are also reflected in the CMS for corporate customers, which provides global services such as managing a corporation's funds and overseeing the efficiency of its finances. Users can ascertain the status of their funds by PC at any time, around the clock.

Marketing information, such as lists of prospective customers, can be accessed overseas from the customer database in the head office, as an extension of the administrative information system. In addition, to access other management information related to domestic legal systems, commercial practices, and political and economic trends and render a prompt decision, Fuji Bank established regional headquarters in both the U.S. and the U.K.

Flow of data accompanying customers' business activities. Data related to instructing overseas remittances and settlement-of-accounts, and the like, that arises in connection with corporate worldwide business developments originate at each office where accounts are kept. Such data may concern transfers between accounts within the bank or accounts with another bank. Settlement-of-accounts messages between banks require a uniform format.

Account settlements between banks are transacted by linking with an external settlement-of-accounts system such as SWIFT, the Clearing House Interbank Payments System (CHIPS), or FedWire (the network clearing system of the U.S. Federal Reserve System). A message switching node at major offices connects to external settlement-of-accounts systems. Data for instructions concerning transactions within the bank are packetized and sent along the global private network, but offices with only a small volume of data traffic use IVANs, such as MARK III.[75]

Flow of data accompanying interbank trading. Data related to interbank dealings are broadly classified into data that arise in connection to dealing itself and data that serve as basic information in carrying out dealing. One example of information necessary for dealing is market information provided from external sources such as Reuters or Telerate by voice and data through dealing terminals. Internal dealing information such as market information, closing prices, and trading volume, is exchanged between offices with large financial markets. Between Tokyo and New York and between Tokyo and London, such information is sent by file transfer through PC communication, and between other markets, by fax. The data flow is from head office to overseas, from overseas to head office, and between overseas offices.

To convey the sense of being present at actual dealing, the major financial markets—New York, London, Tokyo, Hong Kong, and Singapore—are kept connected by the Open Voice system (OV) 24-hours-a-day. Through this system the status of buying and selling in a dealing room is picked up by microphone and sent to dealing rooms in other financial markets.

Data related to dealing are transmitted between dealing markets on-line in real-time.

Other data flow accompanying to business activities. Data used for administrative statistics like statements of accounts are centralized at the head office by the global network within the bank while recently both within and outside the bank information on global merger and acquisition transactions is increasing.

Communications tool. *Voice communication* is important in business activities. Telephone communication, for example, is indispensable. Frequently it is used to convey nuances numbers and paper cannot convey. Communication between the head office and other offices is common, although the dealers conduct communication between offices in the major financial markets. In New York alone, a Japanese staff of nearly eighty uses digitally compressed voice technology when communicating with overseas offices in order to lower international telephone charges.

Fax, given the time difference between the U.S. and Japan which limits telephone communication, can compensate for that limitation and has become indispensable to business activities. It is frequently used also with customers. Compared with telephone communication,

fax has the advantage of low cost and can supplement vague or incomplete information relayed in a telephone conversation. Fax networks are being created in which packet converters are installed at each overseas office.

5.4.4 Features of the Global Network

Computer networks, packet networks, and voice-type (telephone) networks logically separated are now being incorporated into a unique network architecture with a backbone of digital private lines with some features of following features.

Digitized backbone. Overseas offices in the major financial markets designated as communications hubs are connected to the head office by the digital private lines. Tying together all neighboring branches, these hubs both promote the efficiency of high-volume transmission through a digital private line and suppress the effects on the network of the opening of new branches and closure of existing ones. They are connected as follows:

Tokyo–New York	256 Kb/s
Tokyo–London	192 Kb/s
Tokyo–Hong Kong	128 Kb/s
Tokyo–Singapore	64 Kb/s
New York–London	56 Kb/s

Newly commercialized IVPN service is under consideration to cover overflow calls spilling from this private network.

Cost strategy. The cost strategy consists of using 8 Kb/s compressed voice "digital one link technology," PSTN-leased circuits connections, and fax transmission by packets.

Network reliability and security. There is a triangular network configuration connecting Tokyo, New York, and London. To increase reliability, there also are diverse routes, and both the disaster contingency plan and the disaster recovery plan. For security, digital encryptors are used.

In the computer back-up center at Fuji Bank's New York branch, settlements-of-accounts are handled on the scale of trillions of yen every day. Given this huge scale of operations that impacts society, a backup procedure is performed every few hours.*

Network operation and maintenance. Fuji Bank's network operations are managed by its systems department, and the bank consigns maintenance to manufacturers and carriers. Maintenance of its global network, which involves many different circuits and equipment provided by each manufacturer and carrier, is difficult to carry out. In the event of a failure, prompt and accurate diagnosis of the problems on the circuits in equipment is necessary to isolate the portion that is not operational and then to coordinate among manufacturers and carriers to continue transactions and to initial repair. To avoid these complex procedures, Fuji Bank leaves network supervisory operation to a carrier.

Multivendors. On the basis of the policy of choosing the vendor that gives the best function, quality, and cost, the global network is composed of equipment from many different vendors, largely owing to acquisitions of equipment selected as the best over many years.

5.4.5 Importance of the Global Network

Several points are important in evaluating the importance of Fuji Bank's global network. The management style not only at this bank but at Japanese banks in general can considered "head-office orientation leadership," so as much data as necessary for management decisions are gathered in the head office information system. Thus, the global networks of the banks act as a tool for decision making.

With completion in late 1980s of the domestic on-line real-time network, Japanese banks turned their efforts toward construction of global networks. The impetus was a desire to link management of their overseas offices, established to reinforce their role as main banks, to the head office system, thus allowing the banks to improve their level of service to corporate clients as well as to differentiate themselves from their competitors. In addition, with the increased risk resulting from an increase in overseas funds and "off-balance"[76] transactions,

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*Unlike Fuji Bank, other banks, such as the Bank of Tokyo (BOT), a Japanese city bank, have their own backup centers.

Japanese banks have come to recognize the necessity of maintaining a top-notch global network to manage risk on a global scale.

