Taiwan Semiconductor Manufacturing Company

Building 67, No. 195, Sec 4
Chun-Hsen Road
Chu-tung, Hsinchu
Taiwan, ROC
Telephone: (886) 35-961240
Fax: (886) 35-942616
Dun's Number: Not Available

Date Founded: 1986

CORPORATE STRATEGIC DIRECTION

Taiwan Semiconductor Manufacturing Company (TSMC) was founded in 1986 as a joint venture between N.V. Philips of the Netherlands, holding a 27.5 percent share; Taiwan's Executive Yuan Development Fund, holding 48.3 percent; and a group of nine other Taiwanese companies, holding 24.2 percent. Their initial goal was to establish a one-stop semiconductor manufacturing foundry that included wafer fabrication, probing test, packaging, final test, and burn-in.

TSMC has shown very strong performance during the four years of its existence. The Company maintains two fabs. Fab I is an existing fab being leased from the Electronic Research and Service Organization (ERSO), which is a department within the Industrial Technology Research Institute (ITRI) organization, for NT$66 million (US$2.5 million) annually, in which TSMC invested NT$792.3 million (US$30 million) for new equipment. It opened in mid-1988 and has a capacity of 12,060 six-inch wafers per month. Fab II is a new NT$10,564 million (US$400 million) plant in Taiwan's Hsinchu Science-Based Industrial Park. Construction began in April 1988 and was completed in April 1990. Plant capacity will be 40,000 six-inch CMOS wafers per month when it is fully operational. Production will center on 1.0-micron feature sizes. Several major IC Companies have entered long-term purchase commitments with TSMC.

In early 1987, ITRI made an existing 6-inch fabrication facility available to the venture through a special arrangement. Since 1986, TSMC has acquired main process technologies and other research support through a variety of arrangements with Philips and ITRI. In addition to TSMC's Fab II production line, its Fab I reached an average of almost 13,000 wafers per month in 1989. During 1991, Fab I is expected to produce 20,000 wafers per month, and during 1992 and 1993, it is expected to produce 40,000 wafers per month.

On April 28, 1990, TSMC dedicated its second wafer-processing facility in Hsinchu, Taiwan. TSMC's Fab II is the first wafer fab in the world to be designed from the ground up with standard mechanical interface (SMIF) to utilize the "clean-island" concept.

To support this strategy, during 1990, TSMC made a deal with Intel Corporation calling for TSMC's silicon foundry to make DRAMs for distribution through Intel's sales channels in Taiwan and the rest of the Asia/Pacific region.

Total revenue for fiscal year 1989 reached NT$1,848 million (US$70 million), an increase of 100 percent from NT$924 million (US$35 million) in 1988. TSMC employs 1,023 people worldwide.

R&D expenditure and royalties payments totaled US$2.6 million for fiscal 1989, showing an increase over the previous year's figure of US$1.7 million.

Philips has started negotiations to buy additional shares from the TSMC's largest shareholder, Taiwan's Executive Yuan Development Fund. Once it gains majority control, Philips has made known its plans to transfer its submicron CMOS technology to TSMC.

No financial statements are included in this backgrounder because the Company is privately held.

BUSINESS SEGMENT STRATEGIC DIRECTION

Semiconductors

The Company's major products in the semiconductor business are as follows: ASICs, memory devices, microcontrollers, and consumer-related ICs.

Further Information

For further information about the Company's business segment, please contact the appropriate Dataquest industry service.

1989 SALES OFFICE LOCATIONS

North America—1
Europe—1
Asia/Pacific—1

MANUFACTURING LOCATIONS

Asia/Pacific

Hsinchu, Taiwan ROC
CMOS foundry, ASICs, memories, microprocessors, consumer ICs

SUBSIDIARIES

North America

Taiwan Semiconductor Manufacturing Company, San Jose, California (United States)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1989

ERSO-ITRI (Taiwan)
MOS process, Fab I leasing

1987

N.V. Philips (Netherlands)
CMOS process

MERGERS AND ACQUISITIONS

Information is not available.

KEY OFFICERS

Klaus Wiemer
President

Morris Chang
Chairman

F. C. Tseng
Vice president, Operations

E. Heuving
Vice president, Finance

John Luke
Vice president, Marketing

E. Mau
Vice president, Corporate Services

PRINCIPAL INVESTORS

Taiwan's Executive Yuan Development Fund—48.3 percent
N.V. Philips—27.5 percent

FOUNDERS

Yuan Development Fund
N.V. Philips

Tandon Corporation

301 Science Drive
Moorpark, California 93021
Telephone: (805) 523-0340
Fax: (805) 529-8408
Dun's Number: 03-086-1942

Date Founded: 1975

CORPORATE STRATEGIC DIRECTION

Tandon Corporation, founded by Sirjang Lal Tandon, began operations in 1975 in the United States as a magnetic recording head and disk drive manufacturer. With the introduction of the IBM PC, Tandon's business boomed, and by 1983, the Company was a leading force in the microcomputer disk drive market, primarily because of its OEM distribution strategy.

Under the pressure of increasing competition in the disk drive market, Tandon's most successful area of operation, Tandon diversified its activities and started manufacturing PCs to be sold through the original equipment manufacturer (OEM) channel. The first major OEM agreement was with Tandy. This agreement was followed by a contract with Victor Technologies and several smaller contracts with European distributors. In 1984, Tandon began OEM delivery of PC and XT compatibles. In 1985, Tandon entered the European PC-compatible marketplace with its first PCs under its own brand name, the Tandon PCX and PCA lines of computers. Initially, Tandon focused on the European PC market and did not enter the US market with its own brand of machines until mid-1986.

Early 1987 marked Tandon's introduction of the first rugged, removable Winchester disk drives for the personal computer industry, the Personal Data Pac and the Tandon Ad-PAC. During the same year, Tandon ceased manufacturing flexible disk drives due to intense price competition from the Japanese.

In 1988, Tandon sold its Winchester disk drive division to Western Digital Corporation to focus on systems and subsystems.

Tandon's mission is to combine its technical and marketing strengths to produce an extremely high-quality line of personal computers to further its growth in the IBM-compatible personal computer industry.

Tandon reported revenue for 1989 of $377.9 million,* a 22 percent increase over the previous year's revenue of $309.3 million. The majority of Tandon's 1989 revenue came from European sales. In 1990, sales in Europe are expected to contribute an even higher percentage of total sales than in 1989 as a result of the sale of the Company's Hong Kong subsidiary and the expected discontinuation of license and royalty fees that are considered US source income. The Company reported a net loss of $4.3 million in 1989 compared with a loss of almost $20 million during 1988.

R&D expenses decreased to $10.9 million, or 2.9 percent of sales, in 1989 from $13.7 million in 1988. The Company employs approximately 950 people worldwide.

Sales of systems and subsystems represented 95 percent of sales for 1989. Royalty income and other revenue represented the remaining 5 percent of sales. Tandon sells its computers and subsystems through retail channels for resale to end-user channels. Sales are conducted through Tandon Computer Corporation (TTC), a wholly owned subsidiary. TTC has sales offices in the United Kingdom, Germany, Spain, Switzerland, the Netherlands, France, Italy, Austria, and Singapore. North American sales are headquartered in Moorpark, California.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this backgrounder.

*All dollar amounts are in US dollars.

BUSINESS SEGMENT STRATEGIC DIRECTION

Computer Storage

Subsequent to its origin in Winchester disk drives, Tandon has introduced products that feature advanced drive technology. Tandon offers the Personal Data Pac, a removable Winchester disk drive that gives users the power to transport their entire computing environment for use wherever there is a Tandon 386 or PAC 286 Plus computer, or an IBM PC XT- or PC AT-compatible equipped with Tandon's Ad-PAC subsystem.

Personal Computers

The Tandon 486 is the Company's most powerful personal computer family and was among the first Intel i486-based systems in Europe. The system is designed around the Extended Industry Standard Architecture (EISA) and incorporates proprietary technology. This technology includes the Tandon-developed MultiCACHE and Power Poster RAM cache. The Tandon 486 is equipped with a 25-MHz or 33-MHz speed processor that will also run at 8 MHz for maximum software and hardware compatibility. Four megabytes of RAM are standard and may be expanded to 64 megabytes.

The Tandon 386/33 is a faster version of the Tandon 386 system and was among the first 386-based personal computers operating at a speed of 33 MHz to be announced in Europe.

The Tandon LT/286 and LT/386 marked the Company's entry into the laptop market in early 1990. The Company expanded its product line with the PCA/12sl based on the 80286 microprocessor. Additionally, the PAC 386sx, based on the 80386SX microprocessor, features two receptacles for Tandon's patented Personal Data Pac portable hard disk drives.

Dataquest estimates that Tandon holds 3.1 percent of the European PC market share and less than 1 percent of the US PC market share based on 1989 volume shipments.

Further Information

For further information about the Company's business segments, please contact the appropriate Dataquest industry service.

Table 1
Corporate Highlights (Millions of US Dollars)*

	1987	1988	1989
Three-Year Revenue	$289.1	$309.3	$377.9
Percent Change	-	6.99	22.18
Capital Expenditure	$12.3	$7.8	$4.2
Percent of Revenue	4.25	2.52	1.11
R&D Expenditure	$10.3	$13.7	$10.9
Percent of Revenue	3.56	4.43	2.88
Number of Employees	3,482	1,484	954
Revenue ($K)/Employee	$83.03	$208.42	$396.12
Net Income	$23.5	($19.9)	($4.3)
Percent Change	-	(184.68)	(78.39)

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	$92.7	$97.7	$83.8	$103.7
Quarterly Profit	NA	NA	NA	NA

*Restated financial information is not available for 1985 and 1986.
NA = Not available

Source: Tandon Corporation
Annual Reports and Forms 10-K
Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1987	1988	1989
North America	22.00	12.00	5.00
International	78.00	88.00	95.00
Europe	77.00	87.00	94.00
Asia/Pacific	1.00	1.00	1.00

Source: Tandon Corporation
Annual Reports and Forms 10-K
Dataquest (1990)

Table 3
Revenue by Distribution Channel (Percent)

Channel	1988	1989
Direct Sales	0	0
Indirect Sales	100.00	100.00
VARs	50.00	50.00
Dealers	50.00	50.00

Source: Tandon Corporation
Annual Reports
Dataquest (1990)

1989 SALES OFFICE LOCATIONS

North America—1
Europe—10
Asia/Pacific—2

MANUFACTURING LOCATIONS

North America

Moorpark, California
Computers and subsystems

Europe

Vienna, Austria
Systems

SUBSIDIARIES

North America

Tandon Computer Corporation

Europe

Tandon Computer AG (Switzerland)
Tandon Computer B.V. (Netherlands)
Tandon Computer B.V. (Spain)
Tandon Computer GesmbH (Austria)
Tandon Computer GmbH (Germany)
Tandon Computer S.A. (France)
Tandon Computer S.p.A. (Italy)
Tandon Plc (England)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

Information is not available.

MERGERS, ACQUISITIONS, AND DIVESTITURES

1988

Western Digital
Tandon sold its line of 3.5- and 5.25-inch Winchester disk drives, its manufacturing facilities in Singapore, its plated media manufacturing operations in Santa Clara, California, and its disk drive R&D facility in San Jose, California, to Western Digital.

KEY OFFICERS

Sirjang Lal Tandon
Chairman, president, and chief executive officer

Ranjit Sitlani
Executive vice president and corporate secretary

Denis J. Trafecanty
Vice president and chief financial officer

Michel Fromont
Vice president

Robert G. Taylor
Vice president

James C. Goetz
Vice president

Loren M. Eltiste
Chief accounting officer

PRINCIPAL INVESTORS

Information is not available.

FOUNDERS

Sirjang Lal Tandon

Table 4
Comprehensive Financial Statement[1]
Fiscal Year Ending December
(Millions of US Dollars, except Per Share Data)

Balance Sheet	1987[2]	1988	1989
Total Current Assets	$167.8	$175.0	$159.9
Cash	13.4	22.0	22.4
Receivables	51.1	21.0	32.8
Inventory	98.5	127.9	101.3
Other Current Assets	4.8	4.1	3.4
Net Property, Plants	$10.0	$13.0	$8.5
Other Assets	$5.2	$4.0	$3.1
Total Assets	$183.0	$192.0	$171.5
Total Current Liabilities	$67.7	$93.0	$76.9
Long-Term Debt	0	$3.4	$3.0
Other Liabilities	$21.8	$18.7	$18.2
Total Liabilities	$89.5	$115.1	$98.1
Total Shareholders' Equity	$93.5	$76.9	$73.4
Preferred Stock	0	0	0
Common Stock	191.9	0.6	0.6
Other Equity	0	197.6	197.6
Retained Earnings	(98.4)	(121.3)	(124.8)
Total Liabilities and Shareholders' Equity	$183.0	$192.0	$171.5
Income Statement	**1987[2]**	**1988**	**1989**
Revenue	$289.1	$309.3	$377.9
US Revenue	$63.6	$37.1	$18.9
Non-US Revenue	$225.5	$272.2	$359.0
Cost of Sales	$216.8	$243.5	$298.6
R&D Expense	$10.3	$13.7	$10.9
SG&A Expense	$39.3	$68.1	$66.9
Capital Expense	$12.3	$7.8	$4.2
Pretax Income	$19.8	($17.5)	($3.7)
Pretax Margin (%)	6.85	(5.66)	(0.98)
Effective Tax Rate (%)	40.00	NA	NA
Net Income	$23.5	($19.9)	($4.3)
Shares Outstanding, Millions	59.2	62.3	62.3
Per Share Data			
Earnings	$0.42	($0.32)	(0.07)
Dividend	0	0	0
Book Value	$1.58	$1.23	$1.18

Table 4 (Continued)
Comprehensive Financial Statement[1]
Fiscal Year Ending December
(Millions of US Dollars, except Per Share Data)

Key Financial Ratios	1987[2]	1988	1989
Liquidity			
Current (Times)	2.48	1.88	2.08
Quick (Times)	1.02	0.51	0.76
Fixed Assets/Equity (%)	10.70	16.91	11.58
Current Liabilities/Equity (%)	72.41	120.94	104.77
Total Liabilities/Equity (%)	95.72	149.67	133.65
Profitability (%)			
Return on Assets	-	(10.61)	(2.37)
Return on Equity	-	(23.36)	(5.72)
Profit Margin	8.13	(6.43)	(1.14)
Other Key Ratios			
R&D Spending % of Revenue	3.56	4.43	2.88
Capital Spending % of Revenue	4.25	2.52	1.11
Employees	3,482	1,484	954
Revenue ($K)/Employee	$83.03	$208.42	$396.12
Capital Spending % of Assets	6.72	4.06	2.45

[1]Restated financial information is not available for 1985 and 1986.
[2]Tandon changed its fiscal year-end from September to December in 1987.

Source: Tandon Corporation
Annual Reports and Forms 10-K
Dataquest (1990)

Tandem Computers Inc.

19333 Vallco Parkway
Cupertino, California 95014
Telephone: (408) 725-6000
Fax: (408) 865-4545
Dun's Number: 06-910-1152

Date Founded: 1974

CORPORATE STRATEGIC DIRECTION

Tandem Computers Inc., founded in 1974, is a leading supplier of on-line transaction processing (OLTP) computer systems and enterprise-wide networks. Tandem designs, develops, manufactures, markets, and supports computer systems and networks for the OLTP environment. Tandem's target customers are primarily Fortune 500 companies and other large, diversified concerns that are using on-line applications for critical business functions. Tandem's products are used worldwide in a number of governmental agencies and in more than 25 industries. Tandem systems run ATM and point-of-sale networks, stock exchanges, factories, and other enterprises where high-volume business transactions must be processed and recorded in seconds.

Tandem's long-term strategy is to bring to reality "the evolution of on-line transaction processing to the on-line enterprise." The proliferation of different systems, including local area networks (LANs) and PCs, in large companies represents a unique challenge to vendors. The on-line enterprise will bring these different systems and data on-line. Systems and databases, enterprise networks, and application solutions will all be essential in the on-line enterprise. To pursue this strategy, Tandem completed three acquisitions during fiscal year 1988. Most significant was its merger with Ungermann-Bass, Inc., a leader in open, enterprise-wide networks and LANs for large corporations. Ungermann-Bass' experience, coupled with Tandem's fundamental knowledge of OLTP, will be essential in accomplishing Tandem's goal of taking entire enterprises on-line.

In June 1988, Tandem reorganized into five operating groups: Systems Development and Manufacturing; Sales and Marketing; Ungermann-Bass Group; Tandem Companies Group, which manages Atalla and Tandem Telecommunications Systems, Inc. (TTSI), equity investments, and the Micro Products Division; and Customer Service and Support.

At the end of fiscal year 1988, the number of Tandem employees worldwide reached 8,624, compared with 7,007 at the close of fiscal 1987. More than two-thirds of this increase was due to the acquisition of Ungermann-Bass and TTSI.

Tandem's revenue for fiscal 1988 totaled $1.31 billion,* an increase of 26 percent from 1987. Net income decreased from $105.6 million in 1987 to $94.5 million in 1988 as a result of investment mergers, reduced domestic demand, and the settlement of a class-action lawsuit.

Non-U.S. revenue is becoming increasingly important for Tandem, representing 50 percent of total sales in fiscal 1988, compared with 43 percent in 1987 and 40 percent in 1986. Sales in Europe accounted for 35 percent of total sales during fiscal 1988, an increase from 30 percent in 1987 and 27 percent in 1986.

Tandem's systems have been installed in a variety of industries, including banking, other financial services, manufacturing, telecommunications, wholesale and retail distribution, transportation, medical services, printing and publishing, computer services, utilities, and government agencies. Telecommunications is reported to be one of the Company's fastest-growing markets today.

*All dollar amounts are in U.S. dollars.

Corporate-sponsored research and development expenditures totaled $169 million in fiscal 1988. These expenditures were approximately 13 percent of revenue. R&D activities focus on implementing on-line systems at single sites and in geographically distributed information processing networks.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Business Computers

Tandem was founded on a belief that a new system architecture, both hardware and software, was needed for commercial OLTP applications. Tandem's NonStop computer systems are designed to provide continuous operation, distributed processing, complete data integrity, linear expandability, and modular growth. The approach combines multiple parallel processors and nonshared memory. Tandem's unique fault-tolerant architecture is a competitive advantage in the OLTP market. Tandem produces a family of computer systems consisting of the NonStop VLX, NonStop CLX, NonStop TXP, NonStop II, Nonstop EXT10, and NonStop EXT25 systems. All systems are designed to be fault-tolerant and are compatible within a single information processing network. They can be connected in networks with each other and with equipment from other vendors.