5.5 Japanese Manufacturing (Nissan)

5.5.1 Trends in the Japanese Automobile Industry

In 1990, production by the Japanese automobile manufacturing industry was ¥42.4 trillion, making it one of the primary industries in the Japanese economy.[77] This industry has a particularly great influence over trade income: in 1991 it was responsible for 22 percent of the total value of Japanese exports.[78] It produces nearly 30 percent of the world's vehicles.[79]

Concerned by the balance of trade, since 1981 the Japanese automobile industry has imposed voluntary export restraint on exports to Europe and the U.S.[80] The result has been an acceleration in local production of vehicles at factories in the countries where the vehicles will be sold, especially the U.S. market, the largest in the world. Since Japanese manufacturers first embraced the concept of "local production"—producing where the demand exists—and began production all at once in the U.S., the number of vehicles produced locally has continued to rise. In 1991, the total number of vehicles, including trucks, produced by Japanese automobile manufacturers in the U.S. exceeded 1.5 million, including production by joint ventures.[81]

Local production involves working to control the effects of a strengthened yen and a weakened dollar on profits and to stabilize corporate finance. Therefore, Japanese automobile manufacturers are making progress in local production to create managerial foundations for business operations.[82]

5.5.2 Overseas Activities

Business activities in the U.S. have been developed (and are still developing) by locating the auto company's facilities in the areas most favorable with respect to the nature and contents of corporate operations. What follows is an outline of major operations in the U.S.:

- *Nissan Research & Development, Inc. (NRD)* R&D, technological study, evaluation and acquisition of certification of automobiles. Nissan located its development arm in Michigan, the Mecca of the Big Three American auto

manufacturers, where historically there have been a large number of automobile engineers.

- *Nissan Motor Manufacturing Corporation U.S.A. (NMMC)* Manufacturing base producing since 1983. Nissan located its base in Tennessee to take advantage of a vast area with relatively cheap labor.

- *Nissan Motor Corporation in U.S.A. (NMC)* Distributions, sales, and after-sale services of both vehicles imported from Japan and those manufactured in the U.S. Located on the West Coast, close to the port-of-entry of the imported vehicles.

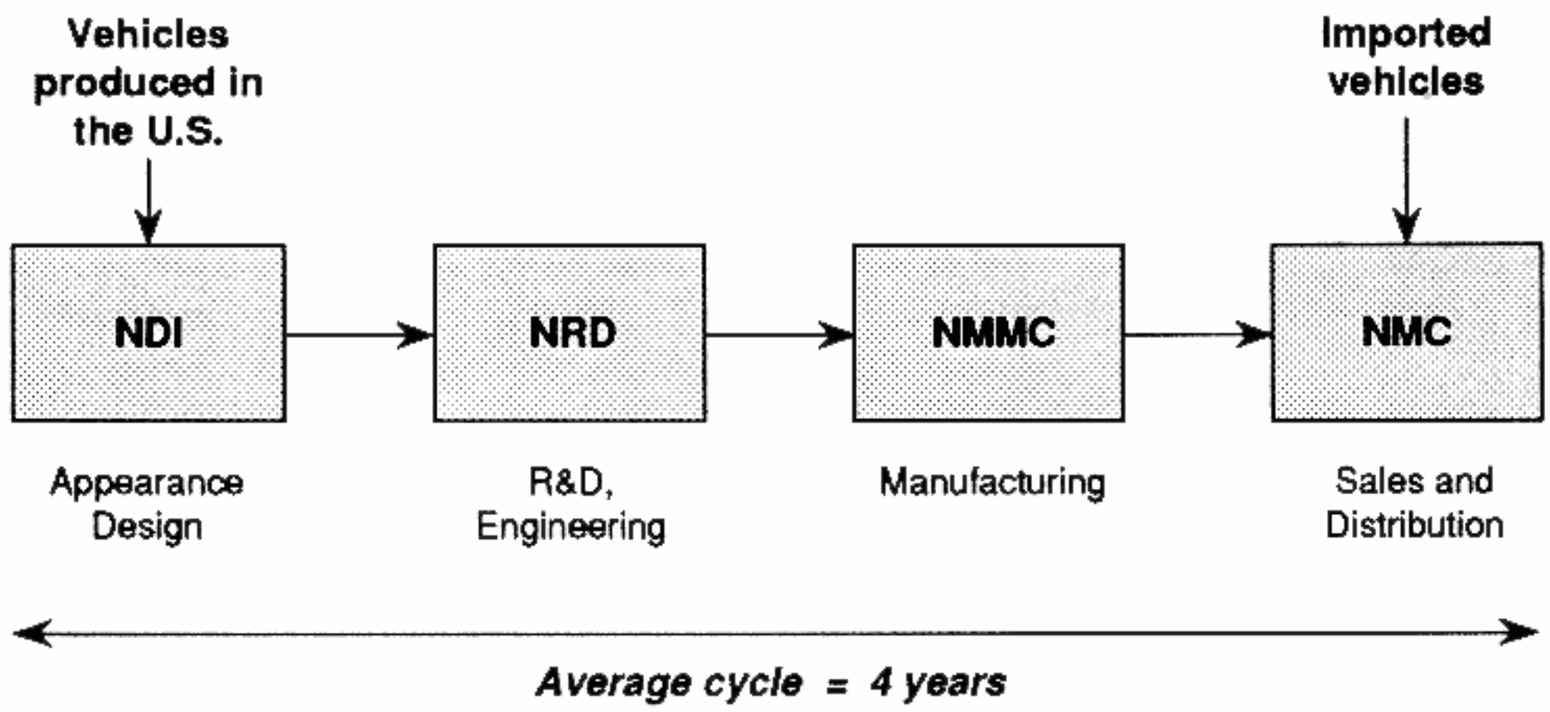
- *Nissan Design International, Inc. (NDI)* Based on the concept of "local design"—matching the tastes and life styles of consumers located nearest to the buying public, NDI was established in California, where the preferences of the American consumer are said to be reflected first.

- *Arizona Test Center (ATC)* Information on the results of special tests conducted in a hard natural environment such as Arizona is gathered and relayed back to R&D bases.

Including subsidiaries, such companies as financing services for group companies and leasing services for Nissan products, there are fourteen Nissan companies in the U.S. **Figure 5-3** shows business relationships between major companies. NDI creates a conceptual design, then NRD starts work with that design. NMMC handles manufacturing, while NMC is responsible for distribution and sales.

5.5.3 Flow of Data Accompanying Business Operations

Flow of data created at development and design arms. As localization of automobile manufacturers proceeds, one condition necessary for recognition as a local company is an increase in the ratio of materials and parts procured locally. Increasing the local content to 75 percent,[83] considered the average local procurement ratio for the Big Three U.S. automobile manufacturers, is the present goal. If the bumper or body is to be manufactured locally, then its development, design, and manufacture must meet local specifications. The "NX," which was developed in the U.S., is an example: the four-door body designed to Japanese specifications was redesigned for two-door use.



NDI Nissan Design International, Inc.
NRD Nissan Research and Development, Inc.
NMMC Nissan Motor Manufacturing Corporation U.S.A.
NMC Nissan Motor Corporation in U.S.A.

Figure 5-3

Operation Flow between Nissan Companies in the U.S.

With data delivered to the U.S. on magnetic tape (MT) as the basis, engineers redesigned the body of the car to meet local specs using CAD technology.* Next, the supercomputer at the Nissan Technical Center (NTC) in Japan simulates the strength of the redesigned body and analyzes wind resistance effects and other factors. The design can be revised on the basis of the results of the simulation sent by NTC, and data necessary for the design are accessed through the CAD database at NTC. Before the design is made into a final product, many repeated simulations, design revisions, and data exchanges between NRD and NTC are required, and data related to design information are repeatedly transmitted by file transfer over international digital circuits, a backbone of the Nissan global network CAD system and CAD database applications are currently run on IBM computers and strength tests and analysis by NTC on Cray computers. The CAD II** developed by Nissan (developed with

*CAD is used not only for design but with computer simulation also for installation of a newly developed part in the engine compartment, which is just one example of the process of designing nearly 5,000 different parts to be installed in a limited space so that they do not interfere with each other.

**Nissan took a general type of CAD application sold in the market and developed it into one that contains functions specifically necessary for automobile manufacturing.

IBM) requires a circuit bandwidth in the range of 64 Kb/s per terminal when transmitting on the global network. In practice, many auto parts are designed simultaneously, so in CAD data transfer batch processing is necessary to avoid overflow on international leased circuits due to simultaneous real-time access.

Resource deployment. For local companies, installation costs may be cited as one reason to conduct simulations on the supercomputer at headquarters (NTC), rather than locally, but a more important reason is that they do not yet have the know-how for operating and managing simulation software that is already present at NTC. The company's global network permits the local site in the U.S. to take advantage of Japanese-based technological and operational expertise.

Flow of data created at manufacturing base. *Data necessary for the production process*. Exchanges of component design information are essential for the production processes of manufacturing and assembly at NMMC, which cover tens of thousands of parts on each vehicle. Once the production process has begun, necessary information is ordinarily exchanged on-line using the global network. Especially in the production of vehicles designed to specifications used in Japan, information for alterations is sent from Japan, while NMMC accesses databases in Japan for mount information (how parts are installed in each unit). In addition, inquiries made to the design specification database and the parts component database in Japan are performed in real time (see ***Database inquiry***, below).

Data for production management. Data for production management at NMMC are accessed from headquarters in Japan through the global network linked with the parts acquisition network of group companies, so that acquisition can be managed on a global basis.

Flow of data at the distribution and sales base. As the sales force in the U.S., NMC handles the flow of data at the distribution and sales base, which involves handling distribution (*data on sales related to the dealers network*), sales (*data on order entries*), and after-sale service (*data on after-sale service*) both of vehicles imported from Japan and those locally produced.

Flow of data accompanying order entries. The flow of data accompanying order entries consists of requests for the number of imported vehicles released monthly and confirmations of which day's shipments are on which production lines, plus, of course, the daily revisions of such requests, when necessary. This data processing is supported by an on-line order-entry system through the global network. Just as product parts are ordered by NMMC, so service parts* are ordered through the on-line parts acquisition network linking Nissan group companies for procurement in Japan. This network permits management of parts acquisition and just-in-time inventories on a global basis.

Flow of data accompanying after-sale service. Information necessary for after-sale service is put into the database in order to manage service technical information at NTC in Japan. Service personnel in charge of maintenance can access this database at any time on a real-time basis through the global network to obtain information needed for maintenance and to file a report to NTC once service has been completed. If a user has filed a claim, claim information can be sent to Japan through the global network for vehicles and parts manufactured there (although final responsibility for parts and vehicles rests with the manufacturer, whether in the U.S. or Japan).

Flow of data on sales accompanying distribution: Dealers network. Currently, no data are exchanged directly with Japan by the distribution network linking NMC with dealers in the U.S. Instead, the customer database in the U.S. is managed only by NMC through a dealers' network in the U.S. This network is connected to numerous dealers of both nonluxury and luxury cars. It allows information, including order entries, to be exchanged with about 1,200 Nissan dealers comprising the distribution channel for nonluxury automobiles over two networks: BT's Tymnet is used for data and MCI's VNET for voice and fax; VNET can also be used as a back-up for data transmission. Exchanges of information, including order entries, with about 130 Infinity dealers that comprise the distribution channel for luxury automobiles are conducted over three networks: the IBM Intelligent Network (IIN), used for order entry;

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*Even for the same part, depending on its use, there are product parts used in production and service parts used for maintenance. Orders for the former are handled by NMMC, those for the latter by NMC.

very small aperture terminal (VSAT)* for product information; and MCI's VNET, for telephone and fax. VSAT circuits, which use AT&T Switched 56 for access lines, can be mutually backed up with VNET.

Database inquiry. The databases at NTC can be accessed in real time through the global network not only for inquiries by NMC service personnel but also from NRD and NMMC for those related to design and manufacturing. Inquiries concerning *design specifications* are through access to the database that manages information such as what is installed in each automobile and which specifications deal with which automobiles. Inquiries to the *parts component tables* are through access to a particular segment of the database that manages which parts are included in which unit of the automobile. This database manages information on over one million parts.

Communications tool. To exchange information for the processes of design, development, and production, along with CAD II, fax is essential for transmitting graphical diagrams necessary for staff to have in hand while conferring in detail by telephone. Telephone and fax are used frequently also to exchange technical information for after-sale service. For such purposes, Group IV (G4) fax machines were installed so that detailed graphical diagrams and the like can be transmitted at high speed by the global network.

To promote local production, in addition to securing production facilities and the labor force, operational and technological expertise for producing automobiles is necessary. To transfer such expertise to local bases, several hundred Japanese engineers work in the U.S. bases. Telephone communications to confer with their counterparts in Japan are on the increase: currently, due to the time difference between the U.S. and Japan, thirty voice channels allocated in the U.S.-Japan digital leased circuit are concentrated in a specific time period, making connections with these channels sometimes difficult to complete.

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*VSAT is used because of its multichannel access capability, through which television commercials for the buying public can be shown to the dealers before they are aired, among other uses. If this video image system is used simultaneously as a telephone conference system, a kind of television conference system is possible, although only with one-way images.

For domestic (U.S.) communication by telephone and fax, MCI VNET (56 Kb/s digital service) is used. For communication with Japan, all bases other than NMC access the communications hub at NMC which connects them to the international circuit.

5.5.4 Features of the Global Network

The Japanese automobile industry has created enormous networks that include companies—sales companies, parts suppliers, parts manufacturers—within a given corporate group. These networks join corporations allied according to type of business and connect each activity on-line. Such network systems architectures are part of a strategy to differentiate one's own company from the competition.