In October 1989, Tandem announced Cyclone, a NonStop on-line mainframe system that provides IBM 3090 mainframe class performance at less than half the cost, offering enterprises the on-line use of massive volumes of information to manage business needs. Cyclone is based on advanced chip technology, and delivers high performance in an air-cooled environment. Cyclone systems can be expanded from 4 to 16 processors. These processors function simultaneously, forming the basis for Tandem's parallel systems architecture.

Tandem's flagship, the NonStop VLX, is designed for the computer room and is capable of handling hundreds of transactions per second when expanded in a linear fashion. Tandem added six new models to the VLX mainframe line in 1988: the VLX 500 series consisting of four models, and the VLX 302E and VLX 304E.

The NonStop CLX system, introduced in 1987, allows Tandem customers to extend OLTP networks to users at the source of business transactions in departments and branch offices. In May 1989, Tandem expanded its CLX minicomputer line by adding four new 700 series systems. The 700 series features a new processor architecture that provides nearly twice the performance of the older 600 series.

NonStop EXT10 and EXT25 systems are departmental computer systems packaged to operate in a copy room rather than in a computer room. These systems are designed to function as lower-priced extensions of a Tandem network or as standalone OLTP systems.

The LXN multiuser microcomputer was introduced in 1987. It expanded the Tandem product line to include the UNIX operating system. Tandem is working to apply MIPS RISC chips to future UNIX systems from Tandem. The new line, code-named S2, will be unveiled during 1990.

Tandem offers a family of PSX workstations and terminal products for its transaction processing systems. The PSX workstations are a family of MS-DOS workstations designed around Intel 80286 and 80386 microprocessors. They function either as standalone units or as system terminals for Tandem NonStop and LXN systems. The PSX workstations will support the OS/2 operating system.

Tandem discontinued production of the 653X terminals in March 1989 but will continue to service the products for seven years. Tandem still offers the 652X terminals.

Tandem ranked eighth among business computer vendors in 1988 revenue. Dataquest estimates that Tandem's factory revenue for business computers totaled $748 million.

Computer Storage

Tandem offers several disk storage products, including the V8, XL8, V80, and XL80 disk storage facilities and the 5200 optical storage facility.

Software

Tandem's GUARDIAN 90 message-based operating system software for NonStop systems is designed to keep applications running through any single failure.

To help control access to sensitive information in computer networks, Tandem offers a number of secure transaction systems primarily for the financial and retail markets. Tandem also offers the SAFEGUARD software designed to make the GUARDIAN 90 system secure.

Tandem is one of two systems vendors that have invested in SQL database software developments. Tandem offers NonStop SQL software, which follows the widely accepted SQL standard supported by the American National Standards Institute (ANSI) and the International Standards Organization (ISO).

Geographically dispersed NonStop systems can be interconnected in a distributed data processing network using EXPAND software. Tandem's Distributed Systems Management (DSM) software enables efficient management of large dispersed networks of NonStop systems. In 1988, Tandem announced SURVEYOR performance management software for NonStop systems to manage system performance data and assist in capacity planning. Tandem supplies a number of products that allow users of Tandem networks to provide company-wide information sharing between users of a variety of incompatible PCs, workstations, terminals, facsimile devices, and LANs. Tandem also offers a range of software tools for the development of on-line application programs.

Further Information

For further information about the Company's business segments, please contact the appropriate industry service.

Table 1
Five-Year Corporte Highlights (Millions of U.S. Dollars)

	1984	1985	1986	1987	1988
Five-Year Revenue	$533	$624	$768	$1,035	$1,314
Percent Change	-	17.07	23.08	34.77	26.96
Capital Expenditure	$72	$68	$65	$143	$185
Percent of Revenue	13.51	10.90	8.46	13.82	14.08
R&D Expenditure	$53	$72	$87	$109	$169
Percent of Revenue	9.94	11.54	11.33	10.53	12.86
Number of Employees	5,223	5,494	5,719	7,007	8,624
Revenue ($K)/Employee	$101.97	$113.59	$134.25	$147.78	$152.46
Net Income	$43	$34	$64	$106	$95
Percent Change	-	(20.93)	88.24	65.63	(10.38)

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	$363.39	$420.69	$456.16	N/A
Quarterly Profit	$16.86	$30.76	$39.40	N/A

N/A = Not Available

Source: Tandem Computers Annual Reports and Forms 10-K
Dataquest
January 1990

Table 2
Revenue by Geographic Region (Percent)

Region	1984	1985	1986	1987	1988
North America	68.00	67.00	60.00	57.00	50.00
International	32.00	33.00	40.00	43.00	50.00
Europe	21.00	22.00	27.00	30.00	35.00
All Others	11.00	11.00	13.00	13.00	15.00

Source: Tandem Computers Annual Reports and Forms 10-K
Dataquest
January 1990

Table 3
Revenue by Distribution Channel (Percent)

Channel	1988
Direct Sales	72.26
Indirect Sales	27.74
VARs	27.74

Source: Dataquest
January 1990

1988 SALES OFFICE LOCATIONS

North America—77
Japan—3
Europe—27
Asia/Pacific—9
ROW—1

MANUFACTURING LOCATIONS

North America

Austin, Texas
System assembly and testing
Cupertino, California
System assembly and testing
Milpitas, California
Data commmunications systems
Sunnyvale, California
System assembly and testing
Watsonville, California
Boards

Europe

Neufaurn, Germany
System assembly and testing

ROW

Guadalajara, Mexico
System assembly and testing

SUBSIDIARIES

North America

Tandem Computers Canada Limited (Canada)
Tandem Telecommunications Systems, Inc. (United States)
Ungermann-Bass, Inc. (United States)
Ungermann-Bass, Ltd. (Canada)

Japan

Tandem Computers Japan, Limited
Ungermann-Bass K.K.

Europe

LANTEC/Ungermann-Bass A.S. (Norway)
Tandem Computers AG (Switzerland)
Tandem Computers A.S./N.V. (Belgium)
Tandem Computers A/S (Netherlands)
Tandem Computers B.V. (Amsterdam)
Tandem Computers Europe, Inc. (Netherlands)
Tandem Computers Ges.m.g.H. (Austria)
Tandem Computers GmbH (West Germany)
Tandem Computers Iberica, S.A. (Spain)
Tandem Computers Italia S.p.A. (Italy)
Tandem Computers Limited (United Kingdom)
Tandem Computers (Norway) A/S (Norway)
Tandem Computers S.A. (France)
Tandem NonStop Pty. Ltd. (Australia)
Ungermann-Bass A.B. (Sweden)
Ungermann-Bass Deutschland GmbH (West Germany)
Ungermann-Bass (Europe) S.A.
Ungermann-Bass (France) S.A. (France)
Ungermann-Bass Limited (England)

Asia/Pacific

Tandem Computers (Hong Kong) Limited (Hong Kong)
Tandem Computers International Inc. (Singapore)
Tandem NonStop Pty. Ltd. (New Zealand)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

August 1989

Westinghouse Electric Corp.
Tandem and Westinghouse entered an integration agreement to design and market a variety of computer systems integration products and services.

July 1989

Telinfo N.V.
Tandem and Telinfo N.V. have formed Twintel N.V., a joint venture in Belgium. The new firm will provide project management and consulting services for on-line application projects in that country.

1988

AT&T
Tandem established an agreement with AT&T to develop interfaces between Tandem systems and AT&T's 5ESS central office switch for Integrated Services Digital Network (ISDN) applications.

Apple Computer
Tandem established a VAR agreement with Apple.

MERGERS AND ACQUISITIONS

May 1988

Integrated Technology Inc. (ITI)
Tandem paid $5.9 million in cash, issued a five-year note for $5.1 million, and assumed ITI's obligations in order to acquire ITI's operations. ITI develops software for intelligent telephone networks. ITI is now Tandem Telecommunications Systems, Inc. (TTSI).

March 18, 1988

Ungermann-Bass Inc.
Tandem paid approximately $271.4 million to acquire UB. UB designs, manufactures, and services open enterprise-wide data communication systems.

November 24, 1987

Atalla Corporation
Tandem exchanged 689,363 shares of stock for all of Atalla's outstanding shares. Atalla provides secure system solutions in the areas of network interchange, electronic payment, and computer security.

KEY OFFICERS

James G. Treybig
President, chief executive officer, founder

Robert C. Marshall
Senior vice president, chief operating officer

Dr. John M. Atalla
Vice president, Tandem Computers; chairman, Atalla Corporation

Ralph Ungermann
Senior vice president, Tandem Computers; president and chief executive officer, Ungermann-Bass, Inc.

David J. Rynne
Senior vice president, chief financial officer

Lawrence A. Laurich
Vice president, Systems Development and Manufacturing

Gerald D. Held
Vice president, Strategy and Corporate Development

Robert G. Gargus
Corporate controller

PRINCIPAL INVESTORS

Sanford C. Bernstein & Co., Inc.—7.8 percent
Capital Group Inc.—7.7 percent
Equitable Life Assurance Society of the United States—5.8 percent

FOUNDERS

James Treybig
Michael Green
John Loustaunou
James Katzman

Table 4
Comprehensive Financial Statement
Fiscal Year Ending September 30
(Millions of U.S. Dollars, except Per Share Data)

Balance Sheet	1984	1985	1986	1987	1988
Total Current Assets	$352	$385	$520	$689	$644
Cash	107	129	240	318	125
Receivables	146	163	198	256	356
Marketable Securities	0	0	0	0	0
Inventory	92	79	64	92	129
Other Current Assets	7	14	18	23	34
Net Property, Plants	$142	$161	$175	$253	$418
Other Assets	$8	$6	$10	$27	$256
Total Assets	$502	$552	$705	$967	$1,318
Total Current Liabilities	$89	$87	$135	$192	$365
Long-Term Debt	$5	$4	$6	$9	$58
Other Liabilities	$32	$41	$30	$46	$38
Total Liabilities	$126	$132	$171	$247	$461
Total Shareholders' Equity	$375	$420	$534	$721	$857
Converted Preferred Stock	0	0	0	0	0
Common Stock	1	1	1	2	2
Other Equity	228	239	289	369	409
Retained Earnings	146	180	244	350	446
Total Liabilities and Shareholders' Equity	$501	$552	$705	$967	$1,318

Income Statement	1984	1985	1986	1987	1988
Revenue	$533	$624	$768	$1,035	$1,314
U.S. Revenue	365	418	464	588	657
Non-U.S. Revenue	168	206	304	448	657
Cost of Sales	$218	$240	$247	$358	$488
R&D Expense	$53	$72	$87	$109	$169
Capital Expense	$72	$68	$65	$143	$185
Pretax Income	$56	$56	$114	$185	$145
Pretax Margin (%)	10.51	8.97	14.84	17.87	11.04
Effective Tax Rate (%)	23.80	39.00	44.30	42.90	35.00
Net Income	$43	$34	$64	$106	$95
Shares Outstanding, Millions	41,399	41,765	44,201	97,711	98,700
Per Share Data					
Earnings	$1.04	$0.82	$0.72	$1.08	$0.96
Dividends	0	0	0	0	0
Book Value	$9.06	$10.70	$6.09	$7.38	$8.68

Table 4 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending September 30
(Millions of U.S. Dollars, except Per Share Data)

Key Financial Ratios	1984	1985	1986	1987	1988
Liquidity					
Current (Times)	3.96	4.43	3.85	3.59	1.76
Quick (Times)	2.92	3.52	3.38	3.11	1.41
Fixed Assets/Equity (%)	37.87	38.33	32.77	35.09	48.77
Current Liabilities/Equity (%)	23.73	20.71	25.28	26.63	42.59
Total Liabilities/Equity (%)	33.60	31.43	32.02	34.26	53.79
Profitability (%)					
Return on Assets	-	6.45	10.18	12.68	8.32
Return on Equity	-	8.55	13.42	16.89	12.04
Profit Margin	8.07	5.45	8.33	10.24	7.23
Other Key Ratios					
R&D Spending % of Revenue	9.94	11.54	11.33	10.53	12.86
Capital Spending % of Revenue	13.51	10.90	8.46	13.82	14.08
Employees	5,223	5,494	5,719	7,007	8,624
Revenue ($K)/Employee	$101.97	$113.59	$134.25	$147.78	$152.46
Capital Spending % of Assets	14.34	12.32	9.22	14.79	14.04

Source: Tandem Computers Annual Reports and Forms 10-K
Dataquest
January 1990

Tandem Computers

19333 Vallco Parkway
Cupertino, California 95014-2599
Telephone: (408) 725-6000
Fax: (408) 285-6938
Dun's Number: 14-464-6452

Date Founded: 1974

CORPORATE STRATEGIC DIRECTION

Tandem Computers, founded in 1974, designs, manufactures, and markets fault-tolerant computer systems for on-line transaction processing (OLTP). The Company also manufactures and markets support products for its computer systems, including system software, storage products, network products, workstations and terminals, and communications products. Tandem's target customers are primarily Fortune 500 companies and other large, diversified concerns.

Although fault-tolerant computer systems have been the mainstay of Tandem's business, recent mergers and acquisitions have broadened the scope of its business activities. Most significant was the merger with Ungermann-Bass, a leader in open, enterprise-wide networks. Two other acquisitions strengthened Tandem's position in specialized areas: Atalla Corporation provides added expertise in secure transaction systems, and Integrated Technology, Inc.—renamed Tandem Telecommunications Systems, Inc. (TTSI)—develops software for intelligent telephone networks.

In order to manage the growing diversity of the Company's product offerings, Tandem has segmented its business into five operating groups:

- Tandem Systems Group, which develops and manufactures computer systems and networks
- Tandem Sales and Marketing Group, which markets products
- Ungermann-Bass, which develops and manufactures enterprise-wide networks
- Tandem Companies Group, which manages Atalla, TTSI, equity investments, and the Micro Products Division
- Tandem Customer Service Group, which is responsible for customer support and service

Tandem's long-term objective is to bring to reality "the evolution of on-line transaction processing to the on-line enterprise." In other words, Tandem aims to supply products that will be used as the database of record by enterprises. To fulfill this objective, Tandem's strategy is to diversify its OLTP product offerings for different industries, such as retail and banking, and to consolidate them into a fully distributed, database management computer system.

In fiscal 1989, Tandem's consolidated revenue increased 24 percent to $1.63 billion* from $1.31 billion in fiscal 1988. The increase in total revenue is attributable to the additional revenue being provided by Ungermann-Bass and from demand for the Company's products and services.

International revenue in fiscal 1989, as in fiscal 1988, represented 50 percent of the Company's total revenue. Europe contributed 32 percent in fiscal 1989 compared with 34 percent in fiscal 1988. Tandem believes that there will be considerable potential for the graphics, telecommunications, and large database products in the Japanese market. Consequently, the Company plans to increase its investment in its Japanese business.

Tandem's net income increased 25 percent to $118 million in fiscal 1989 from $94 million in fiscal 1988. The increase can be partially attributed to a deflated 1988 net income figure that resulted from extraordinary expenses related to the 1988 Ungermann-Bass and Atalla acquisitions, which totaled $241 million. The increase can also be attributed to an increase in demand for the Company's products.

R&D expenditure increased 20 percent to $204 million in fiscal 1989 from $169 million in fiscal 1988.

*All dollar amounts are in US dollars.

As a percentage of revenue, R&D expenditure has remained fairly stable for the past five years, ranging from 10 to 13 percent; fiscal 1989 R&D expenditure was 12.5 percent of sales. R&D efforts were focused toward meeting the needs of customers who are implementing on-line systems for single sites or geographically distributed information processing networks.

Subsequent to year-end, Tandem announced that it would merge with Array Technology Corporation (ATC) of Boulder, Colorado. ATC is a computer storage company developing technology for disk subsystems based on redundant arrays of inexpensive disks (RAID). ATC will operate as a wholly owned subsidiary of Tandem.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Computer Systems

According to Dataquest estimates, in 1989, Tandem acquired a 1.31 percent share of the $67.1 billion worldwide business and technical computer market (excluding personal computers). Revenue for computer systems amounted to $880.3 million, or approximately 54 percent of the Company's total consolidated revenue.

Tandem's family of fault-tolerant computer systems consists of the NonStop Cyclone, NonStop VLX, NonStop CLX, and the Integrity S2. All NonStop systems feature the Company's proprietary hardware and software architecture which, in combination with specialized software, offers a single-system view across a distributed database. The systems are fully application-compatible and can be integrated into area networks, either local or worldwide, using specialized software. A worldwide network may comprise up to 255 NonStop systems, providing access to 4,080 processors.

In 1989, Tandem introduced the NonStop Cyclone on-line mainframe. The Cyclone features 2 to 16 high-performance processors and handles mixed workloads of OLTP, query, and batch. Cyclone also features up to 2 gigabytes of memory in a single system and supports four input/output channels per processor.

In early 1990, Tandem introduced the Integrity S2 midrange computer system, which is based on the MIPS Computer Systems R2000 RISC technology. The Integrity S2 is targeted toward the government, telecommunications, and manufacturing markets.

Tandem markets its computer systems primarily through its own marketing, sales, training, field service, and software support groups. Tandem has approximately 130 domestic and international sales locations.

Enterprise-Wide Networks

Through Ungermann-Bass, Tandem provides a family of enterprise-wide network products, ranging from backbone wiring to desktop workstation software. Ungermann-Bass' main product, Access/One, is a network management and structures wiring network delivery system that integrates LAN and WAN applications into a single platform. Other products include the following:

- Universal Workstation Family, a combination of hardware and software that provides DOS, OS/2, and Macintosh users with access to the resources of mainframes, host systems, peripherals, and other workstations
- Net Director, a group of network management tools that provides comprehensive management functionality, including configuration, fault performance, and security and accounting management of complete networks
- Internetworking Products, a family of standards-based products that interconnect local and remote sites over many types of media, using multiple networking protocols

System Software

Tandem develops a line of software that is designed to facilitate and enhance the functions of its computer systems. The Company's software product offerings include operating system, security, networking and communication, and relational database management software.

Operating System

The GUARDIAN 90, a message-based operating system software package, is designed to keep applications running on the NonStop systems through any single failure. In early 1990, Tandem introduced NonStop-UX, which runs on Tandem's Integrity S2 midrange computer system.

Security

Through Tandem's subsidiary, Atalla Corporation, the Company offers a number of secure transaction systems primarily for the financial and retail markets. These products include network security systems, secure banking systems, and electronic payment solutions. Two of Tandem's main products, SAFEGUARD software and the SAFE-T-NET data encryption subsystem, are designed to integrate security features with Tandem's GUARDIAN 90 system software.

Networking and Communication

Tandem's EXPAND software is designed to geographically interconnect dispersed NonStop systems in a distributed data processing network. EXPAND software extends the GUARDIAN operating system over a network, providing for automatic routing and rerouting of communications.

Tandem also offers Distributed Systems Management (DSM) software that is designed to allow users to efficiently manage large dispersed networks of the Company's NonStop systems.

Tandem offers a number of other products that allow users of Tandem networks to provide company-wide information sharing between users of a variety of incompatible PCs, workstations, terminals, facsimile devices, and LANs as well as a range of software tools for the development of on-line application programs.

Relational Database Management

Tandem's NonStop SQL software for the NonStop systems is a high-performance distributed relational database management system incorporating the ANSI-standard Structured Query Language (SQL). The SQL software provides the performance needed for high-volume OLTP, as well as transparent data distribution.

Other relational database management software products include products that are designed to maintain the consistency of a distributed database as well as protect the database from damage in situations where an entire computer facility may be damaged or inaccessible.

To encourage outside companies to develop software that enhances and facilitates the capabilities of Tandem's computer systems, the Company has established an alliance program, called Tandem Alliance. Through this program, Tandem offers value-added resellers (VARs), software houses, and other related businesses a variety of licensing, marketing, technical, and sales support programs.

Storage Products

Tandem offers several disk storage products, including one optical and four disk storage facilities. The optical storage facility is an 84-gigabyte, write-once, read-many times (WORM) optical disk library subsystem designed for rapid retrieval of archival data. The four disk storage facilities are designed specifically for high-volume OLTP and employ a packaging design that includes up to eight high-speed Winchester drives in a single cabinet.

Network Products

Through Tandem's subsidiary, TTSI, the Company offers three Intelligent Network products: the TSCP-1000, the TSMS-1000, and the Service Creation Environment. The TSCP-1000 is a service central point that provides on-line database architecture for high-speed query support and call-processing logic. The TSMS-1000 is a service management system that features communication facilities that can interact with the products of multiple vendors. The Service Creation Environment is a set of software development tools that facilitates application design and implementation.

Workstations and Terminals

Tandem offers a family of workstations and terminal products for its transaction processing systems: PSX workstations, 653x terminals, and 652x terminals. The PSX family of workstations support the MS-DOS and OS/2 operating systems. The workstations function either as standalone units or as system terminals for Tandem's NonStop. Tandem discontinued

production of the 653x terminals in March 1989 but will continue to service the products for seven years. Tandem still offers the 652x terminals.

In 1988, Tandem announced a four-year, VAR agreement with Apple Computer, Inc., under which Tandem will sell, support, and service Macintosh SE, II, and IIx computers as part of Tandem's OLTP systems.

Communications Products

Tandem offers the 6100 communications product family, which consists of intelligent data communications processors to support data communications applications for the Company's NonStop systems. Tandem also supplies tape drives, printers, and other peripheral equipment.

Table 1
Five-Year Corporate Highlights (Thousands of US Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	$624,138	$778,014	$1,047,532	$1,314,721	$1,632,522
Percent Change	-	24.65	34.64	25.51	24.17
Capital Expenditure	$53,247	$62,706	$145,302	$419,658	$163,999
Percent of Revenue	8.53	8.06	13.87	31.92	10.05
R&D Expenditure	$71,577	$88,202	$109,504	$169,356	$203,520
Percent of Revenue	11.47	11.34	10.45	12.88	12.47
Number of Employees	5,494	5,719	7,007	8,624	9,548
Revenue ($K)/Employee	$113.60	$136.04	$149.50	$152.45	$170.98
Net Income	$34,374	$64,258	$105,229	$94,485	$118,316
Percent Change	-	86.94	63.76	(10.21)	25.22

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	$392,285	$363,388	$420,687	$456,162
Quarterly Profit	$31,295	$16,858	$30,759	$39,404

Source: Tandem Computers
Annual Reports and Forms 10-K
Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
North America	67.00	63.00	57.00	50.00	50.00
International	33.00	39.00	43.00	50.00	50.00
Europe	22.00	27.00	29.00	34.00	32.00
All Others	11.00	12.00	14.00	16.00	18.00

Source: Tandem Computers
Annual Reports and Forms 10-K
Dataquest (1990)

Table 3
Revenue by Distribution Channel (Percent)

Channel	1988	1989
Direct Sales	72.26	NA
Indirect Sales	27.74	NA
VARs	27.74	NA

NA=Not available

Source: Dataquest (1990)

1989 SALES OFFICE LOCATIONS

North America—86
Europe—28
Asia/Pacific—15
ROW—0

MANUFACTURING LOCATIONS

North America

Austin, Texas
Cupertino, California
Ronkonkoma, New York
Santa Clara, California
Watsonville, California

Europe

Neufahrn, Germany

ROW

Guadalajara, Mexico

SUBSIDIARIES

Information is not available.

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

Nissho Iwai Corp.
Tandem entered a marketing agreement with Nissho whereby Nissho will market Tandem's NonStop computer systems in Japan.

Andersen Consulting
Tandem and Andersen entered a systems integration alliance that will be used as a framework on systems integration bids.

Confederation des Caisses Populaires et d'Economie Desjardins du Quebec
Tandem has agreed to allow Desjardins to use its financial computer technology to build a credit-card checking and point-of-sale (POS) debit-card payment network.

Sistemas y Redes Limitada
Tandem and Sistemas jointly formed Tandem Chile S.A. to strengthen Tandem's presence in the Chilean market.

AT&T
Tandem and AT&T jointly developed the fault-tolerant StarServer FT. Tandem agreed to license the rights to market the UNIX System V fault-tolerant products to AT&T. Tandem and AT&T agreed to jointly develop UNIX hardware and software and Open Systems Interconnection (OSI) protocols.

Nixdorf Computer Philippines
Tandem signed an OEM and marketing agreement with Nixdorf regarding the sale of Tandem's NonStop-UX computer system in the Philippines.

US Air Force Military Airlift Command
Tandem and US Air Force Military Airlift Command signed a three-year agreement for NonStop computer systems that will keep track of cargo and passengers on planes worldwide.

EBB AG (a COS Group company)
Tandem and EBB AG jointly formed Twincos AG, which will provide Tandem customers with project management and contract consulting services for large on-line application projects.

Engineering-Ingegneria Informatica S.p.A.
The two companies jointly formed Twineng S.p.A., which will provide Tandem customers with project management and contract consulting services for large on-line application projects.

1989

MIPS Computer Systems
Tandem will act as MIPS' sole field-service provider for all MIPS computer systems.

Nixdorf Computer
Tandem signed an OEM agreement with Nixdorf whereby Nixdorf will resell Tandem's NonStop-UX computer system. Tandem and Nixdorf agreed to jointly develop fault-tolerant systems based on MIPS-RISC technology and the UNIX operating standard.

Lockheed Electronics
Tandem and Lockheed agreed to jointly market telephone directory services.

Westinghouse Electric's Electronic Systems Group
Tandem and Westinghouse agreed to jointly offer systems integration services.

National Institute of Standards and Technology
The two organizations agreed to jointly develop a computerized data repository for the National Product Data Exchange Specification test-bed program.

DMR Group
Tandem and DMR signed an agreement to develop Wise, an integrated software package.

Oracle
Tandem and Oracle agreed to develop and market Oracle's database tools for use with Tandem's NonStop SQL relational database management system.

1988

SEL Canada and Union Pacific Railroad
Tandem, SEL Canada, and Union Pacific Railroad jointly own Automated Monitoring and Control International, which focuses on bringing OLTP to the transportation industry.

AT&T
Tandem formed a partnership with AT&T to develop ISDN technology.

Boeing Computer Services, Electronic Data Systems, and MSA Advanced Manufacturing, Inc.
Tandem entered an agreement to jointly develop OLTP systems for manufacturing applications. Tandem's Tandem Integrated Manufacturing Environment (T.I.M.E.) is the result.

Apple Computers
Tandem agreed to sell, support, and service Apple's Macintosh SE, II, and IIx as part of Tandem's OLTP systems.

MERGERS AND ACQUISITIONS

1990

Array Technology Corporation (ATC)
Tandem merged with ATC, a computer storage company developing technology for disk subsystems based on redundant arrays of inexpensive disks (RAID).

1988

Ungermann-Bass
Tandem merged with Ungermann-Bass, an open, enterprise-wide networks company.

Integrated Technology, Inc. (ITI)
Tandem acquired ITI, an intelligent telephone network software company. In May 1988, ITI was renamed Tandem Telecommunications Systems, Inc. (TTSI).

Atalla Corporation
Tandem acquired Atalla, a security systems company.

KEY OFFICERS

James G. Treybig
President and chief executive officer

Robert C. Marshall
Senior vice president and chief operating officer

Martin M. Atalla
Vice president

Jack W. Chapman
Vice president, Sales

Donald W. Fowler
Senior vice president and general manager, Tandem Companies Group

Gerald D. Held
Vice president, Strategy and Corporate Development

Lawrence A. Laurich
Vice president, Systems Development and Manufacturing

Gerald L. Peterson
Senior vice president and general manager, Tandem Sales and Marketing Group

Stephen C. Schmidt
Senior vice president and general manager, Tandem System Group

Michael K. Bateman
Vice president, New Business and Distributor Marketing

Roberta Henderson
Vice president, OLTP Software Development

Larry W. McGraw
Vice president and general manager, Tandem Source Company

F. Steven Weick
Vice president, Services and Communications Products

Barry E. Young
Vice president and general manager, Micro Products Division

Ralph K. Ungermann
Senior vice president, Ungermann-Bass Group; president and chief executive officer, Ungermann-Bass

Chris Erickson
President and general manager, Tandem Telecommunications Systems, Inc.

W. Dale Hopkins
Vice president, Engineering, and acting general manager

PRINCIPAL INVESTORS

Information is not available.

FOUNDERS

Information is not available.

Table 4
Comprehensive Financial Statement
Fiscal Year Ending September 30
(Thousands of US Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	$385,417	$519,211	$692,304	$643,763	$863,151
Cash	128,676	239,819	318,271	124,599	197,174
Receivables	163,378	197,658	256,296	355,635	419,440
Marketable Securities	-	-	-	-	-
Inventory	78,962	64,229	94,846	129,426	144,176
Other Current Assets	14,401	17,505	22,891	34,103	102,361
Net Property, Plants	$160,598	$175,022	$253,232	$418,521	$447,382
Other Assets	$6,329	$10,792	$27,504	$256,093	$308,255
Total Assets	$552,344	$705,025	$973,040	$1,318,377	$1,618,788
Total Current Liabilities	$86,806	$134,792	$194,591	$365,298	$441,405
Long-Term Debt	$12,412	$5,725	$9,055	$58,197	$106,643
Other Liabilities	$32,718	$29,828	$45,539	$38,021	$81,622
Total Liabilities	$131,936	$170,345	$249,185	$461,516	$629,670
Total Shareholders' Equity	$420,408	$534,680	$723,855	$856,861	$989,118
Common Stock	240,033	290,539	372,488	405,644	502,707
Other Equity*	0	0	0	5,365	(77,757)
Retained Earnings	180,375	244,141	351,367	445,852	564,168
Total Liabilities and Shareholders' Equity	$552,344	$705,025	$973,040	$1,318,377	$1,618,788

Income Statement	1985	1986	1987	1988	1989
Revenue	$624,138	$778,014	$1,047,532	$1,314,721	$1,632,522
US Revenue	418,172	490,149	597,093	657,361	816,261
Non-US Revenue	205,966	365,667	450,439	657,361	816,261
Cost of Sales	$240,148	$283,227	$363,730	$487,791	$606,408
R&D Expense	$71,577	$88,202	$109,504	$169,356	$203,520
SG&A Expense	$262,332	$299,572	$403,859	$510,313	$638,267
Capital Expense	$53,247	$62,706	$145,302	$419,658	$163,999
Pretax Income	$56,350	$115,412	$184,646	$145,363	$186,325
Pretax Margin (%)	9.03	14.83	17.63	11.06	11.41
Effective Tax Rate (%)	39.00	44.30	43.00	35.00	43.00
Net Income	$34,374	$64,258	$105,229	$94,485	$118,316
Shares Outstanding, Millions	83,530	89,096	98,424	98,683	101,386
Per Share Data					
Earnings	$0.41	$0.72	$1.07	$0.96	$1.17
Dividend	0	0	0	0	0
Book Value	$5.03	$6.00	$7.35	$8.68	$9.76

Table 4 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending September 30
(Thousands of US Dollars, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
Liquidity					
Current (Times)	4.44	3.85	3.56	1.76	1.96
Quick (Times)	3.53	3.38	3.07	1.41	1.63
Fixed Assets/Equity (%)	38.20	32.73	34.98	48.84	45.23
Current Liability/Equity (%)	20.65	25.21	26.88	42.63	44.63
Total Liability/Equity (%)	31.38	31.86	34.42	53.86	63.66
Profitability (%)					
Return on Assets	-	10.22	12.54	8.25	8.06
Return on Equity	-	13.46	16.72	11.95	12.82
Profit Margin	5.51	8.26	10.05	7.19	7.25
Other Key Ratios					
R&D Spending % of Revenue	11.47	11.34	10.45	12.88	12.47
Capital Spending % of Revenue	8.53	8.06	13.87	31.92	10.05
Employees	5,494	5,719	7,007	8,624	9,548
Revenues ($K)/Employee	$113.60	$136.04	$149.50	$152.45	$170.98
Capital Spending % of Assets	9.64	8.89	14.93	31.83	10.13

*In July 1989, the Company implemented an Employee Stock Ownership Plan (ESOP). The Company repurchased $50 million of capital stock on the open market to satisfy the requirements of the ESOP and is carrying it at cost.

Source: Tandem Computers Annual Reports and Forms 10-K
Dataquest (1990)

Taiwan Semiconductor Manufacturing Company

No. 121, Park Avenue III
Science-Based Industrial Park
Hsinchu, Taiwan R.O.C.
Telephone: 886-35-780221
Fax: 886-35-770354
Dun's Number: 68-773-5506

Date Founded: 1986

CORPORATE STRATEGIC DIRECTION

Taiwan Semiconductor Manufacturing Company (TSMC) was founded in 1986 as a joint venture between N.V. Philips of the Netherlands, holding a 27.5 percent share; Taiwan's Executive Yuan Development Fund, holding 48.3 percent; and a group of nine other Taiwanese companies, holding 24.2 percent. Their initial goal was to establish a one-stop semiconductor manufacturing foundry that included wafer fabrication, probing test, packaging, final test, and burn-in.

The company's strategy is to manufacture integrated circuits in wafer form to customer specifications without independent design or marketing of its own products. TSMC produces and ships 6-inch wafers using CMOS technologies. Operations are headquartered at the Industrial Technology Research Institute in Hsinchu, Taiwan.

The company has two major fabs in Taiwan. Fab I is an existing fab being leased from the Electronic Research and Service Organization, which is a department within the Industrial Technology Research Institute (ITRI). It opened in mid-1988 and has a capacity of 15,000 six-inch wafers per month. Fab II is a plant in Hsinchu Science-Based Industrial Park. Construction began in April 1988 and was completed in April 1990. When the plant is fully operational, it can produce 40,000 six-inch CMOS wafers per month. In 1990, it operated at more than 10,000 wafers per month. The company anticipates bringing this capacity to 33,000 by the end of 1991. Production will center on 1.0-micron feature sizes.

In early 1987, an existing 6-inch fabrication facility was made available to TSMC through a special arrangement with ITRI. Since 1986, TSMC has acquired main process technologies and other research support through a variety of arrangements with Philips, ITRI, and customers. Fab I is expected to produce 20,000 wafers per month during 1991, and it is expected to produce 40,000 wafers per month during 1991 and 1993.

According to TSMC, revenue for 1990 and 1989 totaled NT$2.2 billion (US$82 million) and NT$1.9 billion (US$70 million), respectively. Revenue for 1991 is expected to reach NT$3.8 billion (US$140 million), an increase of 71 percent from 1990.

In 1990, TSMC made a deal with Intel Corporation calling for TSMC's silicon foundry to make DRAMs for distribution through Intel's sales channels in Taiwan and the rest of the Asia/Pacific region. This agreement was dissolved in 1991.

More detailed information is available in Table 1, which appears after "Business Segment Strategic Direction" and presents corporate highlights. Information on revenue by region and distribution channel is not available. Tables 2 through 6 at the end of this backgrounder present comprehensive financial information.

BUSINESS SEGMENT STRATEGIC DIRECTION

Semiconductors

The company's major products in the semiconductor business are as follows: applications-specific integrated circuits (ASICs), memory devices, microcontrollers, EPROMs, and SRAMs.

Further Information

For further information about the company's business segment, please contact Dataquest's Semiconductors *Asia* service.

Table 1
Corporate Highlights (Millions of U.S. Dollars)

	1989	1990
Two-Year Revenue	69.8	82.7
Percent Change	-	18.42
Capital Expenditure	7,685.9	7,685.9
Percent of Revenue	11,009.20	9,296.91
R&D Expenditure	NA	NA
Percent of Revenue	0	0
Number of Employees	10,208	11,490
Revenue ($K)/Employee	0.01	0.01
Net Income	16.0	(6.5)
Percent Change	-	(140.70)

NA = Not available

Source: Taiwan Semiconductor Manufacturing Company Annual Reports
Dataquest (October 1991)

1990 SALES OFFICE LOCATIONS

North America—1
Europe—1
Japan—0
ROW—1

MANUFACTURING LOCATIONS

ROW

Hsinchu, Taiwan ROC
CMOS foundry, ASICs, memories, microprocessors, EPROMs, SRAMs

SUBSIDIARIES

North America

Taiwan Semiconductor Manufacturing Company (United States)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1991

Advanced Micro Devices (AMD)
TSMC and Advanced Micro Devices signed an agreement under which TSMC will act as a foundry for some of AMD's EPROMs. Advanced Micro Devices is transferring its 1.35-micron CMOS process to TSMC, which will use it to produce 64K, 128K, 256K, 512K, and 1M EPROMs for the company. According to TSMC, the first products to come from the agreement are expected by the third quarter of 1991.

VLSI Technology
TSMC will license gate array design tools from VLSI technology for use by its Taiwan-based customers. The deal allows Taiwan designers to use VLSI's gate array design software and back-end software, matched to TSMC's process. TSMC will pay VLSI Technology about $1 million for rights to the software.