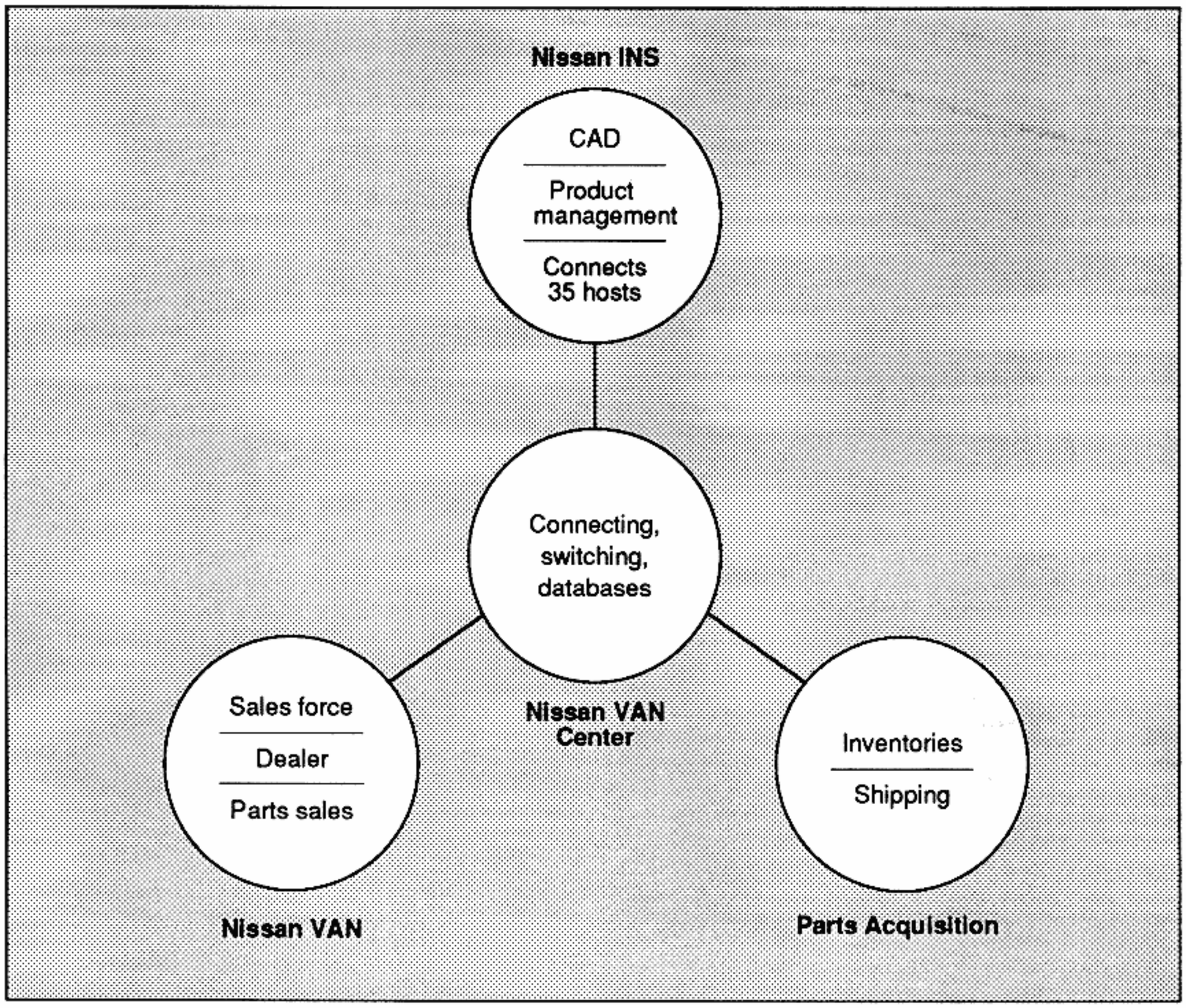
Nissan's strategic network, the "Nissan Area Network," incorporates three concepts: the Nissan area information network system; the Nissan area VAN; and the parts acquisition network.

Nissan area information network system. This system functions as the trunk of the Nissan Area Network; telephone and fax as well as data are integrated. It is used primarily for the transfer of CAD data and production management information between Nissan offices and various major affiliates companies.

Nissan area VAN. The VAN performs data transfers for placing and receiving orders and also handles all inquiries between automobile sales companies and parts sales companies over a 2.4 Kb/s PSTN line. In addition to querying the parts inventory information for the entire Nissan group from each terminal at each base, the VAN provides access to the database that supports service and maintenance.

Parts acquisition network. This network was introduced to realize "just-in-time" for acquiring parts. Information on order entries and the shipping of parts is transmitted to the parts manufacturers over a public switched network.

These three concepts, illustrated in **Figure 5-4**, are combined at the Nissan VAN center, where they are formed into the Nissan Area Network connecting the companies in the entire Nissan group. Many different kinds of databases are centrally managed at the VAN center.



CAD Computer-aided design
VAN Value-added network
INS Information network system

Figure 5-4

Concepts of Nissan Area Network

The global network connects the Japan (Asia), U.S., and Europe "market blocs" to allow database inquiries and just-in-time inventory on a global basis as a part of Nissan Area Network systems architecture.

Digitized backbone. International digital leased circuits are used as a backbone of the global network to connect market blocs.

Tokyo–NMC	768 Kb/s	NMC–Mexico	256 Kb/s
Tokyo–Amsterdam	768 Kb/s	Amsterdam–London	512 Kb/s
Amsterdam–Brussels	256 Kb/s	Amsterdam–Barcelona	256 Kb/s

Between U.S. bases, public switched digital services such as VPN are used for voice and data transmission. Other bases with relatively low transmission volume use international VAN services.

Cost strategy. The cost strategy used depends on whether digitally compressed voice technology (16 Kb/s with two digital links) or public switched networks to leased circuits connection, and so on, is available.

Network reliability and security. To support reliability on the global network, the U.S. and Europe will be linked by digital circuits, which allow for a triangle network connecting Japan, the U.S., and Europe. This connection would provide a roundabout route for securing reliable communications, in addition to its usefulness for rerouting some Japan-U.S. traffic to the Japan–Europe side.*

Maintenance and operation. Because the Nissan Area Network is a conglomeration of different hardware and software system resources installed at each company, no external resources can maintain and manage the network uniformly. To cope with this complexity, Nissan established a subsidiary that runs the VAN center, training technical personnel within the corporation. Network supervision is performed centrally, at the VAN center.

Multivendors. Aside from the group companies, Nissan uses various vendors. Host computers are chosen according to function from IBM, Cray Research, and HP; TDM is uniformly NEC.

5.5.5 Importance of the Global Network

The following points are essential in evaluating the importance of the Nissan global

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*Time differences require the concentration of international telephone calls related to international business operations into a limited time range. Because the establishment of sufficient channels to cover the peak time is costly, overflow calls occur. The problem of overflow calls between the U.S. and Japan, for example, owing to the time difference could be solved by rerouting calls through the Japan–Europe line.

network: *supporting local production*; *promoting just-in-time inventory*; and *supporting alliances*.

Supporting local production. The global network in use in its current stage since 1988 can be said to support local production, which is still in early development. To transfer corporate expertise to another country, closer communication with headquarters (NTC) is essential, using a strategic network.