MERGERS AND ACQUISITIONS

Taiwan Semiconductor Manufacturing Company has not made any mergers or acquisitions recently.

KEY OFFICERS

Donald W. Brooks
President

Morris Chang
Chairman

F. C. Tseng
Vice president, Operations

E. Heuving
Vice president, Finance

John Luke
Vice president, Marketing

E. Mou
Vice president, Corporate Services

PRINCIPAL INVESTORS

Taiwan's Executive Yuan Development Fund—48.3 percent
N.V. Philips—27.5 percent

FOUNDERS

Yuan Development Fund
N.V. Philips

Table 2
Balance Sheet
Fiscal Year Ending December 31
(Millions of U.S. Dollars)

Balance Sheet	1989	1990
Cash	10.7	1.0
Receivables	12.9	26.7
Marketable Securities	-	-
Inventory	9.3	15.5
Other Current Assets	10.5	3.1
Total Current Assets	43.4	46.3
Net Property, Plants	8.2	209.1
Other Assets	0.7	2.4
Total Assets	52.3	257.9
Total Current Liabilities	54.2	55.1
Long-Term Debt	3.0	49.3
Other Liabilities	0.4	0.5
Total Liabilities	57.6	104.9
Converted Preferred Stock	-	-
Common Stock	124.1	146.8
Other Equity	-	-
Retained Earnings	16.7	6.1
Total Shareholders' Equity	140.8	152.9
Total Liabilities and Shareholders' Equity	198.4	257.9

Source: Taiwan Semiconductor Manufacturing Company
Annual Reports
Dataquest (October 1991)

Table 3
Consolidated Income Statement
Fiscal Year Ending December 31
(Millions of U.S. Dollars, except Per Share Data)

Consolidated Income Statement	1989	1990
Revenue	69.8	82.7
Domestic Revenue	NA	NA
International Revenue	28.9	59.7
Cost of Sales	35.5	67.3
R&D Expense	NA	NA
SG&A Expense	17.3	17.2
Capital Expense	117.2	77.9
Pretax Income	NA	NA
Pretax Margin (%)	NA	NA
Effective Tax Rate (%)	NA	NA
Net Income	16.0	(6.5)
Shares Outstanding, Thousands	NA	NA
Per Share Data		
Earnings	NA	NA
Dividend	NA	NA
Book Value	NA	NA

NA = Not available

Source: Taiwan Semiconductor Manufacturing Company Annual Reports
Dataquest (October 1991)

Table 4
Balance Sheet
Fiscal Year Ending December 31
(Millions of New Taiwan Dollars)

Balance Sheet	1989	1990
Cash	284.8	27.1
Receivables	343.1	710.4
Marketable Securities	-	-
Inventory	248.5	414.2
Other Current Assets	279.8	82.2
Total Current Assets	1,156.1	1,234.0
Net Property, Plants	4,112.1	5,570.9
Other Assets	17.5	64.9
Total Assets	5,285.7	6,869.8
Total Current Liabilities	1,443.3	1,468.5
Long-Term Debt	80.4	1,312.5
Other Liabilities	10.8	14.4
Total Liabilities	1,534.4	2,795.4
Converted Shareholders' Equity	-	-
Common Stock	3,306.0	3,911.8
Other Equity	-	-
Retained Earnings	445.4	162.7
Total Shareholders' Equity	3,751.4	4,074.5
Total Liabilities and Shareholders' Equity	5,285.8	6,869.9

Source: Taiwan Semiconductor Manufacturing Company
Annual Reports
Dataquest (October 1991)

Table 5
Consolidated Income Statement
Fiscal Year Ending December 31
(Millions of New Taiwan Dollars, except per Share Data)

Consolidated Income Statement	1989	1990
Revenue	1,859.9	2,202.4
Domestic Revenue	NA	NA
International Revenue	NA	NA
Cost of Sales	945.7	1,793.7
R&D Expense	NA	NA
SG&A Expense	460.6	457.4
Capital Expense	3,122.5	2,074.2
Pretax Income	NA	NA
Pretax Margin (%)	NA	NA
Effective Tax Rate (%)	NA	NA
Net Income	425.2	(173.1)
Shares Outstanding, Thousands	NA	NA
Per Share Data		
Earnings	NA	NA
Dividend	NA	NA
Book Value	NA	NA

NA = Not available

Source: Taiwan Semiconductor Manufacturing Company Annual Reports
Dataquest (October 1991)

Table 6
Key Financial Ratios
Fiscal Year Ending December 31

Key Financial Ratios	1989	1990
Liquidity		
Current (Times)	0.80	0.84
Total Assets/Equity (%)	140.90	168.60
Current Liabilities/Equity (%)	38.47	36.04
Total Liabilities/Equity (%)	40.90	68.61
Profitability (%)		
Return on Assets	8.04	(2.52)
Return on Equity	11.33	(4.25)
Profit Margin	22.86	(7.86)
Other Key Ratios		
R&D Spending % of Revenue	0	0
Capital Spending % of Revenue	167.89	94.18
Employees	10,208	11,490
Revenue (NT$K)/Employee	0.18	0.19
Capital Spending % of Assets	59.07	30.19

Source: Taiwan Semiconductor Manufacturing Company Annual Reports
Dataquest (October 1991)

Tachonics Corporation

Tachonics Corporation
107 Morgan Lane
Plainsboro, NJ 08536
(609) 275-2501
(609) 275-2550 (Product information)

Established 1985
No. of Employees: 50

BACKGROUND

Tachonics, a division of Grumman Corporation, was founded to design and develop custom linear and digital products for both captive and merchant markets. The Company offered its first products in 1987.

BOARD

- Chairman—Robert A. Nafis (president, Electronic Systems Division, Grumman)
- Vice President, Administration—William J. Sirico (manager, Electronic Systems Division, Grumman)
- Treasurer—Gary L. Symansky (controller, Grumman)
- Secretary—Raymond Nightengale (vice president, Grumman)

COMPANY EXECUTIVES

- President—Dr.Chuni L. Ghosh (formerly manager, GaAs Products, ITT)
- Vice President, Administration—William J. Sirico (formerly manager, Electronic Systems Division, Grumman)
- Marketing—Leonard Lea

FINANCIAL BACKING AND STRATEGIC ALLIANCES

In 1985, Tachonics received its initial financing of $15 million to $20 million from Grumman Corporation, with whom it has a strategic alliance.

Tachonics Corporation

SERVICES

Tachonics is a full-service GaAs foundry, supported with design manual, cell library, guaranteed parameters, and fab/packaging/test.

PROCESS TECHNOLOGY

Tachonics uses 0.5u- and 1.0u-GaAs MESFET technology.

PRODUCTS

- Custom MMICs
- Proprietary ICs

Applications

- Military
- Commercial

FACILITIES

Tachonics' Plainsboro, New Jersey, facility has 38,500 square feet, including a 6,000-square-foot class 10 clean room.

Tachonics Corporation

Tachonics Corporation
107 Morgan Lane
Plainsboro, NJ 08536
(609) 275-2501
(609) 275-2550 (Product information)

Established 1985
No. of Employees: 70

BACKGROUND

Tachonics, a division of Grumman Corporation, was founded to design and develop custom linear and digital products for both captive and merchant markets. The Company offered its first products in 1987.

BOARD

- Chairman—Robert A. Nafis (president, Electronic Systems Division, Grumman)
- Vice President, Administration—William J. Sirico (manager, Electronic Systems Division, Grumman)
- Treasurer—Gary L. Symansky (controller, Grumman)
- Secretary—Raymond Nightengale (vice president, Grumman)

COMPANY EXECUTIVES

- President—Dr.Chuni L. Ghosh (formerly manager, GaAs Products, ITT)
- Vice President, Digital Products—Steven Goodspeed (formerly digital design manager, Fairchild)
- Vice President, Microwave Products—Dr. Douglas Maki (formerly manager, microwave IC lab, General Electric)
- Vice President, Administration—William J. Sirico (formerly manager, Electronic Systems Division, Grumman)
- Sales Manager—Kevin Townsend

Tachonics Corporation

FINANCIAL BACKING

In 1985, Tachonics received its initial financing of $15 million to $20 million from Grumman Corporation.

STRATEGIC ALLIANCES

- Alternate source for GigaBit Logic cell-based ICs.
- Technology exchange agreement with California Micro Devices on GaAs gate arrays and other ICs.

SERVICES

Tachonics is a full-service GaAs foundry, supported with design manual, cell library, guaranteed parameters, and fab/packaging/test.

PROCESS TECHNOLOGY

Tachonics uses 0.5u- and 1.0u-GaAs MESFET technology.

PRODUCTS

- Custom MMICs
- Proprietary ICs

Applications

- Military
- Commercial

FACILITIES

Tachonics' Plainsboro, New Jersey, facility has 38,500 square feet, including a 6,000-square-foot class 10 clean room.

Tandon Corporation

301 Science Drive
Moorpark, California 93021
Telephone: (805) 523-0340
Fax: (805) 529-4450
Dun's Number: 03-086-1942

Date Founded: 1975

CORPORATE STRATEGIC DIRECTION

Tandon Corporation, founded by Sirjang Lal Tandon, started operations in 1975 in the United States as a magnetic printhead and disk drive manufacturer. With the introduction of the IBM PC, Tandon's business boomed, and by 1983, the Company was a leading force in the microcomputer disk drive market, primarily because of its OEM distribution strategy.

Under the pressure of increasing competition in the disk drive market, Tandon's most successful area of operation, Tandon diversified its activities and started manufacturing PCs to be sold through the OEM channel. The first major OEM agreement was with Tandy. This agreement was followed by a contract with Victor and several smaller contracts with European distributors from the remnants of the old Osborne dealer network. In 1984, Tandon began OEM delivery of PC and XT compatibles. In 1985, Tandon entered the European PC-compatible marketplace with its first PCs under its own brand name, the Tandon PCX and PCA lines of computers. Tandon focused initially on the European PC market, and did not enter the U.S. market with its own brand of machines until mid-1986.

Early 1987 marked Tandon's introduction of the first rugged, removable Winchester disk drive for the personal computer industry, the Personal Data Pac and the Tandon Ad-PAC. During the same year, Tandon ceased manufacturing flexible disk drives due to intense price competition from the Japanese.

In 1988, Tandon sold its disk drive division to Western Digital Corporation to focus on systems and subsystems.

Tandon's mission is to combine its technical and marketing strengths to produce an extremely high-quality line of personal computers to further its growth in the IBM-compatible personal computer industry. Tandon's challenge is to continue its transformation into a recognized brand name personal computer company.

Tandon reported revenue for fiscal 1988 of $309.3 million compared with fiscal 1987 revenue of $289.1 million*. The majority of Tandon's 1988 revenue, 83 percent, came from Europe. The computer industry experienced a soft summer selling period in Europe, resulting in lower than expected sales for Tandon. To combat the slow period, Tandon lowered its selling prices to stimulate fourth quarter sales. The effect of this was a net loss for Tandon of $19.9 million for fiscal 1988.

Because of rapid technology changes, Tandon increased its research and development spending to $13.7 million in fiscal 1988 from $10.3 million in fiscal 1987. Tandon's intentions were to enhance existing products and develop new ones.

Tandon sells its computers and subsystems through retail channels for resale to end-user channels. Sales are effected through Tandon Computer Corporation (TTC), a wholly owned subsidiary. TTC has European sales offices in the United Kingdom, West Germany, Spain, Switzerland, the Netherlands, and France. It also has distributors in 12 other countries outside of North America.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction," and present corporate highlights and revenue by region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this profile.

*All dollar amounts are in U.S. dollars.

BUSINESS SEGMENT STRATEGIC DIRECTION

Computer Storage

From its evolution in Winchester disk drives, Tandon has introduced products that feature advanced drive technology. Tandon offers the Personal Data Pac, a removable Winchester disk drive. The Personal Data Pac gives users the power to transport their entire computing environment—contained on a completely enclosed 30- or 40-megabyte Winchester disk drive—and use it wherever there is a Tandon 386 or PAC 286 Plus computer, or an IBM PC XT or PC AT compatible equipped with Tandon's Ad-PAC subsystem.

The Ad-PAC subsystem allows IBM-compatible system users to add Data Pac technology to their existing system.

Personal Computers

Dataquest estimates that Tandon's 1988 factory revenue was $245 million, up from $133 million in 1987. Tandon holds 1 percent of the worldwide PC market. Dataquest estimates that, in the European market, Tandon holds the number seven market share position, or 2.7 percent of the PC market based on 1988 revenue.

Tandon markets three lines of personal computers, the PCA family, the PAC 286 Plus, and the Tandon 386. The PCA family is a line of IBM-compatible PC AT systems that use an Intel 80286 microprocessor. The Tandon PAC 286 Plus features Tandon's Memory Mapper and is available with two receptables for Tandon's Personal Data Pacs and an optional floppy disk drive. The Tandon 386 uses the Intel 80386 microprocessor with models running at 16, 20, 25, or 33 MHz. The latest addition, the Tandon 386sx, is designed to access two Tandon Personal Data Pac Winchester disk drives.

Further Information

For further information on the company's business segment, please contact the appropriate industry services.

Table 1
Five-Year Corporate Highlights (Millions of U.S. Dollars)

	1984	1985	1986	1987	1988
Five-Year Revenue	$400.8	$268.8	$99.8	$289.1	$309.3
Percent Change	-	(32.93)	(62.87)	189.68	6.99
Capital Expenditure	0	0	0	0	0
Percent of Revenue	0	0	0	0	0
R&D Expenditure	$16.3	$12.3	$6.3	$10.3	$13.7
Percent of Revenue	4.07	4.58	6.31	3.56	4.43
Number of Employees	4,645	2,994	2,851	3,509	1,484
Revenue ($K)/Employee	N/A	N/A	N/A	$82.39	$208.42
Net Income	$29.4	($135.4)	($62.8)	$23.5	($19.9)
Percent Change	-	(560.54)	53.62	137.42	(184.68)

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	$92.69	$97.7	$83.83	N/A
Quarterly Profit	N/A	N/A	N/A	N/A

N/A = Not Available

Source: Tandon Corporation
Annual Reports and Forms 10K
Dataquest
January 1990

Table 2
Revenue by Geographic Region (Percent)

Region	1984	1985	1986	1987	1988
North America	68.00	54.00	91.00	25.00	13.00
International	32.00	46.00	9.00	75.00	87.00
Europe	5.00	13.00	N/A	70.00	83.00
Asia	27.00	33.00	N/A	5.00	4.00

N/A = Not Available

Source: Tandon Corporation
Annual Reports
Dataquest
January 1990

Table 3
Revenue by Distribution Channel (Percent)

Channel	1987	1988
Direct Sales	0	0
Indirect Sales	100.00	100.00
VARs	50.00	50.00
Dealers	50.00	50.00

Source: Tandon Corporation
Forms 10K
Dataquest
January 1990

1988 SALES OFFICE LOCATIONS

North America—1
Europe—6
Asia/Pacific—1

MANUFACTURING LOCATIONS

North America

Moorpark, California
Computer and subsystems

Europe

Vienna, Austria
Systems

Asia/Pacific

Hong Kong
Printed circuit boards

SUBSIDIARIES

Europe

Tandon Computer AG (Switzerland)
Tandon Computer B.V. (Netherlands)
Tandon Computer B.V. (Spain)
Tandon Computer GesmbH (Austria)
Tandon Computer GmbH (West Germany)
Tandon Computer (UK) Ltd. (England)
Tandon Computer S.A. (France)
Tandon Computer S.p.A. (Italy)

Asia/Pacific

Tandon (S) Pte. Ltd. (Singapore)

MERGERS AND ACQUISITIONS

March 1988

Western Digital
Tandon sold its line of 3.5- and 5.25-inch Winchester disk drives, all its manufacturing facilities in Singapore, its plated media manufacturing operations in Santa Clara, California, and its disk drive R&D development facility in San Jose, California, to Western Digital.

1987

Atasi
Tandon acquired Atasi, a disk drive maker, for approximately $5 million in stock.

Tandon Computer Corporation (TCC)
Tandon purchased its independent distribution arm, TCC, in a stock exchange transaction valued at approximately $3 million.

Xerox
Xerox has acquired approximately 3 percent share of Tandon after converting a year-old $4 million bridge loan into shares of Tandon common stock.

Western Digital
Western Digital acquired most of Tandon's disk-drive business, valued at nearly $49 million.

KEY OFFICERS

Sirjang Lal Tandon
Chairman of the board, chief executive officer

Ranjit Sitlani
Executive vice president

Denis J. Trafecanty
Vice president, chief financial officer

Loren M. Eltiste
Chief accounting officer

Michel Fromont
Vice president

Juergen Tepper
Vice president

Robert G. Taylor
Vice president

James C. Goetz
Vice president

PRINCIPAL INVESTORS

Sirjang Lal Tandon—7.3 percent

FOUNDERS

Sirjang Lal Tandon

Table 4
Comprehensive Financial Statement
Fiscal Year Ending September
(Millions of U.S. Dollars, except Per Share Data)

Balance Sheet	1984	1985	1986	1987*	1988
Total Current Assets	$320.6	$128.7	$105.9	$167.8	$184.1
Cash	12.8	1.9	9.8	13.4	21.9
Receivables	85.2	18.9	18.4	51.1	28.1
Inventory	186.1	62.3	75.9	98.5	129.8
Other Current Assets	36.5	45.6	1.8	4.8	4.3
Net Property, Plants	$36.9	$36.6	$26.9	$10.0	$13.0
Other Assets	$3.5	$1.3	$8.1	$5.2	$4.0
Total Assets	$361.0	$166.6	$140.9	$183.0	$201.1
Total Current Liabilities	$83.8	$52.3	$77.2	$67.7	$102.3
Long-Term Debt	0	0	0	0	0
Other Liabilities	$35.3	$6.6	$12.6	$21.8	$22.1
Total Liabilities	$119.1	$58.9	$89.8	$89.5	$124.4
Total Shareholders' Equity	$241.9	$107.6	$51.1	$93.5	$76.9
Converted Preferred Stock	0	0	0	0	0
Common Stock	167.9	167.9	174.0	191.9	198.3
Other Equity	(1.3)	(0.2)	0	0	(3.1)
Retained Earnings	75.3	(60.1)	(122.9)	(98.4)	(118.3)
Total Liabilities and Shareholders' Equity	$361.0	$166.5	$140.9	$183.0	$201.3

Income Statement	1984	1985	1986	1987*	1988
Revenue	$400.8	$268.8	$99.8	$289.1	$309.3
U.S. Revenue	273.0	144.0	91.0	72.3	39.7
Non-U.S. Revenue	127.8	124.8	8.8	216.8	269.6
Cost of Sales	$311.1	$370.7	$67.8	$209.6	$243.5
R&D Expense	$16.3	$12.3	$6.3	$10.3	$13.7
SG&A Expense	$30.1	$53.9	$26.4	$46.5	$68.1
Capital Expense					
Pretax Income	$42.1	($166.1)	$0.3	$19.8	($17.5)
Pretax Margin (%)	10.50	(61.79)	0.30	6.85	(5.66)
Effective Tax Rate (%)	46.00	(46.00)	46.00	40.00	(34.00)
Net Income	$29.4	($135.4)	($62.8)	$23.5	($19.9)
Shares Outstanding, Millions	50.8	50.8	51.3	59.2	62.3
Per Share Data					
Earnings	$0.58	($2.66)	($1.24)	$0.42	$0.32
Dividends	-	-	-	-	-
Book Value	$4.76	$2.12	$1.00	$1.58	$1.23

Table 4 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending September
(Millions of U.S. Dollars, except Per Share Data)

Key Financial Ratios	1984	1985	1986	1987*	1988
Liquidity					
Current (Times)	3.83	2.46	1.37	2.48	1.80
Quick (Times)	1.61	1.27	0.39	1.02	0.53
Fixed Assets/Equity (%)	15.25	34.01	52.64	10.70	16.91
Current Liabilities/Equity (%)	34.64	48.61	151.08	72.41	133.03
Total Liabilities/Equity (%)	49.24	54.74	175.73	95.72	161.77
Profitability (%)					
Return on Assets	-	(51.33)	(40.85)	14.51	(10.36)
Return on Equity	-	(77.48)	(79.14)	32.50	(23.36)
Profit Margin (%)	7.34	(50.37)	(62.93)	8.13	(6.43)
Other Key Ratios					
R&D Spending % of Revenue	4.07	4.58	6.31	3.56	4.43
Capital Spending % of Revenue	0	0	0	0	0
Employees	4,645	2,994	2,851	3,509	1,484
Revenue ($K)/Employee	N/A	N/A	N/A	$82.39	$208.42
Capital Spending % of Assets	0	0	0	0	0

*Tandon changed its fiscal year end from September to December 31 in 1987.
N/A = Not Available

Source: Tandon Corporation Annual Reports and Forms 10-K
Dataquest January 1990

Tandy Corporation

1800 One Tandy Center
Fort Worth, Texas 76102
Telephone: (817) 390-3700
Fax: (817) 390-2774
Dun's Number: 00-801-2635

Date Founded: 1927

CORPORATE STRATEGIC DIRECTION

Tandy Corporation is a multifaceted, multibillion dollar company. As a retail company, it is known for its nationwide chain of Radio Shack stores, Computer Centers, and dealer/franchise outlets and for the Scott-McDuff and VideoConcepts retail operations of its Tandy Name Brand Retail Group. As a manufacturer, it designs and manufactures more than a billion dollars of consumer electronics products and computers per year. As a corporate innovator, Tandy strives to identify areas of growth potential, including the acquisition of companies that complement its technology base in audio and video equipment, telephony, personal computers, and magnetic media.

Tandy's total revenue increased 10 percent to $4.2 billion* in fiscal 1989 from $3.8 billion in fiscal 1988. In order to sustain this growth through 1990, Tandy intends to focus on several factors, including revitalizing the demand for its low-end computers, resuming new store additions in the Name Brand Group, and augmenting Radio Shack's sales and profits through a sophisticated point-of-sale (POS) system.

In 1989, international sales accounted for less than 5 percent of total revenue. The Company was forced to close a major manufacturing facility in Korea due to political and civil unrest. However, strategic relationships involving original equipment manufacturing and technology sharing with Digital Equipment Corporation (DEC) and Matsushita/Panasonic have been established, and Tandy hopes to develop similar relationships that will allow it to expand into Europe in the 1990s. Also, Tandy opened a new manufacturing facility in Huizhou, China, to supply Tandy products to the domestic Chinese market and to export products.

*All dollar amounts are in US dollars.

Tandy does not report its R&D expenditure, but its seventh R&D center, added in fiscal 1989, is located in San Jose, California, and work has begun on a major technology center, located at Tandy's headquarters in Fort Worth, Texas. Capital expenditure totaled $123 million in fiscal 1989, representing 3 percent of revenue. Most of these outlays were used for expansion of Tandy's manufacturing capabilities and for Radio Shack's remodeling and implementation of the POS system. This system is designed to increase sales growth through increased productivity rather than reliance upon new store expansion to fuel growth. This system should improve promotional planning, merchandising effectiveness, retail store control, and, ultimately, inventory turnover.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Retail Chains

Tandy's strength lies in the retail chains that it owns. Today, through its chain of Radio Shack outlets, Tandy is a leading distributor of electronic products. Tandy/Radio Shack claims to have the largest number of retail electronics outlets in the world. Through more than 4,800 Company-owned retail stores and 2,200 dealer/franchise outlets, Tandy distributes a product line of nearly 2,800 noncomputer items plus nearly 1,800 products, including a line of microcomputers, peripherals, software, and accessories. The

Company entered the name-brand consumer electronics market through purchases of the Scott-McDuff and VideoConcepts chains in 1985 and 1986, thereby forming the Tandy Name Brand Retail Group. The Name Brand division achieved an 11.3 percent same-store sales growth in 1989, in contrast to its essentially flat growth in 1988. In 1988, Tandy acquired GRiD Systems, a manufacturer of laptop personal computers. GRiD Systems Centers are now established in 61 major domestic markets and 7 locations in Canada and Europe.

Marketing Companies

Excluding GRiD Systems, Tandy's marketing companies achieved a 15.5 percent increase in sales in 1989 to complement a 19.0 percent increase in the previous year.

Memtek Products, the manufacturer and marketer of Memorex brand audio- and videotapes and accessories, expanded its product line and achieved a record year in sales. In addition to audio- and videotapes, Memtek has introduced universal remote controllers, audio and video head cleaners and headphones, and other accessory items in seven different product categories.

O'Sullivan Industries, a leading producer of ready-to-assemble electronics racks, desks, and cabinets, opened a new 335,000-square-foot plant in Virginia. This new facility provides added production capacity and manufactures high-capacity audio speakers that are being built as OEM products for sale by various foreign manufacturers in the United States.

Lika Corporation, a manufacturer of printed circuit boards, redirected its products away from high-volume, low profit margin products to higher profit margin lines of business—computers and telecommunications. Lika currently is ranked among the top 10 printed circuit board producers in the United States.

GRiD Systems Corporation designs, develops, manufactures, and markets field automation systems for laptop computers. Tandy formally realigned its computer marketing plan in March 1989 by positioning GRiD Systems as the operating unit with full responsibility for marketing computers to major corporate accounts, state governments, and the federal government. GRiD had sales of $130.4 million due in part to Computer Centers and value-added reseller (VAR) programs transferred from Radio Shack in 1989. Tandy also enhanced GRiD's product line to include desktop workstations and file servers, plus additional field support equipment, such as cellular telephones and facsimile machines.

A&A International manages the worldwide product and component sourcing, evaluation, quality control, and delivery for Tandy Electronics, Radio Shack, Memtek Products, GRiD Systems, and the Tandy Brand Name Retail Group. It also serves as a communications link between Tandy headquarters and major markets in Japan.

Personal Computers

In 1989, Tandy's unit sales of low-cost desktop computers, primarily for the home user, declined 13.4 percent. This decline was attributed to two factors: an industry-wide slowing in the low-end market, and the realignment of Radio Shack's computer marketing efforts toward its traditional sectors of strength—i.e., the home, the home office, small and medium-size businesses, and education. Tandy expects its DeskMate graphical user interface to expand the market for low-cost PCs by providing a high degree of user friendliness previously unavailable on such systems. SchoolMate offers similar ease-of-use for the education market with an integrated collection of classroom management applications and teaching utilities. Also, in August 1989, Tandy announced that a version of the Lotus 1-2-3 Spreadsheet would be available using the DeskMate graphical user interface. Until 1989, Tandy's low-priced, entry-level, desktop MS-DOS computers for the home and small business market were predominantly 8088-based, and constituted a major portion of Radio Shack's low-priced product mix. Partially offsetting the decline in 8088-based products was an increase in low-end 8086 and 80286 computer sales.

Although a viable market still exists for 8088 microprocessor-based computers, the market for this product has matured. As a result, it is likely that all new desktop computer products introduced by the Company will be 8086 or above. Dataquest estimates that Tandy ranked seventh in the worldwide personal computer market in 1989 with 3.2 percent market share.

Tandy's greatest competitive advantage in the PC market is that, with its extensive chain of retail stores, it is the only PC manufacturer with its own distribution channels. This advantage could prove vital as competition for the home market increases.

Business Computers

The acquisition of GRiD Systems and manufacturing agreements with DEC and Matsushita significantly strengthened Tandy's 1989 computer business by expanding upper-end desktop business computer and laptop and portable computer unit sales by 18.9 and 271.4 percent, respectively.

The higher average price of these upper-end business computers enabled 1989 total computer revenue to increase nearly 15 percent over 1988 in spite of the decline in sales of the low-cost desktop computers. In a further effort to tap the more profitable business market, Tandy introduced three new high-end desktop computers in February 1990. These included two PC-compatibles based on the Intel 80386 chip, the Tandy 4016 DX (which runs at 16 MHz) and the 4033 LX (which runs at about twice the speed of the 4016 DX), and the 2800 HD, a 12.5-pound laptop with a 20MB hard disk and an Intel 286 chip. The 2800 HD is the first laptop made by Tandy for Radio Shack. In 1989, Tandy captured less than 1 percent of the worldwide business computer market share.

Compact Discs

THOR-CD was first announced in 1988. It represents a breakthrough in rewritable compact disc (CD) technology. Tandy believes that THOR-CD is the only erasable CD technology in existence that is compatible with most current CD players. With the belief that THOR-CD could become the next major consumer electronics product, Tandy has devoted the new San Jose research facility toward its development.

Printers

Tandy manufactures and sells a line of printers for its desktop computers. This line includes fully formed (daisywheel), serial, and page printers. Tandy recently introduced several new serial printer models.

Further Information

For more information about the Company's business segments, please contact the appropriate Dataquest industry service.

Table 1
Five-Year Corporate Highlights (Millions of US Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	$2,841.4	$3,036.0	$3,452.2	$3,793.8	$4,180.7
Percent Change	-	6.85	13.71	9.90	10.20
Capital Expenditure	$75.0	$55.0	$93.3	$94.2	$122.6
Percent of Revenue	2.64	1.81	2.70	2.48	2.93
R&D Expenditure	NA	NA	NA	NA	NA
Percent of Revenue	NA	NA	NA	NA	NA
Number of Employees	29,862	33,191	33,918	35,145	38,995
Revenue ($K)/Employee	$9.50	$9.10	$10.18	$10.79	$10.72
Net Income	$189.0	$197.7	$242.3	$316.3	$323.5
Percent Change	-	4.60	22.56	30.54	2.28

Calendar Year*	Q1	Q2	Q3	Q4
Quarterly Revenue	$985.98	$1,456.59	$1,013.50	NA
Quarterly Profit	$62.75	$117.63	$53.03	NA

*Based on fiscal year ended June 30, 1990
NA = Not available

Source: Tandy Corporation Annual Reports
Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
North America	93.76	97.36	98.37	98.23	96.65
International	6.24	2.64	1.63	1.77	3.35
Europe	4.08	NA	NA	NA	NA
Asia/Pacific	2.16	NA	NA	NA	NA

NA = Not available

Source: Tandy Corporation Annual Reports

Table 3
Revenue by Distribution Channel (Percent)

Channel	1988	1989
Direct Sales	0	0
Indirect Sales	100.00	100.00
Dealers	100.00	100.00

Source: Dataquest (1990)

1990 SALES OFFICE LOCATIONS

Information is not available.

MANUFACTURING LOCATIONS

North America

GRiD Systems Corporation, Fremont, California
GRiD portable computers
Lika Corporation, Salt Lake City, Utah
Printed circuit boards
Lika Corporation, Stockton, California
Printed circuit boards
O'Sullivan Industries, Inc., Lamar, Missouri
Furniture to be used with electronic products
O'Sullivan Industries, Inc., South Boston, Virginia
Furniture to be used with electronic products
T.C. Antennas, Fort Worth, Texas
Mobile CB radio equipment
Tandy Electronics Business Computers, Fort Worth, Texas
Manufacturing and final assembly of business computer products
Tandy Electronics Packaging, Fort Worth, Texas
Electronic parts packaging
Tandy Instruments, Fort Worth, Texas
Printed circuit board assemblies
Tandy Magnetics, Fort Worth, Texas
Cartridge and reel-to-reel tape
Tandy Molded Products, Fort Worth, Texas
Fabricates molded products
Tandy/Rank Home Video, Northbrook, Illinois
Video cassettes
Tandy Software Assembly, Fort Worth, Texas
Assembles computer diskette software, telephone and game cartridges

Asia/Pacific

T.C. Electronics (Taiwan) Corp.
Radios, tuners, modems, amplifiers, security devices, and telephones
Tandy Electronics China, Ltd.
Telephones and cassette tape recorders
Tandy Electronics Japan, Ltd.
Consumer electronics R&D

SUBSIDIARIES

North America

GRiD Systems Corporation
Lika Corporation
O'Sullivan Industries, Inc.
Tandy Credit Corporation
Tandy Electronics, Inc.
Tandy International Disc, Inc.
Tandy International Electronics, Inc.
Tandy Life Insurance Co.
Tandy Marketing (Canada) Ltd.
Tandy Properties, Inc.
Tandy Transportation
Trans World Electronics
200 Houston Street Associates

Europe

Victor Technologies Group (Sweden)

Asia/Pacific

A&A International (Japan)
Tandy Radio Shack Ltd. (Hong Kong)

ROW

Tandy FSC Ltd. (Jamaica)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

DEC

General Systems Business has been formed by DEC to sell Tandy 386-based PCs through VARs to the small-to-midsize business market. Tandy has had an ongoing OEM relationship with DEC.

Matsushita Electric

Matsushita Electric Industrial Co., Ltd., will develop 16- and 32-bit notebook-size PCs and will market the devices in the United States and Europe. Matsushita will commission the production of the PCs for the US market to Tandy. Tandy has had an ongoing OEM relationship with Matsushita/Panasonic.

Nokira-Mobira
Long known for its OEM cellular business with Tandy, Nokira has entered into a joint cellular telephone manufacturing venture with the Company.

Novell
Tandy will sell the full line of Novell's NetWare products in its Radio Shack and GRiD Computer Centers.

UNICO
UNICO's subsidiary, American Educational Computer (AEC), will comarket its Reading Skills Development Program (RSDP) with the Radio Shack Education Division. RSDP supports SchoolMate, Tandy Corporation's local area network (LAN) for the classroom.

1989

Toshiba
Toshiba and Tandy's GRiD Systems formed a licensing agreement on patents for portable laptop computers.

Lotus Development
Tandy is to sell Lotus Development's Lotus Spreadsheet for DeskMate at Radio Shack stores and at 300 of its Radio Shack Computer Centers.

Open Desktop Group
Tandy, DEC, Locus Computing, Relational Technology, and The Santa Cruz Operation have joined together to pursue the development of new software tools that will make PCs easier to use with the UNIX operating system.

MERGERS AND ACQUISITIONS

1990

Datatronic AB
Tandy signed an agreement with Datatronic of Stockholm, Sweden, to acquire its Victor microcomputer and Micronic handheld computer subsidiaries in Europe for approximately $120 million.

1988

GRiD Systems
Tandy Corporation purchased GRiD Systems in a stock transaction. GRiD Systems continues to manufacture and market portable computer products from its corporate headquarters in Fremont, California.

KEY OFFICERS

John V. Roach
Chairman of the board, chief executive officer and president

Herschel C. Winn
Senior vice president and secretary

John W. Burnam
Vice president

Ronald L. Parish
Vice president

Richard L. Ramsey
Vice president and controller

PRINCIPAL INVESTORS

Information is not available.