Promoting just-in-time inventory. By connecting the global network to the domestic parts acquisition network, Nissan can have a grasp on inventory information on a global scale, which will promote global just-in-time inventory.

Supporting alliances. Strategic alliances with not only related industries but also other auto manufacturers, such as the Nissan–Ford tie-up, are increasing. To optimize mutual resources, network linkages with one another are essential.

5.6 Japanese Transportation (Kawasaki Kisen Kaisha ["K" Line])

5.6.1 Trends in the Marine Transportation Industry in Japan

The shipping industry in Japan is regulated by shipping business law, and various approvals and permits are required, depending on the type of business performed. Shipping is classified into marine transportation—goods conveyed by sea—and land transportation—goods conveyed overland. Major trucking companies engaged in land transportation also act as middlemen in the marine transportation business.

Marine transportation in Japan, a country enclosed by ocean, has developed over centuries. Because Japan depends on other countries for natural resources, marine transportation serves as a lifeline for Japanese manufacturing industries in particular. Three major marine transportation companies that provide regularly scheduled service (such as liners operating on fixed routes and schedules which mainly transport industrial products), independently or in business tie-ups, also provide unscheduled service (ships that transport raw materials and energy resources; ships used exclusively to transport automobiles are included as part of unscheduled shipping service), in which ships can be sent anywhere under contract with the shipper.

When trucking companies, as middlemen (acting as agents for users for the transportation of shipped goods, because they have the specialized knowledge required for filling out shipping papers, complying with customs clearance procedures, etc.), are depended on for land transportation, they usually are companies in direct contact with the user. Strictly speaking, there are various other middlemen, including warehousers and cargo handlers. The relationships of companies and middlemen are illustrated in **Figure 5-5**.

Figure 5-5

International Marine Transportation Process

5.6.2 Overseas Activities

"K" Line's container terminals in Tacoma, Washington, and Long Beach, California, serve as bases for liner services, and the company has twenty bases in the U.S. for unscheduled shipping service and distribution. In the U.S., given there are no regulations to govern the relationship between marine and land transportation, "K" Line America, Inc., Murray Hill (KAM), headquartered in New Jersey, was established to develop land transportation as well.

5.6.3 Flow of Data Accompanying Business Activities

Flow of data for shipping. Transportation of a user's cargo begins with a request for shipment from the user (in practice, usually the middleman, the user's agent), that is entered into a database which manages the movement of containers (marine cargo is always loaded and shipped in container units and its movement tracked by those units). The database is accessed to check the availability of shipping. After obtaining the container information, the booking is received and processed and an ID is assigned, and from that point on the cargo's movements are tracked by the ID. A bill of lading (B/L) is prepared from information in the

shipment papers from the user, and information incidental to loading* entered. Input data are sent to the shipping destination in real time (so users' inquiries about cargo can be answered immediately) by the "K" Line global network, and information necessary for the customs declaration, such as a manifest, is prepared in advance of arrival. Declarations to U.S. Customs by the ship company are converted to EDI format and made by Automated Manifest System (AMS). Customs investigates by collating AMS data with data from the Automated Bond Entry Information (ABI) system, an EDI system for users. After the cargo has been declared at U.S. Customs, it is handed over to the user in exchange for the B/L. The job of marine transportation ends there; next, KAM, the U.S. subsidiary, arranges for delivery to the user's address, using specialized trucking companies.

Facsimile (fax) mail system (FMS). The flow of data accompanying shipping includes information entered into the database as well as a significant amount of information exchanged by fax. Because the format of most of the necessary shipping documents is fixed, the documents are on preformatted sheets exchanged through the FMS network.

Information for tracking cargo. To answer user inquiries immediately, cargo must be traced through information obtained on-line in real time. The global network uses connection nodes with VANs** and public switched networks to support worldwide access to the cargo information database. This inquiry service was introduced to provide added value not available from other companies and to differentiate the company from the competition.

Transmitting cargo information to users. Information on the arrival of cargo is provided to users by fax sent from the cargo's destination point to both sender and recipient through the FMS network between U.S.A. and Japan.

Issuance of invoices. Because billing information may involve prepayment of transportation charges or payment on delivery and because inquiries about charges must be answered promptly, account information from the loading location is sent in real time to the destination along with the shipping information.

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*Including, in addition to the contents of the cargo, the movement of containers, the movement of ships, and schedules; companywide, in the neighborhood of thirty thousand B/L are issued monthly.

**Shipping VANs like Kleinschmidt, OrderNet, and GEISCO as well as DSTs, previously mentioned.

Management of container information. One way to lower distribution costs is to optimize the distribution of containers in order to increase their turnover rate.* To deploy roughly 140,000 containers properly to the locations where cargo awaits them, accurate information on a container must be obtainable immediately whenever it is moved. Access to the global network is allowed from any location so that container movements can be obtained on-line worldwide.

5.6.4 Features of the Global Network

Digitized backbone. The backbone of the company's global network is digitized to integrate different types of networks, such as computer, fax, telex, and telephone. To achieve on-line access to this network required the introduction of connection nodes with public networks, including VANs, for example, the X.25 interface unit in the computer network, facsimile mail unit in the fax network, and a telex server in the telex network, as shown in **Figure 5-6**.

Cost strategy. To lower the total costs for global communications, all media that previously separately existed in each network were integrated into the digital network. In addition, between the U.S. and Japan, where transactions occur in great volume, digital circuits are connected with PSTN to take advantage of the flat-rate charge of leased circuits.

Network reliability and security. To ensure the network's reliability, roundabout routes are established in a circuit structure of double triangles within the U.S. Between New Jersey, London, and Tokyo, the route of the host computer network is made roundabout by using a London-Tokyo analog circuit.

Network operation and maintenance. A marine transportation business network horizontally links various business participants—middlemen, land transporters, warehousers, and insurance companies. Because the paradigm for this type of network differs from the vertical one used for interoffice communication within a company, a subsidiary in charge of corporate networks was established to create a network with a conceptual orientation that