FOUNDER

David Tandy

Table 4
Comprehensive Financial Statement
Fiscal Year Ending June
(Millions of US Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	$1,456.8	$1,419.4	$1,388.8	$1,986.0	$1,942.4
Cash	90.2	273.6	58.4	188.2	58.4
Receivables	105.2	116.2	160.4	462.4	553.4
Marketable Securities	0	0	0	0	0
Inventory	1,197.4	982.9	1,128.4	1,287.8	1,285.4
Other Current Assets	64.0	46.7	41.6	47.6	45.2
Net Property, Plants	$310.6	$301.7	$337.1	$367.3	$420.7
Other Assets	$155.6	$357.0	$236.6	$176.8	$211.2
Total Assets	$1,923.0	$2,078.1	$1,962.5	$2,530.1	$2,574.3
Total Current Liabilities	$375.0	$512.3	$302.1	$649.3	$569.0
Long-Term Debt	$320.1	$164.0	$168.2	$153.6	$113.6
Other Liabilities	$164.4	$95.3	$112.2	$124.1	$108.9
Total Liabilities	$859.5	$771.6	$582.5	$927.0	$791.5
Total Shareholders' Equity	$1,063.5	$1,306.5	$1,380.0	$1,603.1	$1,782.8
Converted Preferred Stock	0	0	0	0	0
Common Stock	95.6	95.6	95.6	95.6	95.6
Other Equity	(135.5)	(90.1)	(60.0)	(101.9)	(192.5)
Retained Earnings	1,103.4	1,301.0	1,344.4	1,609.4	1,879.7
Total Liabilities and Shareholders' Equity	$1,923.0	$2,078.1	$1,962.5	$2,530.1	$2,574.3
Income Statement	**1985**	**1986**	**1987**	**1988**	**1989**
Revenue	$2,841.4	$3,036.0	$3,452.2	$3,793.8	$4,180.7
US Revenue	2,458.4	2,955.9	3,395.8	3,726.6	4,040.5
Non-US Revenue	383.0	80.1	56.4	67.2	140.2
Cost of Sales	$1,291.8	$1,471.3	$1,700.1	$1,870.4	$2,148.5
R&D Expense	NA	NA	NA	NA	NA
SG&A Expense	$1,102.1	$1,077.7	$1,205.6	$1,341.1	$1,441.6
Capital Expense	$75.0	$55.0	$93.3	$94.2	$122.6
Pretax Income	$351.4	$387.0	$458.8	$514.7	$527.4
Pretax Margin (%)	12.37	12.75	13.29	13.57	12.62
Effective Tax Rate (%)	46.20	48.20	46.60	38.50	38.70
Net Income	$189.0	$197.7	$242.3	$316.3	$323.5
Shares Outstanding, Millions	89.5	89.2	89.9	89.5	88.8
Per Share Data					
Earnings	$2.11	$2.22	$2.70	$3.54	$3.64
Dividend	0	0	$0.38	$0.58	$0.60
Book Value	$11.88	$14.65	$15.35	$17.91	$20.08

Table 4 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending June
(Millions of US Dollars, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
Liquidity					
Current (Times)	3.88	2.77	4.60	3.06	3.41
Quick (Times)	0.69	0.85	0.86	1.08	1.15
Fixed Assets/Equity (%)	29.21	23.09	24.43	22.91	23.60
Current Liabilities/Equity (%)	35.26	39.21	21.89	40.50	31.92
Total Liabilities/Equity (%)	80.82	59.06	42.21	57.83	44.40
Profitability (%)					
Return on Assets	-	9.88	11.99	14.08	12.68
Return on Equity	-	16.68	18.04	21.21	19.11
Profit Margin	6.65	6.51	7.02	8.34	7.74
Other Key Ratios					
R&D Spending % of Revenue	NA	NA	NA	NA	NA
Capital Spending % of Revenue	2.64	1.81	2.70	2.48	2.93
Employees	29,862	33,191	33,918	35,145	38,995
Revenue ($K)/Employee	$9.50	$9.10	$10.18	$10.79	$10.72
Capital Spending % of Assets	3.90	2.65	4.75	3.72	4.76

NA = Not available

Source: Tandy Corporation Annual Reports
Dataquest (1990)

Tandy Corporation

1800 One Tandy Center
Fort Worth, Texas 76102
Telephone: (817) 390-3700
Fax: (817) 390-2774
Dun's Number: 00-801-2635

Date Founded: 1927

CORPORATE STRATEGIC DIRECTION

Tandy Corporation is a multifaceted, multibillion dollar company. As a retail company, it is known for its nationwide chain of Radio Shack stores, Computer Centers and dealer/franchise outlets and for the McDuff and VideoConcepts retail operations of its Tandy Name Brand Retail Group. As a manufacturer, it designs and produces almost a billion dollars of consumer electronics products and computers per year. As a corporate innovator, Tandy strives to identify areas of growth potential, including the acquisition of companies that complement its technology base in audio, video, telephony, personal computers, and magnetic media.

Tandy's total revenue increased 10 percent to $4.2 billion* in fiscal 1989 from $3.8 billion in fiscal 1988. Its net income increased 2 percent to $323.5 million from $316.3 million during the same period. Tandy employs approximately 39,000 people worldwide.

The North American sales contribution to the Company's total revenue grew to $4.0 billion in fiscal 1989. North American sales accounted for 97 percent of Tandy's total sales, slightly down from 98 percent in fiscal 1988.

The Company has manufacturing locations worldwide with a concentration in the United States and the Far East.

Tandy does not report its research and development expenditures. Capital expenditures totaled $123 million in fiscal 1989, representing 3 percent of revenue.

*All dollar amounts are in U.S. dollars.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Retail Chains

Tandy's strength lies in the retail chains that the Company owns and franchises. Today, through its chain of Radio Shack outlets, Tandy is a leading distributor of technological products to electronics consumers. Tandy/Radio Shack claims to have the largest number of retail electronics outlets in the world. Through more than 4,790 Company-owned retail stores and 2,240 dealer/franchise outlets, Tandy distributes a product line that includes 2,759 noncomputer items plus 800 products from a line of microcomputers, peripherals, software, and accessories. The Company entered the name-brand consumer electronics market through purchases of the Scott-McDuff and VideoConcepts chains in 1985 and 1986, respectively. Tandy Name Brand Retail Group outlets served this market starting in 1987. The Name Brand division achieved an 11.3 percent same-store sales growth in 1989 in contrast to its essentially flat growth in 1988. In 1988, Tandy acquired GRiD Systems, a manufacturer of laptop personal computers. GRiD Systems Centers are now established in 61 major domestic markets and 7 locations in Canada and Europe.

Tandy's marketing companies—Memtek Products, a manufacturer and marketer of the highly popular Memorex brand of audio and video tape and

accessories; Personal Computers; O'Sullivan Industries, a leading producer of ready-to-assemble electronics racks, desks, and cabinets; Lika Corporation, a marketer of printed circuit boards; and GRiD Systems—continued to expand at an accelerated growth rate in 1989. The marketing companies achieved a 15.5 percent increase in sales in 1989.

Personal Computers

In 1989, Tandy's computer sales decline of 13.4 percent was attributed to two factors: an industry-wide slowing in the low end of the market and the realignment of Radio Shack's computer marketing efforts. Until 1989, low-priced, entry-level, desktop MS-DOS computers for the home and small business market were predominantly 8088-based, and constituted a major portion of Radio Shack's low-priced product mix. Partially offsetting the decline in 8088-based products was an increase in low-end 8086 and 80286 computer sales. Dataquest estimates that Tandy ranked seventh in 1989 with 3.2 percent of the worldwide market share.

Business Computers

The acquisition of GRiD Systems and manufacturing agreements with Digital Equipment Corporation and Matsushita significantly strengthened Tandy's 1989 computer business by expanding upper-end desktop business computer and laptop and portable computer unit sales by 18.9 and 271.4 percent, respectively. In 1989, Tandy captured less than 1.0 percent of the worldwide market share.

Printers

Tandy was one of the five serial printers manufacturers that ranked in the lower 50 percentile of the 1989 market share. In this segment, the top five manufacturers captured 57 percent of the market.

Further Information

For more information about the Company's business segments, please contact the appropriate industry service.

Table 1
Five-Year Corporate Highlights (Millions of U.S. Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	$2,841.4	$3,036.0	$3,452.2	$3,793.8	$4,180.7
Percent Change	-	6.85	13.71	9.90	10.20
Capital Expenditure	$75.0	$55.0	$93.3	$94.2	$122.6
Percent of Revenue	2.64	1.81	2.70	2.48	2.93
R&D Expenditure	N/A	N/A	N/A	N/A	N/A
Percent of Revenue	N/A	N/A	N/A	N/A	N/A
Number of Employees	29,862	33,191	33,918	35,145	38,995
Revenue ($K)/Employee	$9.50	$9.10	$10.18	$10.79	$10.72
Net Income	$189.0	$197.7	$242.3	$316.3	$323.5
Percent Change	-	4.60	22.56	30.54	2.28

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	$943.68	$897.40	$985.98	N/A
Quarterly Profit	$66.68	$56.87	$62.75	N/A

N/A = Not Available

Source: Tandy Corporation Annual Reports
Dataquest
January 1990

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
North America	93.76	97.36	98.37	98.23	96.65
International	6.24	2.64	1.63	1.77	3.35
Europe	4.08	N/A	N/A	N/A	N/A
Asia/Pacific	2.16	N/A	N/A	N/A	N/A

N/A = Not Available

Source: Tandy Corporation Annual Reports

Table 3
Revenue by Distribution Channel (Percent)

Channel	1988	1989
Direct Sales	0	0
Indirect Sales	100.00	100.00
Dealers	100.00	100.00

Source: Dataquest
January 1990

MANUFACTURING LOCATIONS

North America

GRiD Systems Corp., Fremont, California
GRiD portable computers
Lika Corp., Salt Lake City, Utah
Printed circuit boards
Lika Corp., Stockton, California
Printed circuit boards
O'Sullivan Industries Inc., Lamar, Missouri
Furniture to be used with electronic products
O'Sullivan Industries Inc., South Boston, Virginia
Furniture to be used with electronic products
T. C. Antennas, Fort Worth, Texas
Mobile CB radio equipment
Tandy Electronics Business Computer, Fort Worth, Texas
Manufacturing and final assembly of business computer products
Tandy Electronics Packaging, Fort Worth, Texas
Electronics parts packaging
Tandy Instruments, Fort Worth, Texas
Printed circuit board assemblies
Tandy Magnetics, Fort Worth, Texas
Cartridge and reel-to-reel tape
Tandy Molded Products, Fort Worth, Texas
Fabricates molded products
Tandy/Rank Home Video, Northbrook, Illinois
Video cassettes
Tandy Software Assembly, Fort Worth Texas
Assembles computer diskette software, telephone and game cartridges

Japan

Tandy Electronics Japan, Ltd.
Consumer electronics research and development

Asia/Pacific

T. C. Electronics (Taiwan) Corp.
Radios, tuners, modems, amplifiers, security devices, and telephones
Tandy Electronics China, Ltd.
Telephones and cassette tape recorders

SUBSIDIARIES

United States

GRiD Systems Corporation
O'Sullivan Industries, Inc.
Tandy Credit Corporation
Tandy Electronics, Inc.

Japan

A&A International, Inc.

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1989

Toshiba
Paid GRiD for computer licenses

1988

Digital Equipment Corporation
Joint development of microcomputers

MERGERS AND ACQUISITIONS

1988

GRiD Systems
Acquired this laptop computer manufacturer

KEY OFFICERS

John V. Roach
Chairman of the board, chief executive officer and president

Herschel C. Winn
Senior vice president and secretary

John W. Burnam
Vice president

Ronald L. Parish
Vice president

Richard L. Ramsey
Vice president and controller

FOUNDER

David Tandy

Table 4
Comprehensive Financial Statement
Fiscal Year Ending June
(Millions of U.S. Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	$1,456.8	$1,419.4	$1,388.8	$1,986.0	$1,942.4
Cash	90.2	273.6	58.4	188.2	58.4
Receivables	105.2	116.2	160.4	462.4	553.4
Marketable Securities	0	0	0	0	0
Inventory	1,197.4	982.9	1,128.4	1,287.8	1,285.4
Other Current Assets	64.0	46.7	41.6	47.6	45.2
Net Property, Plants	$310.6	$301.7	$337.1	$367.3	$420.7
Other Assets	$155.6	$357.0	$236.6	$176.8	$211.2
Total Assets	$1,923.0	$2,078.1	$1,962.5	$2,530.1	$2,574.3
Total Current Liabilities	$375.0	$512.3	$302.1	$649.3	$569.0
Long-Term Debt	$320.1	$164.0	$168.2	$153.6	$113.6
Other Liabilities	$164.4	$95.3	$112.2	$124.1	$108.9
Total Liabilities	$859.5	$771.6	$582.5	$927.0	$791.5
Total Shareholders' Equity	$1,063.5	$1,306.5	$1,380.0	$1,603.1	$1,782.8
Converted Preferred Stock	0	0	0	0	0
Common Stock	95.6	95.6	95.6	95.6	95.6
Other Equity	(135.5)	(90.1)	(60.0)	(101.9)	(192.5)
Retained Earnings	1,103.4	1,301.0	1,344.4	1,609.4	1,879.7
Total Liabilities and Shareholders' Equity	$1,923.0	$2,078.1	$1,962.5	$2,530.1	$2,574.3

Income Statement	1985	1986	1987	1988	1989
Revenue	$2,841.4	$3,036.0	$3,452.2	$3,793.8	$4,180.7
U.S. Revenue	2,458.4	2,955.9	3,395.8	3,726.6	4,040.5
Non-U.S. Revenue	383.0	80.1	56.4	67.2	140.2
Cost of Sales	$1,291.8	$1,471.3	$1,700.1	$1,870.4	$2,148.5
R&D Expense	N/A	N/A	N/A	N/A	N/A
SG&A Expense	$1,102.1	$1,077.7	$1,205.6	$1,341.1	$1,441.6
Capital Expense	$75.0	$55.0	$93.3	$94.2	$122.6
Pretax Income	$351.4	$387.0	$458.8	$514.7	$527.4
Pretax Margin (%)	12.37	12.75	13.29	13.57	12.62
Effective Tax Rate (%)	46.20	48.20	46.60	38.50	38.70
Net Income	$189.0	$197.7	$242.3	$316.3	$323.5
Shares Outstanding, Millions	89.5	89.2	89.9	89.5	88.8
Per Share Data					
Earnings	$2.11	$2.22	$2.70	$3.54	$3.64
Dividends	0	0	$0.38	$0.58	$0.60
Book Value	$11.88	$14.65	$15.35	$17.91	$20.08

Table 4 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending June
(Millions of U.S. Dollars, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
Liquidity					
Current (Times)	3.88	2.77	4.60	3.06	3.41
Quick (Times)	0.69	0.85	0.86	1.08	1.15
Fixed Assets/Equity (%)	29.21	23.09	24.43	22.91	23.60
Current Liabilities/Equity (%)	35.26	39.21	21.89	40.50	31.92
Total Liabilities/Equity (%)	80.82	59.06	42.21	57.83	44.40
Profitability (%)					
Return on Assets	-	9.88	11.99	14.08	12.68
Return on Equity	-	16.68	18.04	21.21	19.11
Profit Margin	6.65	6.51	7.02	8.34	7.74
Other Key Ratios					
R&D Spending % of Revenue	N/A	N/A	N/A	N/A	N/A
Capital Spending % of Revenue	2.64	1.81	2.70	2.48	2.93
Employees					
Revenue ($K)/Employee	N/A	N/A	N/A	N/A	N/A
Capital Spending % of Assets	3.90	2.65	4.75	3.72	4.76

N/A = Not Available

Source: Tandy Corporation Annual Reports
Dataquest
January 1990

TECO Electric and Machinery Co., Ltd.

BACKGROUND

President: Huo Shan Chang

Head office: 156-2, Sung Ciang Road, Taiwan
Factory: Chung Li Plant, No. 11, An Tung Road, Chung Li Industrial District, Taiwan

Tan Shui Plant, 25, Che Lu Chiao, Hsin Jen Li, Tan-Shui, Taiwan

Hsin Chuang Plant, 20, Shih Yuan Road, Hsin Chuang, Taiwan

Telephone: Head office--(02) 562-1111
Factory--Chung Li Plant: (034) 525101
Tan Shui Plant: (02) 621-2321
Hsin Chuang Plant: (02) 992-6321

Telex: 22261 TECO

Cable: TECO TAIPEI

Capital: US$37,273,000

Established: 1956

Employees: Head office--690
Chung Li Plant--610
Tan Shui Plant--Household Electrical Appliances--350
--Electronics--350
Hsin Chuang Plant--400

Facilities: Chung Li Plant--Land space: 27.52 acres
Floor space: 11.62 acres
Tan Shiu Plant--Land space: 9.16 acres
Floor space: 8.07 acres
Hsin Chuang Plant--Land space: 9.54 acres
Floor space: 8.96 acres

TECO Electric and Machinery Co., Ltd.

MAIN PRODUCTS

- Chung Li Plant
  - Single and three-phase AC induction motors
  - 75HP and below household motors
  - Stepping motors
  - Precision casting
  - Precision molding dies
  - Freon air-conditioning compressors
- Tan Shui Plant
  - Household electrical appliances plant: window air conditioners, package air conditioners, refrigerators, washing machines
  - Electronics plant: television sets, minicomputers, display monitors, terminals, printers
- Hsin Chuang Plant: AC induction; motors (100HP and above); synchronous, DC, eddy-current, and gear motors; generator sets; industrial reports

WORLDWIDE SALES (Millions of U.S. Dollars)

	1982	1983	1984	1985	1986
Domestic	$62	$ 88	$102	$ 96	$110
Export	29	46	71	72	67
Total	$91	$134	$173	$168	$177

Source: Dataquest
March 1987

TECO Electric and Machinery Co., Ltd.

WORLDWIDE SALES BY MAJOR PRODUCT LINE (Millions of U.S. Dollars)

	1982	1983	1984	1985	1986
Data information devices	$23	$ 41	$ 50	$ 58	$ 45
Electronic home appliances	28	36	54	52	72
Industrial electric appliances	40	47	59	58	60
Total	$91	$124	$173	$168	$177

Source: Dataquest
March 1987

SEMICONDUCTORS PURCHASED--1985 (Millions of U.S. Dollars)

Total semiconductor	$3.0
IC	1.5
Discrete	1.5
Transistor	1.0
Diode	0.5

Source: Dataquest
March 1987

FOREIGN INVESTMENT

- TECO American, Inc.

  Address: 853 East Sandhill Avenue, Carson, CA 90746, U.S.
  4515 South Piedmont, Houston, TX 77041, U.S.

  Telephone: (213) 770-6680, 770-6683
  (713) 939-8899

  TWX: 910-346-6324
  TWX: 910-881-1014

TECO Electric and Machinery Co., Ltd.

- TECO Singapore Electric and Machinery (PTE), Ltd.

  Address: 26, Third Chin Bee Road, Jurong, Singapore 2261, Singapore

  Telephone: 265-4622 (10 lines)

  Telex: TECO RS 23364

- TECO Australia Pty., Ltd.

- Vertriebsstellen in Europa

  - Microscan GmbH

  Address: Uberseering 31, 2000 Hamburg 60, W. Germany

- Technology Resources SA

  Address: 114 Rue Marius Aufan, 92300 Levallois Perret, France

AFFILIATED ENTERPRISES

- Tung Pei Industrial Company, Ltd.

  Address: Horng Chuen Bldg., 6F, 219, Section 3, Nanking E. Road, Taipei, Taiwan

  Telephone: (02) 715-3211

  Main products: high-carbon chrome, steel ball bearings

- TAIAN Electric Company, Ltd.

  Address: 156-2 Sung Chiang Road, Taipei, Taiwan

  Telephone: (02) 511-1181/6

  Main products: magnetic contactors and switches

- Liang Yuan Household Electric and Electronic Appliances Company, Ltd.

  Address: 27, Section 1, Chung Hwa Road, Taipei, Taiwan

  Telephone: (02) 381-0707

  Main products: TECO's electronic household products

TECO Electric and Machinery Co., Ltd.

- United Microelectronics Corporation

  Address: 9F, 201-26, Tun Hua N. Road, Taipei, Taiwan
  Taipei (Taipei Office)

  Telephone: (02) 715-2455

  Main products: ICs

- Lien Chang Electronic Enterprise Company, Ltd.

  Address: 224 Hsin Shu Road, Hsin Chuang, Taiwan

  Telephone: (02) 901-5143/5

  Main products: deflection yokes and fly-back transformers

- Great TECO Trade Company, Ltd.