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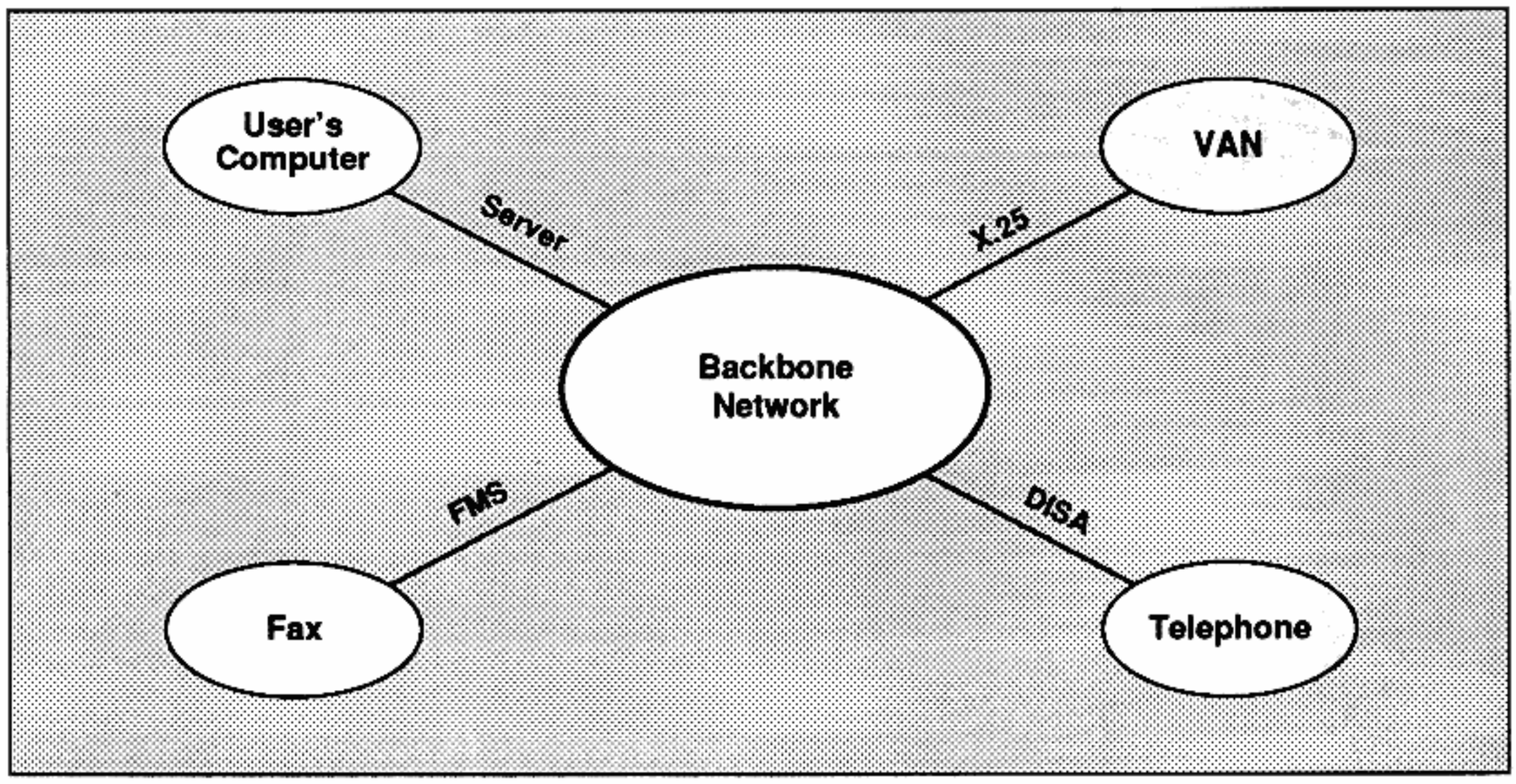
*The rate of container turnover between Japan and the U.S. averages 2.5 months per cycle. To raise this rate, container information must more precise in order to eliminate errors. Storage expenses for a container that must wait empty are reflected in distribution costs.

extends beyond the company. The subsidiary operates and maintains the network, and its center controls supervisory operations for all "K" Line private networks.



VAN Value-Added Network
FMS Facsimile (fax) Mail System
X.25 International standard of ITU-T
DISA Direct Inward System Access

Figure 5-6

Logical Connection of "K" Line Networks

Multivendors. In accord with the strategy of pursuit of efficient use of host computer resources, Fujitsu has been assigned as a unique vendor, but for network equipment, TDMs are provided by Infotron for the global network and by Fujitsu for the domestic one, while FMSs are provided by Panasonic.

5.6.5 Importance of the Global Network

In the marine transportation industry, because there are no differences among operators in basic services and charges, an important part of a company's management strategy is to find another way to differentiate itself from its competition. In an effort to stand out from other companies, "K" Line has equipped itself with a private network infrastructure and built an on-line network system to improve its container turnover rate by quick, accurate information and to provide value-added services for users.

Chapter Six

Conclusion

When randomly generated data flow through a network in real time, the network should be conceived of as a kind of information resource that possesses processing capabilities, rather than merely as a wire through which data flow.

In the past, when networks acted simply as transmitters of data that flowed only in one direction at a time, network performance could be improved by increasing the line capacity—i.e., increasing the size of the wire. But networks now manage many different kinds of data, such as batch and real-time data—even different kinds of real-time data, such as database inquiries and ATM data—which flow in all directions at once. Consequently, networks should be able to control data processing by type, for example, segmenting various types on the networks and guaranteeing network response time. The most important asset of companies currently operating on a global scale is information. To increase its value as part of corporate strategy and to enhance its usefulness, full utilization of information resources is essential.

Networks can represent physical space (see section **4.5**), that is, they can make remote information resources, such as computers and databases, appear as if present right in front of the user. Further, the network itself is one of these information resources, used to transform data and information into a useful strategic asset.

In the future, the key issue will be how information will be processed as a function of the global network. As distance increases between sender of information and receiver, the benefits of networking also will increase. In the construction of global networks in particular, it is therefore essential that this be recognized. The present high cost of international lines may hinder the advancement of global networks, but, as the case studies here clearly indicate, the increasing need for global networks should outweigh cost as a factor in determining their future.

The convergence of recently commercialized high-speed and broadband network services (e.g., ATM, broadband ISDN) will rapidly advance corporate global networks to the level shown in **Figures 4-3**, **4-4**, and **4-5** at relatively low cost. Global networks are core resources vital for corporate strategies, and they can be built by using private circuits or public switched services or some hybrid of them, depending on the needs of the users. The important concerns for users are who is responsible for controlling and managing data in the global networks and to what extent.

Global corporate networks that will provide seamless linkage between headquarters and foreign arms will strengthen the global activities of these corporations. A relatively inadequate domestic information infrastructure provided by telecom carriers could be a major hindrance for corporate global networks. Therefore, building a highly enhanced information infrastructure will prove strategically indispensable for telecom carriers to maintain strong relations with the global corporations headquartered in their countries.

Notes

1. Lester C. Thurow, *Head to Head: The Coming Economic Battle among Japan, Europe, and America* (N.Y.: Morrow, 1992), p. 66.

2. *Information Communications Almanac '91* (Tokyo: Jotsuken, InfoCom Research, February 1991), p. 889.

3. U.S. Department of Commerce, "Trans-Atlantic Cable Systems, 1956-1992" [Table], *U.S. Telecommunications in a Global Economy* (August 1990), p. 221.