  Address: 413 Chi Lin Road, Taipei, Taiwan

  Telephone: (02) 559-6666

  Main products: Whirlpool's electronic household products

- TONG DAI Company, Ltd.

  Address: 66 Szechwan Road, Tai Chung, Taiwan

  Telephone: (02) 254-2415

  FAX: (04) 222-3226

Tegra/Varityper, Inc.

11 Mt. Pleasant Avenue
East Hanover, New Jersey 07936
Telephone: (201) 887-8000
Fax: (201) 884-6201
Dun's Number: Not Available

Date Founded: 1883

CORPORATE STRATEGIC DIRECTION

Varityper, Inc., is one of the oldest US business organizations, with roots dating back to a Civil War correspondent James B. Hammond. He developed the "VariTyper," the first typewriter to use proportional spacing and changeable type styles and sizes. Today, Varityper is recognized as one of the world's leading suppliers of high-resolution professional systems for both in-house and commercial imagesetting applications.

Tegra, Inc., the parent company, based in Billerica, Massachusetts, established itself in the publishing market in 1984 by introducing a highly successful imaging system architecture that enables more than one image recorder to work from the same processor. Called the Tegra Image Controller, this system was the cornerstone from which the Tegra line of laser image recorders evolved. In 1988, Tegra acquired the Varityper Division of AM International, Inc. Since that time, the operations of Tegra and Varityper have been merged. Varityper, Inc., remains the operating company and, combined with Tegra's unique technology, has become a high-resolution imagesetting devices and systems company.

Because Varityper is a wholly owned subsidiary of Tegra, which is a privately held company, no financial information is available.

BUSINESS SEGMENT STRATEGIC DIRECTION

Varityper's Adobe PostScript-based devices include the VT600 family of 600-dots-per-inch (dpi) plain paper imagesetters offered in two models. The VT600 is targeted at desktop publishing users. It provides an easy add-on to their systems, with image resolution that cannot be met by the users' basic systems. The Varityper Series 4000 family of laser imagesetters offers very high-resolution imaging on either photographic paper or film. Available in resolutions ranging from 900 dpi through 3,048 dpi, these devices meet the requirements of high-quality typesetting and printing using only the PostScript language.

Varityper's VT600Plus (VT600P) is the first PostScript 600-dpi plain paper laser printer. The VT600P was developed for corporate electronic publishing users who wish to increase their output quality without investing in more costly phototypesetting equipment. The VT600W is the industry's first 600-dpi PostScript laser printer able to output to 11 x 17-inch (ledger size) plain paper. The VT600W was developed for applications such as engineering computer-aided design and manufacturing (CAD/CAM) drawings, financial reports, and newspaper and book publishing.

Products originating from Tegra's technology are designated the Varityper Series 5000. This series is based on the use of an Image Controller that is an advanced combination of computer technology and proprietary software. Unlike the Adobe PostScript-based family of products described above (which are limited to the setting of images created by PostScript software), the Image Controller is specifically designed to offer extreme flexibility to emulate a wide variety of other high-resolution output devices and to interface to many different text and graphic input systems. Plain paper models include the Model 5100, which offers 1,000 dpi on paper sizes up to 11 x 17 inches and A3 European size; and the Model 5510, which also offers 1,000 dpi on paper sizes up to 24 x 36 inches.

The Series 5000 is targeted at users needing high-quality proofs in large publishing operations. The Series 5000 photomedia line includes the

Model 5320, which offers 72-pica width and 2,000-dpi resolution; the Model 5330, with 72-pica width and 3,000-dpi resolution; and the Model 5500, which offers 108-pica width and 1,000-dpi resolution and is targeted at the newspaper market.

EPICS Composition System

EPICS is a multiterminal, multitasking text management and batch composition system. EPICS supports a network of up to eight workstations. Each terminal has access to the common database (on Winchester disk) and can direct output to up to nine available typesetters, including Varityper's VT600 and 4300 laser imagesetters.

The EPICS graphics server captures, edits, and stores bit map graphics for display on the EPICS 20/20 terminal and/or high-resolution output through the VT600 plain paper laser printer or the 4300 laser imagesetter, Series 4000 Postscript, and Series 5000 PostScript, or in the Tegra language.

Further Information

For further information about the Company's business segments, please contact the appropriate Dataquest industry service.

1989 SALES OFFICE LOCATIONS

North America—32
Europe—Distributed by AM International
Asia/Pacific—Distributed by AM International
ROW—Distributed by AM International

MANUFACTURING LOCATIONS

North America

East Hanover, New Jersey (United States)
EPICS, imagesetters, typesetters

SUBSIDIARIES

Information is not available.

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

Information is not available.

MERGERS AND ACQUISITIONS

Information is not available.

KEY OFFICERS

Donald P. Moffet
Chairman of the board, chief executive officer

Robert Trenkamp
President

E. E. Hale
Senior vice president

Pat T. Juliano
Vice president of Sales

James Marlow
Vice president of Finance

Ed Fortier
Director of Customer Services

Wilfred Harvey
Vice president of Manufacturing

William Brine
Vice president of Type and Supplies

Dave Lehn
Director of Product Marketing

PRINCIPAL INVESTORS

Information is not available.

FOUNDERS

Information is not available.

Tektronix, Incorporated

14150 S.W. Karl Braun Drive
Beaverton, Oregon 97077
Telephone: (503)627-7111
Fax: (503) 627-5139
Dun's Number: 00-902-0231

Date Founded: 1946

CORPORATE STRATEGIC DIRECTION

Tektronix, Incorporated, is a leading supplier of electronic equipment and systems in the areas of test and measurement, visual systems, and communications. The Company has a catalog of more than 3,000 products. Tektronix serves over 50,000 customers, none of whom account for more than 4 percent of total sales.

In May 1990, Tektronix announced a major restructuring and work force reduction that resulted in a one-time charge of approximately $70 million. The employment reduction will affect 1,300 employees (primarily those in the test and measurement division), lowering total employment to about 13,000. Also, Tektronix will sell or close certain of its noncore businesses in its test and measurement and nontelevision-related communications areas. Steps to reduce costs and increase effectiveness in domestic and international distribution are also being taken.

Recent Tektronix ventures have proved successful in some areas and quite costly in others. Sixty-two percent of total sales have come from new products introduced since 1986, but an unsuccessful attempt to enter the computer-aided engineering (CAE) software field cost the Company approximately $200 million. The failure to return the Company to profitability in fiscal 1990 led to the replacement of Tektronix's CEO in April 1990.

Tektronix's total revenue decreased 2 percent from 1989 figures, totaling $1.41 billion in fiscal 1990. The decrease was primarily a reflection of the test and measurement revenue decline, as the visual systems and communications groups each showed revenue increases. Net income decreased from $18.9 million in 1989 to a net loss of $92.6 million in fiscal 1990. The year, particularly the fourth quarter, was affected significantly by charges against income for costs of restructuring, including employment reductions and asset write-downs.

The US sales contribution to total revenue fell slightly to $757.7 million in 1990, down from $768.0 million in 1989. That figure represents 54 percent of the total revenue, the same percentage as in 1988. Forty-three percent of Tektronix's sales offices are in US locations. The Company has manufacturing facilities in the United States, Europe, Japan, Hong Kong, and India.

R&D expenditure totaled $195 million, or nearly 14 percent of revenue. In spite of decreasing profits in the last few years, R&D expenditure has remained relatively consistent.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Test and Measurement

Test and measurement products are used in a wide variety of applications, including scientific research; digital and analog design of electronic equipment; engineering verification and production testing of integrated circuits; electromechanical design; the

manufacturing, testing, and servicing of electronic equipment; and education. Tektronix is the world leader in digital and analog oscilloscopes, digitizers, and semiconductor curve tracers, and is a leader in other test equipment product categories, including logic analyzers, spectrum analyzers, and card-modular instruments.

The Company also produces a variety of additional test and measurement products, including digital VLSI semiconductor test systems, counters, multimeters, and signal sources. Also included in test and measurement products are components such as circuit boards, integrated circuits, hybrid circuits, and displays.

Sales of test and measurement products totaled $799.5 million in fiscal 1990, representing 57 percent of Tektronix's total. The test and measurement division experienced a 7 percent decrease in sales from 1989.

Visual Systems

Visual systems products are used in applications such as computer-aided mechanical engineering, process control, earth resources, scientific data analysis, molecular modeling, graphic arts, and business presentations. The Company is a leading supplier of graphics terminals, and in 1987 entered the growing workstation market. Tektronix is also a player in the growing high-performance color graphics printer business.

Visual systems revenue came to $307.3 million in 1990, accounting for 22 percent of Tektronix's total sales. That figure represents a 10 percent increase from this division's 1989 revenue.

Graphics Terminals

Dataquest estimates that Tektronix ranked third in worldwide sales of graphics terminals in 1989 based on revenue of $130.6 million. Tektronix's revenue in this industry was essentially unchanged from that of 1988, whereas the industry overall showed a 9 percent decrease in units shipped and an 18 percent decline in revenue. Dataquest believes that the industry can recover in 1990 partly due to the X Window system.

Tektronix has positioned its new family of terminals in the midrange to high end of the terminal spectrum. Combined with previously announced products at the low end, Tektronix offers one of the widest choices of graphics devices available. The new terminals offer good graphics with workstation connectivity; these products are closer to diskless workstations than traditional terminals.

Workstations

In April 1989, Tektronix announced its second-generation graphics workstation product line, the XD88. The Motorola 88000 CPU gives the new products 14 to 17 mips of computing power, which, when combined with the high-quality graphics capability, places them in the high end of the line in the superworkstation category.

In January 1990, Tektronix introduced the second in a series of RISC coprocessor boards using Motorola's new 88000 RISC architecture. The RP88B25 coprocessor for the Mac II has a built-in floating-point processor, providing up to 9 million floating-point operations per second (mflops) and 21 million instructions per second (mips). Software applications configured for the new 25-MHz coprocessor will run up to 37 times faster than standard Mac II 68020-based configurations. The RP88B25 coprocessor is sold through Tektronix's Advance Technologies group.

Dataquest estimates that Tektronix captured 1 percent of the worldwide workstation market in 1989, based on revenue of $62.9 million.

Color Printers

Tektronix manufactures PostScript-compatible thermal wax printers, which produce lush images on ink-impregnated wax paper. Sales in 1989 were higher than the Company expected. The printer is being used by engineers who need working copies of their designs, fashion designers, and people in organizations who make presentations and need impressive color overheads.

Communications

Communications products serve the test and production needs of the television and telecommunication industries. Television applications, which make up more than 75 percent of this product class, include

live production, post-production, broadcast operations and control, and TV equipment manufacturing and service. Tektronix is the leading worldwide supplier of television test equipment, including waveform monitors, vectorscopes, signal generators, and test systems.

The Company's Grass Valley Group subsidiary is a leading worldwide supplier of television production equipment such as routers, switchers, editors, and digital effects systems.

Telecommunications applications include testing the content of local area networks (LANs) and the physical integrity of cable and optical fiber. Products include coaxial and fiber-optic cable testers, network analyzers, and fiber-optic links.

Communications products contributed 21 percent of Tektronix's revenue in 1990, totaling $301.5 million. This represented a slight increase over 1989 revenue.

Further Information

For further information about the Company's business segments, please contact the appropriate Dataquest industry service.

Table 1
Five-Year Corporate Highlights (Millions of US Dollars)

	1986	1987	1988	1989	1990
Five-Year Revenue	$1,352.2	$1,395.9	$1,411.9	$1,433.0	$1,408.3
Percent Change	(5.97)	3.23	1.15	1.49	(1.72)
Capital Expenditure	$70.1	$65.9	$77.9	$85.8	$80.4
Percent of Revenue	5.18	4.72	5.52	5.99	5.71
R&D Expenditure	$201.2	$199.6	$215.6	$189.2	$194.6
Percent of Revenue	14.88	14.30	15.27	13.20	13.82
Number of Employees	19,251	17,099	16,085	15,708	13,941
Revenue ($K)/Employee	$70.24	$81.64	$87.78	$91.23	$101.02
Net Income	$39.3	$51.2	($16.7)	$18.9	($92.6)
Percent Change	(56.43)	30.28	(132.62)	213.17	(592.06)

1990 Fiscal Year	Q1	Q2	Q3	Q4
Quarterly Revenue	$294.1	$330.1	$421.8	$362.3
Quarterly Profit	($1.86)	$463.0	($25.5)	($5.7)

Source: Tektronix, Incorporated
Annual Reports and Forms 10-K
Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1986	1987	1988	1989	1990
North America	70.03	66.57	67.33	68.37	68.92
International	29.97	33.43	32.67	31.63	31.08
Europe	26.00	30.00	28.00	27.00	26.55
Others	3.97	3.43	4.67	4.63	4.53

Source: Tektronix, Incorporated
Annual Reports and Forms 10-K
Dataquest (1990)

Table 3
Revenue by Distribution Channel (Percent)

Channel	1989*	1990*
Direct Sales	97.00	97.00
Indirect Sales	3.00	3.00
Distributors	3.00	3.00

*Dataquest estimate

Source: Dataquest (1990)

1989 SALES OFFICE LOCATIONS

North America—54
Europe—40
Asia/Pacific—28
  Japan—9
ROW—3

MANUFACTURING LOCATIONS

North America

Beaverton, Oregon
  Function not available
Forest Grove, Oregon
  Etched circuit boards
Portland, Oregon
  Function not available
Redmond, Oregon
  Function not available
Vancouver, Washington
  Instrument products
Wilsonville, Oregon
  Function not available

Europe

Tektronix Guernsey Limited, Channel Island of Guernsey, United Kingdom
Tektronix Holland, N.V., Heerenveen, Netherlands
Tektronix U.K. Limited, Hoddesdon, United Kingdom

Asia/Pacific

Sony/Tektronix Corporation, Tokyo and Gotemba, Japan
Tektronix Hong Kong Limited

SUBSIDIARIES

North America

Dubner Computer Systems, Inc. (Fort Lee, New Jersey)
G.V.G. International, Limited (Grass Valley, California)
Grass Valley International, Inc. (St. Thomas, US Virgin Islands)
LP Com, Inc. (Mountain View, California)
Tektronix Asia, Limited (Beaverton, Oregon)
Tektronix Canada Inc. (Canada)
Tektronix Development Company (Beaverton, Oregon)
Tektronix Foreign Sales Corporation (St. Thomas, US Virgin Islands)
The Grass Valley Group, Inc. (Grass Valley, California)
TriQuint Semiconductor, Inc. (Beaverton, Oregon)

Europe

Bouwerij Heerenveen N.V. (Netherlands)
Tektronix AB (Sweden)
Tektronix A/S (Denmark)
Tektronix Espanola S.A. (Spain)
Tektronix Europe B.V. (Netherlands)
Tektronix (France)
Tektronix GmbH (Austria)
Tektronix GmbH (Germany)
Tektronix Guernsey Limited (Channel Island of Guernsey, United Kingdom)
Tektronix Holland N.V. (Netherlands)
Tektronix International A.G. (Switzerland)
Tektronix Limited (Channel Island of Guernsey, United Kingdom)
Tektronix N.Z. Limited (New Zealand)
Tektronix Norge A/S (Norway)
Tektronix Oy (Finland)
Tektronix S.A. (Belgium)
Tektronix S.p.A. (Italy)
Tektronix U.K. Limited (England)

Asia/Pacific

Sony/Tektronix Corporation (Japan)
Tektronix Australia Pty. Limited (Australia)
Tektronix China Limited (Hong Kong)
Tektronix Taiwan Limited (Taiwan)

ROW

Tektronix-Industria e Comercio Ltda. (Brazil)
Tektronix S.A. de C.V. (Mexico)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

JR Group
  As an addition to its comprehensive range of Tektronix products, the JR Group now offers the Tektronix 222 digital storage oscilloscope.

Image Data Corp.
Tektronix announced a strategic partnership with Image Data. The objective is to create a fully integrated image, graphics, and video workstation based on Tektronix's 88000-based technology.

Racal-Dana
To strengthen its position as the first commercial VXIbus systems integrator, Racal-Dana signed an agreement to distribute Tektronix Test Management System (TMS) software. TekTMS is a complete interactive system directed at increasing productivity in the process of developing, debugging, and executing test programs.

Taq Communications Corp.
Taq signed an OEM agreement with Tektronix for the Taq Remote Access Intelligent Test Switch (TRAITS) product line. The nonexclusive agreement has a duration of 42 months. TRAITS is a network management system that allows remote testing of communication network nodes from a centralized service location using an IBM-compatible PC.

1989

Parametric Technology Corp.
Parametric Technology's Pro/ENGINEER software is the latest CAD/CAM package to support Tektronix's XD88 graphics superworkstations. Pro/ENGINEER is a parametric, feature-driven solids modeling system that has gained acceptance in the mechanical engineering market.

Oracle Corporation
The companies have a joint technology and marketing agreement to develop the ORACLE relational database management system for use with Tektronix workstations.

1987

URW Karow Rubow Weber GmbH
Tektronix licensed its font technology and several URW typefaces for future use.

MERGERS AND ACQUISITIONS

1989

Colorado Data Systems Inc.
Tektronix acquired Colorado Data Systems, which manufactures C-size cards as well as other modular instruments.