4. Global ISDN service among the U.S., the U.K., and Japan was introduced in June 1989.

5. IVPN service between the U.S. and the U.K. was introduced under the name of international center service (ICS) in 1989. AT&T provides this service as the global software defined network (GSDN), with over twenty countries as of April 1993 (AT&T internal report). In Japan, Kokusai Denshin Denwa (KDD) provides this service as the virtual network (VIRNET), with thirteen countries as of April 1993 (AT&T internal report).

6. MPT Network Advisory Board, *Nihon no Nettowaku 1992*, p. 48.

7. Many companies pursuing cost performance are attracted to value-added services of VANs.

8. Ford provides the designs, Nissan the assembly lines.

9. For further information, see "Alliances of Automobile Manufacturing Industry," *1992 The Motor Industry of Japan* (Tokyo: Japan Automobile Manufacturers Assoc., Inc., 1992), pp. 28-29.

10. For further information, see Peter F. Crowley and Jonathan D. Aronson, *Managing the World Economy: The Consequences of Corporate Alliances* (New York: Council on Foreign Relations, 1993), pp. 148-149.

11. Michael E. Porter, "How Information Gives You Competitive Advantage," *Competitive Advantage: Creating and Sustaining Superior Performance* (New York: Free Press, 1985), p. 68.

12. Report of the Bank of Japan. "Banking Industry under BIS Standard," *Nikkei Shimbun*, 23 March 1993, p. 7. Off-balance trading can take advantage of profits while avoiding financial risk to the flow of money on the balance sheet. Traditionally, off-balance trading has been used to hedge against risks, but it is now occasionally used for speculative financial engineering, so that such trading is accompanied by risks when interest rates fluctuate.

13. The Federal Reserve Board, FDIC, and Office of the Comptroller of the Currency defined seven categories of risk: counterparty credit risk; market risk involving interest-rate risk, exchange-rate risk, and commodity-price risk; settlement risk; operating risk; liquidity risk; legal risk; and aggregation risk. For further information, see "R is for Risk," *The Economist* (10 April 1993), p. 33.

14. "In Search of Borrowers," *The Economist*, vol. 326, no. 7805 (3 April 1993), p. 71.

15. Established in 1933, the FDIC insures each depositor "up to $100,000 in member banks of the Federal Reserve System and in nonmember banks that join the Bank Insurance Fund." U.S. Bureau of the Census, *Statistical Abstract of the United States: 1992* (112th edition, Washington, D.C., 1992), Section 16.

16. Kenneth H. Bacon, "Banks' Earning Increased Sharply In Fourth Period and Year, FDIC Reports," *The Wall Street Journal* (10 May 1993).

17. Barbara A. Rehm, "Bank Profits Shattered Record in '92," *American Banker*, vol. 158, no. 46 (10 March 1992), pp. 1, 17.

18. BIS capital adequacy guidelines, agreed on in 1988, prescribe that BIS-based banks must achieve 8 percent of the capital-to-assets ratio until the end of 1992.

19. *Nihon Keizai Shimbun* (11 March 1993), p. 9.

20. The Federal Reserve System was established in 1913 to exercise central banking functions, some of which are shared with the U.S. Treasury. *Statistical Abstract of the United States* (1992), Section 16.

21. David T. Johannesen and Julie K. Fordyce, "Interbank Exposure Needs More Scrutiny," *American Banker*, vol. 158, no. 46 (10 March 1993), p. 4.

22. *U.S. Industrial Outlook '93*, p. 45-4.

23. Johannesen and Fordyce, p. 5.

24. "The 100 Largest Commercial Banking Companies," *Fortune*, vol. 126, no. 4 (24 Aug. 1992), p. 213.

25. Barbara A. Rehm, "Failures Off Expected Pace; FDIC Cites Profitability," *American Banker*, vol. 158, no. 40 (2 March 1993), p. 14.

26. Mark Borowsky, "M&A Activity Slacks Off Following 1991's Big Deals," *Bank Management*, vol. 69, no. 1 (January 1993), p. 35.

27. *The Economist*, vol. 325, no. 7782 (24 Oct. 1992), pp. 90-91.

28. CITICORP Annual Report, 1991, p. 6.

29. "Citicorp in Asia," *The Economist*, vol. 325, no. 7782 (24 Oct. 1992), p. 90.

30. Ibid., p. 95.

31. Ibid.

32. CITICORP Annual Report 1991, p. 6.

33. According to CITICORP's 1991 Annual Report (p. 10), during 1991, Japanese travelers used the global ATM service 13,000 times per month in the company's branches outside Japan.

34. Porter, p. 123.

35. Ibid.

36. Company X 1992 Annual Report, p. 24.

37. Ikuo Kojima, *Gaishikei kigyo no Keiretsu to Seiryoku Chizu* [Grouping and Mapping of Foreign Companies] (Tokyo: Nihon Jitsugyo Shuppan, 1992), pp. 74-75.

38. Company X 1992 Annual Report, p. 24.

39. Company X 1992 Annual Report, p. 25.

40. The Federal Express Corporation operates in 130 countries and earns $7.7 billion with its 421 flight equipment, about 33,700 automotive delivery vehicles, and 91,550 employees as of 1991. For further information, see *Hoover's Handbook of American Business 1993*, p. 267.

41. DHL does not publish its financial data, but from a sum of the information on major world regions included in the DHL Worldwide Express Corporate Report (1992) in 1991 it was operating in more than 160 countries with 124 flight equipment, 7,810 courier vehicles, and about 26,000 employees.

42. *U.S. Industrial Outlook '93*, p. 40-1.

43. Thurow, p. 42.

44. Ryan, "Air Freight Gets a New Face," *Transportation & Distribution*, vol. 34, no. 2 (February 1993), p. 26.

45. DHL Worldwide Express Corporate Report 1992, p. 8.

46. Ryan, p. 26.

47. Perry A. Trunick, "Forwarders Offer Seamless Logistics Pipeline," *Transportation & Distribution*, vol. 34, no. 2 (February 1993), p. 25.

48. Ryan, p. 26.

49. DHL Worldwide Express Corporate Report 1992, p. 8.

50. Diskettes are increasingly treated as documents by the customs. *Nikkei Communications*, no. 60 (27 Feb. 1989), p. 79.

51. Julie J. Gentry and Martin T. Farris, "The Increasing Importance of Purchasing in Transportation Decision Making," *Transportation Journal*, vol. 32, no. 1 (Fall 1992), p. 67.

52. DHL Worldwide Express Corporate Report 1992, "Managing Information in Real Time," p. 22.

53. Toshio Shinmura, "Six Banks, Four Brokers Plan Entry across Torn Firewalls," *The Nikkei Weekly*, 5 April 1993, 17.

54. The total fund volume of eleven Japanese city banks amounts to ¥354 trillion (approximately $3 trillion; $1.00 [U.S. 1993] = ¥120). See *The Nikkei Weekly*, "Japan Economic Almanac 1992" (Tokyo: Nihon Keizai Shimbun, 1992), p. 233.

55. According to *The Economist*, many big corporate clients were clustered around a "main bank," which owned shares in the companies and closely monitored their performance. Similar in concept is *keiretsu*: the traditional keiretsus were organized around Japan's big trading companies, such as Mitsui and Mitsubishi. Another kind of alliance is the keiretsu centered on a main bank. See "The Japanese Economy: From Miracle to Mid-Life Crisis," *The Economist*, vol. 326, no. 7801 (March 6th-12th 1993), pp. 6, 15. For further information on Japanese keiretsu, see Dodwell Marketing Consultants, *Industrial Grouping in Japan* (Tokyo: Dodwell Marketing Consultants), June 1992.

56. *Statistical Abstract of the United States* (105th ed., 1985), p. 804.

57. *Statistical Abstract of the United States* (112th ed., 1992), p. 786.

58. Ibid.

59. *U.S. Industrial Outlook '85*, p. 59-2.

60. *U.S. Industrial Outlook '92*, p. 46-2.

61. The eight best banks according to *Fortune* are Japanese (vol. 126, no. 4 [24 Aug. 1992], pp. 213-214).

62. "Americans on the Top of the World," *Euromoney* (19 Feb. 1993), p. 102.

63. Shigeru Wada, "City Banks Vault over Capital-Adequacy Hurdle," *The Nikkei Weekly*, 5 April 1993, 17. A total average of ninety Japanese banks that have adopted BIS standards is 8.3 percent, with ¥52.4 trillion in total capital and ¥628.1 trillion in total risk assets (*Nihon Keizai Shimbun* [Japan Financial Newspaper], 17 March 1993, p. 17).

64. BIS international standards, agreed to in 1988, prescribe that BIS-based banks had to achieve 8 percent of the capital-to-assets ratio until the end of 1992, but Japanese banks, whose fiscal year ends in March, must achieve the ratio before March 1993.

65. See "Interbank Exposure Needs More Scrutiny," *American Banker*, vol. 158, no. 46 (10 March 1993), p. 4.

66. *Nihon Keizai Shimbun*, 17 March 1993, p. 19.

67. *Nihon Keizai Shimbun*, 13 September 1992, p. 3. An office includes branches,

representative offices, and subsidiaries, more than 50 percent of whose capital is invested by Japanese banks.

68. "The Bubble: Why It Happened, Why It Burst, What It Wrought," *The Nikkei Weekly*, 12 April 1993, p. 11.

69. Ibid.

70. "The Japanese Economy From Miracle to Mid-Life Crisis," p. 6.

71. Ibid.

72. Ibid.

73. "The Bubble," p. 11.

74. *Nihon Keizai Shimbun*, 16 December 1992, p. 27.

75. A time-sharing service provided by the General Electric Information Service Co. (GEISCO).

76. Report of the Bank of Japan. "Banking Industry under BIS Standard," *Nikkei Shimbun*, 23 March 1993, p. 7.

77. For further information, see *1992 Motor Industry of Japan* (Tokyo: Japan Automobile Manufacturers Association, Inc., 20 May 1992), p. 4.

78. Ibid., p. 5.

79. Kevin Done, "World Automotive Components," *Financial Times*, Sections II, III, 14 July 1992.

80. In 1991 the voluntary export quota for Japanese cars exported to the U.S. was 2.3 million cars, but the actual number exported was 1.73, only a 3 percent increase over the number of cars exported in 1981, 1.6 million.

81. *1992 Motor Industry of Japan*, p. 25.

82. Takehiko Ota, "Future Course of Japan's Automotive Industry," *Digest of Japanese Industry & Technology* (Tokyo: Japan Trade & Industry Publicity, Inc.), no. 271 (30 June 1992), p. 3.

83. Nissan achieved approximately 80 percent of local content value. See *Globalisation of Industrial Activities, Four Case Studies: Auto Parts, Chemicals, Construction, and Semiconductors* (France: Organisation for Economic Cooperation and Development (OECD) Publication, 1992), p. 57.

Acronyms

ABI	automated bond entry information
ALM	assets and liabilities management
AMS	automated manifest system
ATC	Arizona Test Center (Nissan)
ATM	asynchronous transfer mode automatic teller machine
AT&T	American Telephone and Telegraph Co., Inc.
B-ISDN	broadband ISDN
BIS	Bank for International Standards
B/L	bill of lading
BOT	Bank of Tokyo
BT	British Telecommunications plc.
CAD	computer-aided design
CHIPS	Clearing House Interbank Payments System
CMS	cash management service
dB/km	decibel per kilometer
DHL	DHL Worldwide Express
DISA	direct inward system access
DST	double-stack train
EDI	electronic data interchange
E-mail	electronic mail
EST	eastern standard time
EU	European Union (formerly the European Community [EC])
FBTC	Fuji Bank Trust Company
FDIC	Federal Deposit Insurance Corporation
FDICIA	FDIC Improvement Act
FedEx	Federal Express Corporation
FedWire	U.S. Federal Reserve System network clearing system
FMS	facsimile mail system
G4	Group IV
GEISCO	General Electric Information Service Co.
GCM	global cash management
GMIS	global management information system
GSDN	global software defined network
HP	Hewlett-Packard
HTFN	Hi-Tech Forwarder Network
IBM	International Business Machines, Inc.
ID	identification code

IIN	IBM Intelligent Network
IIS	Integrated Interline Systems
ISDN	integrated services digital network
IVAN	international value-added network
IVPN	international virtual private network
JST	Japanese standard time
"K" Line	Kawasaki Kisen Kaisha, Ltd.
KAM	"K" Line America, Inc., Murray Hill, New Jersey
Kb/s	kilobits per second
KDD	Kokusai Denshin Denwa
LAN	local area network
M&A	mergers and acquisitions
Mb/s	megabits per second
MCA	multichannel access
MCI	Microwave Communication, Inc.
MPT	Ministry of Posts and Telecommunications (Japan)
MSD	Management Systems Division
MT	magnetic tape
NAFTA	North America Free Trade Agreement
NDI	Nissan Design International, Inc.
NMC	Nissan Motor Corporation in U.S.A.
NMMC	Nissan Motor Manufacturing Corporation U.S.A.
NRD	Nissan Research & Development, Inc.
NTC	Nissan Technical Center in Japan
OECD	Organisation for Economic Cooperation and Development
OV	open voice system
PAD	packet assembly/disassembly
PC	personal computer
PSD	product supply operation
PSTN	public switched telephone network
R&D	research and development
SMDS	switched multimegabit data service
SWIFT	Society for Worldwide Interbank Financial Telecommunication
TDF	transborder data flow
TDM	time division multiplexers
VAN	value-added network
VSAT	very-small-aperture terminal

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ISBN 1-879716-06-2