KEY OFFICERS

Robert W. Lundeen
Chairman of the board and chief executive officer

William D. Walker
President and chief operating officer

Gary P. Arnold
Vice president and chief financial officer

Charles H. Frost
Vice president, Public Affairs

Stephen D. Kerman
Vice president and general manager, Worldwide Marketing and Sales

R. Allen Leedy, Jr.
Vice president, secretary, and general counsel

Philip J. Robinson
Vice president, Administration

PRINCIPAL INVESTORS

FMR Corp.—9.93 percent
Jean Vollum—8.10 percent
Dodge & Cox—6.44 percent
The Capital Group—6.29 percent
PRIMECAP Management—5.79 percent
Manning & Napier Advisors—5.44 percent

FOUNDERS

Jack Murdock
Howard Vollum

Table 4
Comprehensive Financial Statement
Fiscal Year Ending May
(Millions of US Dollars, except Per Share Data)

Balance Sheet	1986	1987	1988	1989	1990
Total Current Assets	$727.5	$696.8	$544.3	$549.3	$522.5
Cash	116.4	190.2	48.9	70.7	71.5
Receivables	240.1	251.6	262.3	259.4	246.1
Marketable Securities	142.0	52.6	0.2	0	0
Inventory	165.0	146.2	180.9	183.9	165.9
Other Current Assets	64.0	56.2	52.0	35.3	39.1
Net Property, Plants	$379.6	$357.6	$347.5	$344.5	$361.3
Other Assets	$89.9	$105.0	$132.5	$129.2	$89.5
Total Assets	$1,197.0	$1,159.4	$1,024.3	$1,023.0	$973.3
Total Current Liabilities	$319.4	$229.2	$249.9	$357.0	$339.9
Long-Term Debt	$10.9	$50.9	$219.4	$113.9	$175.1
Other Liabilities	$29.7	$40.9	$57.5	$54.8	$73.7
Total Liabilities	$360.0	$321.0	$526.8	$525.7	$588.7
Total Shareholders' Equity	$837.0	$838.4	$497.5	$497.3	$384.6
Common Stock	130.8	130.6	149.7	167.3	166.8
Other Equity	(70.4)	(95.9)	55.7	36.1	33.9
Retained Earnings	776.6	803.7	292.1	293.9	183.9
Total Liabilities and Shareholders' Equity	$1,197.0	$1,159.4	$1,024.3	$1,023.0	$973.3

Income Statement	1986	1987	1988	1989	1990
Revenue	$1,352.2	$1,395.9	$1,411.9	$1,433.0	$1,408.3
US Revenue	946.9	929.2	950.7	979.7	970.6
Non-US Revenue	405.3	466.7	461.2	453.3	437.7
Cost of Sales	$673.4	$639.7	$685.6	$705.7	$731.1
R&D Expense	$201.2	$199.6	$215.6	$189.2	$194.6
SG&A Expense	$393.0	$402.3	$450.4	$443.2	$449.8
Capital Expense	$70.1	$65.9	$77.9	$85.8	$80.4
Pretax Income	$42.3	$103.0	$15.6	$57.3	($70.3)
Pretax Margin (%)	3.13	7.38	1.10	4.00	(4.99)
Effective Tax Rate (%)	NA	NA	NA	NA	NA
Net Income	$39.3	$51.2	($16.7)	$18.9	($92.6)
Shares Outstanding, Millions	40.0	38.4	30.1	28.5	29.0
Per Share Data					
Earnings	$0.98	$1.33	($0.55)	$0.66	($3.19)
Dividend	$0.50	$0.55	$0.60	$0.60	$0.60
Book Value	$20.93	$21.83	$16.53	$17.45	$13.26

Table 4 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending May
(Millions of US Dollars, except Per Share Data)

Key Financial Ratios	1986	1987	1988	1989	1990
Liquidity					
Current (Times)	2.28	3.04	2.18	1.54	1.54
Quick (Times)	1.76	2.40	1.45	1.02	1.05
Fixed Assets/Equity (%)	45.35	42.65	69.85	69.27	93.94
Current Liabilities/Equity (%)	38.16	27.34	50.23	71.79	88.38
Total Liabilities/Equity (%)	43.01	38.29	105.89	105.71	153.07
Profitability (%)					
Return on Assets	3.25	4.35	(1.53)	1.85	(9.32)
Return on Equity	4.65	6.11	(2.50)	3.80	(21.09)
Profit Margin	2.91	3.67	(1.18)	1.32	(6.60)
Other Key Ratios					
R&D Spending % of Revenue	14.88	14.30	15.27	13.20	13.82
Capital Spending % of Revenue	5.18	4.72	5.52	5.99	5.71
Employees	19,251	17,099	16,085	15,708	13,941
Revenue ($K)/Employee	$70.24	$81.64	$87.78	$91.23	$101.02
Capital Spending % of Assets	5.86	5.68	7.61	8.39	8.26

NA = Not available

Source: Tektronix, Incorporated
Annual Reports and Forms 10-K
Dataquest (1990)

Tektronix, Incorporated

14150 S.W. Karl Braun Drive
Beaverton, Oregon 97077
Telephone: (503)627-7111
Fax: (503) 627-5139
Dun's Number: 00-902-0231

Date Founded: 1946

CORPORATE STRATEGIC DIRECTION

Tektronix, Incorporated, is a leading supplier of electronic products and systems in the areas of test and measurement, computer graphics, and communications. Test and measurement products made up 60 percent of Tektronix's sales in fiscal 1989, down 3 percent from 1988. Visual systems products sales made up 19 percent of sales and were down 1 percent in 1989, after a 16 percent decline in 1988. Communications products made up 21 percent of sales in fiscal 1989, increasing 20 percent over 1988, following an increase of 19 percent in 1988 over 1987.

Tektronix's total revenue increased 1.5 percent to $1.433 billion* in fiscal 1989 from $1.412 billion in fiscal 1988. Net income increased 213 percent to $18.9 million in 1989 from a $16.7 million loss in fiscal 1988. Tektronix employs more than 15,000 people worldwide.

The U.S. sales contribution to the Company's total revenue grew to $979.7 million in 1989, accounting for 68 percent of the total, up slightly from 67 percent in fiscal 1988. Thirty-seven percent of Tektronix's 122 sales offices are in U.S. locations. The Company has manufacturing sites worldwide with a concentration in the United States.

Research and development expenditures totaled $189.2 million in fiscal 1989, representing 13 percent of Tektronix's revenue. Capital spending totaled $85.8 million in fiscal 1989, or 6 percent of revenue.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this profile.

*All dollar amounts are in U.S. dollars.

BUSINESS SEGMENT STRATEGIC DIRECTION

Test and Measurement

Test and measurement products are used in a wide variety of applications, including scientific research; digital and analog design of electronic equipment; engineering verification and production testing of integrated circuits; electromechanical design; the manufacturing, testing, and servicing of electronic equipment; and education. Tektronix is the world leader in digital and analog oscilloscopes, digitizers, and semiconductor curve tracers, and is a leader in other test equipment product categories, including logic analyzers and spectrum analyzers. Dataquest believes that in the digital protocol analyzer market, there is no dominant supplier. The market has low barriers to entry. It is a growing market ($675.9 million in 1988) with more than 72 participating companies; no market share estimates were available.

The Company also produces a variety of additional test and measurement products, including digital VLSI semiconductor test systems, counters, multimeters, and signal sources. Also included in test and measurement products are components such as circuit boards, integrated circuits, hybrid circuits, and displays.

Visual Systems

Visual systems products are used in applications such as mechanical engineering CAD, process control, earth resources, scientific data analysis, and desktop

publishing. The Company is the leading supplier of graphics computer terminals, and in 1987 entered the growing workstation market. Tektronix is also a player in the growing high-performance color graphics printer business.

Graphics Terminals

Dataquest estimates that Tektronix ranked as the number one graphics terminal company in 1988, with 27 percent of the worldwide market share. Sales have declined an average 4 percent over the last five years because of a decline in the graphics terminal market caused mainly by customers moving from terminals to workstations.

Tektronix has positioned its new family of terminals in the midrange to high end of the terminal spectrum. Combined with previously announced products at the low end, Tektronix offers one of the widest choices of graphics devices available. The new terminals offer good graphics with workstation connectivity; these products are closer to diskless workstations than traditional terminals.

Workstations

In April 1989, Tektronix announced its second-generation graphics workstation product line, the XD88. The Motorola 88000 CPU gives the new products 14 to 17 mips of computing power, which, when combined with the high-quality graphics capability, places the high end of the line in the super-workstation category.

This second-generation offering is a strong signal that Tektronix is committed. Dataquest believes that Tektronix will become a strong player in the industry, although in 1988, the Company captured less than 1 percent of the worldwide market share.

Color Printers

Tektronix manufactures PostScript-compatible thermal-wax printers, which produce lush images on ink-impregnated wax paper. Sales in 1989 were higher than the Company expected. The printer is being used by engineers who need working copies of their designs, fashion designers, and people in organizations who make presentations and need impressive color overheads. Dataquest estimates Tektronix to be ranked in the lower 15 percent of line printer companies. In this industry, the top five manufacturing companies captured 73 percent of the market.

Communications

Communications products serve the test and production needs of the television and telecommunication industries. Television applications, which make up more than 75 percent of this product class, include live production, post-production, broadcast operations and control, and TV equipment manufacturing and service. The Company is the leading worldwide supplier of television test equipment, including waveform monitors, vectorscopes, signal generators, and test systems.

Telecommunications applications include testing the content of local area networks (LANs) and the physical integrity of cable and optical fiber. Products include coaxial and fiber-optic cable testers, network analyzers, and fiber-optic links.

Further Information

For further information about the Company's business segments, please contact the appropriate industry service.

Table 1
Five-Year Corporate Highlights (Millions of U.S. Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	$1,438.1	$1,352.2	$1,395.9	$1,411.9	$1,433.0
Percent Change	-	(5.97)	3.23	1.15	1.49
Capital Expenditure	$78.3	$70.1	$65.9	$77.9	$85.8
Percent of Revenue	5.44	5.18	4.72	5.52	5.99
R&D Expenditure	$191.2	$201.2	$199.6	$215.6	$189.2
Percent of Revenue	13.30	14.88	14.30	15.27	13.20
Number of Employees	20,525	19,251	17,099	16,085	15,708
Revenue ($K)/Employee	$70.07	$70.24	$81.64	$87.78	$91.23
Net Income	$90.2	$39.3	$51.2	($16.7)	$18.9
Percent Change	-	(56.43)	30.28	(132.62)	213.17

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	$434.1	$294.08	N/A	N/A
Quarterly Profit	$6.38	$7.39	N/A	N/A

N/A = Not Available

Source: Tektronix, Inc. Annual Reports Dataquest January 1990

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
North America	73.17	70.03	66.57	67.33	68.37
International	26.83	29.97	33.43	32.67	31.63
Europe	23.00	26.00	30.00	28.00	27.00
Other	3.83	3.97	3.43	4.67	4.63

Source: Tektronix, Inc. Annual Reports Dataquest January 1990

Table 3
Revenue by Distribution Channel (Percent)

Channel	1988	1989
Direct Sales	98.00	97.00
Indirect Sales	2.00	3.00
Distributors	2.00	3.00

Source: Dataquest January 1990

1989 SALES OFFICE LOCATIONS

North America—54
Japan—9
Europe—40
Asia/Pacific—19
ROW—3

MANUFACTURING LOCATIONS

North America

Beaverton, Oregon
Function not available
Forest Grove, Oregon
Etched circuit boards
Portland, Oregon
Function not available
Redmond, Oregon
Function not available
Vancouver, Washington
Instrument products
Wilsonville, Oregon
Function not available

Japan

Sony/Tektronix Corporation, Tokyo and Gotemba

Europe

Tektronix Guernsey Limited, Guernsey, Channel Islands
Tektronix Holland, N.V., Heerenveen, Netherlands
Tektronix U.K. Limited, Hoddesdon, United Kingdom

Asia/Pacific

Tektronix Hong Kong Limited

SUBSIDIARIES

North America

Dubner Computer Systems, Inc., Fort Lee, New Jersey
G.V.G. International, Limited, Grass Valley, California
Grass Valley International, Inc., St. Thomas, U.S. Virgin Islands
LP Com, Inc., Mountain View, California
Tektronix Asia, Limited, Beaverton, Oregon
Tektronix Canada Inc., Canada
Tektronix Development Company, Beaverton, Oregon
Tektronix Foreign Sales Corporation, St. Thomas, U.S. Virgin Islands
The Grass Valley Group, Inc., Grass Valley, California
TriQuint Semiconductor, Inc., Beaverton, Oregon

Japan

Sony/Tektronix Corporation

Europe

Bouwerij Heerenveen N.V., Netherlands
Tektronix A/S, Denmark
Tektronix AB, Sweden
Tektronix Espanola S.A., Spain
Tektronix Europe BV, Netherlands
Tektronix, France
Tektronix Ges.m.b.H., Austria
Tektronix G.m.b.H., Germany
Tektronix Guernsey Limited, Channel Island of Guernsey
Tektronix Holland N.V., Netherlands
Tektronix International A.G., Switzerland
Tektronix Limited, Channel Island of Guernsey
Tektronix Norge A/S, Norway
Tektronix Oy, Finland
Tektronix S.A., Belgium
Tektronix S.p.A., Italy
Tektronix U.K. Limited, England

Asia/Pacific

Tektronix Australia Pty. Limited, Australia
Tektronix China Limited, Hong Kong
Tektronix N.Z. Limited, New Zealand
Tektronix Taiwan Limited, Taiwan

ROW

Tektronix-Industria e Comercio Ltda., Brazil
Tektronix S.A. de C.V., Mexico

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1989

Oracle Corporation
The companies have a joint technology and marketing agreement to develop the ORACLE relational database management system for use with Tektronix workstations.

1987

URW Karow Rubow Weber GmbH
Tektronix licensed its font technology and several URW typefaces for future use.

MERGERS AND ACQUISITIONS

1989

Colorado Data Systems Inc.
Tektronix acquired Colorado Data Systems, which manufactures C-size cards as well as other modular instruments.

KEY OFFICERS

David P. Friedley
President and chief executive officer

Charles H. Frost
Vice president, Public Affairs

Lawrence R. Kaplan
Vice president and general manager, Visual Systems Group

Richard I. Knight
Vice president and general manager, Test and Measurement Group

R. Allen Leedy, Jr.
Vice president, secretary, and general counsel; acting manager, Finance and Control

Tom Long
Vice president and general manager, Technology Group

Philip J. Robinson
Vice president, Administration

Daniel G. Wright
Vice president and general manager, Communications Group

PRINCIPAL INVESTORS

Capital Group, Inc.—8.14 percent
Vollum, Jean—8.13 percent
Dodge & Cox—6.77 percent
Primecap Management Company—6.60 percent

FOUNDERS

Jack Murdock
Howard Vollum

Table 4
Comprehensive Financial Statement
Fiscal Year Ending May
(Millions of U.S. Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	$765.8	$727.5	$696.8	$544.3	$549.3
Cash	115.5	116.4	190.2	48.9	70.7
Receivables	279.8	240.1	251.6	262.3	259.4
Marketable Securities	117.0	142.0	52.6	0.2	0
Inventory	219.1	165.0	146.2	180.9	183.9
Other Current Assets	34.4	64.0	56.2	52.0	35.3
Net Property, Plants	$398.5	$379.6	$357.6	$347.5	$344.5
Other Assets	$60.0	$89.9	$105.0	$132.5	$129.2
Total Assets	$1,224.3	$1,197.0	$1,159.4	$1,024.3	$1,023.0
Total Current Liabilities	$228.4	$319.4	$229.2	$249.9	$357.0
Long-Term Debt	$92.1	$10.9	$50.9	$219.4	$113.9
Other Liabilities	$48.8	$29.7	$40.9	$57.5	$54.8
Total Liabilities	$369.3	$360.0	$321.0	$526.8	$525.7
Total Shareholders' Equity	$855.0	$837.0	$838.4	$497.5	$497.3
Converted Preferred Stock	0	0	0	0	0
Common Stock	128.3	130.8	130.6	149.7	167.3
Other Equity	(30.6)	(70.4)	(95.9)	55.7	36.1
Retained Earnings	757.3	776.6	803.7	292.1	293.9
Total Liabilities and Shareholders' Equity	$1,224.3	$1,197.0	$1,159.4	$1,024.3	$1,023.0

Income Statement	1985	1986	1987	1988	1989
Revenue	$1,438.1	$1,352.2	$1,395.9	$1,411.9	$1,433.0
U.S. Revenue	1,052.3	946.9	929.2	950.7	979.7
Non-U.S. Revenue	385.8	405.3	466.7	461.2	453.3
Cost of Sales	$705.9	$673.4	$639.7	$685.6	$705.7
R&D Expense	$191.2	$201.2	$199.6	$215.6	$189.2
SG&A Expense	$355.9	$393.0	$402.3	$450.4	$443.2
Capital Expense	$78.3	$70.1	$65.9	$77.9	$85.8
Pretax Income	$120.4	$42.3	$103.0	$15.6	$57.3
Pretax Margin (%)	8.37	3.13	7.38	1.10	4.00
Effective Tax Rate (%)	N/A	N/A	N/A	N/A	N/A
Net Income	$90.2	$39.3	$51.2	($16.7)	$18.9
Shares Outstanding, Millions	40.9	40.0	38.4	30.1	28.5
Per Share Data					
Earnings	$2.20	$0.98	$1.33	($0.55)	$0.66
Dividends	$0.50	$0.50	$0.55	$0.60	$0.60
Book Value	$20.90	$20.93	$21.83	$16.53	$17.45

Table 4 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending May
(Millions of U.S. Dollars, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
Liquidity					
Current (Times)	3.35	2.28	3.04	2.18	1.54
Quick (Times)	2.39	1.76	2.40	1.45	1.02
Fixed Assets/Equity (%)	46.61	45.35	42.65	69.85	69.27
Current Liabilities/Equity (%)	26.71	38.16	27.34	50.23	71.79
Total Liabilities/Equity (%)	43.19	43.01	38.29	105.89	105.71
Profitability (%)					
Return on Assets	-	3.25	4.35	(1.53)	1.85
Return on Equity	-	4.65	6.11	(2.50)	3.80
Profit Margin	6.27	2.91	3.67	(1.18)	1.32
Other Key Ratios					
R&D Spending % of Revenue	13.30	14.88	14.30	15.27	13.20
Capital Spending % of Revenue	5.44	5.18	4.72	5.52	5.99
Employees	20,525	19,251	17,099	16,085	15,708
Revenue ($K)/Employee	$70.07	$70.24	$81.64	$87.78	$91.23
Capital Spending % of Assets	6.40	5.86	5.68	7.61	8.39

N/A = Not Available

Source: Tektronix, Inc. Annual Reports
Dataquest
January 1990

Telecom*USA

780 Douglas Road, Suite 800
Atlanta, Georgia 30342
Telephone: (404) 250-5500
Fax: (404) 250-5591

Date Founded: 1988

CORPORATE STRATEGIC DIRECTION

Telecom*USA came into existence as a result of a one-for-one exchange of 12.9 million shares of common stock, effective on December 14, 1988, when SouthernNet*USA and Teleconnect*USA merged operations. SouthernNet became the holding company and promptly changed its name to Telecom*USA. Also on December 14, 1988, Touch and Save of Nashville, Inc., a long distance telephone company, was acquired by Telecom*USA in exchange for 125,000 shares of common stock. On January 22, 1988, SouthernNet acquired all of the outstanding common and Class C preferred stock of Southland Communications Corporation (Southland), making Southland a subsidiary of Telecom*USA. Southland offers local telephone services and switched and dedicated long distance services to commercial and residential customers. Telecom*USA is the fourth largest long distance telephone company in the United States.

Since Telecom*USA became a legal entity and the holding company for SouthernNet*USA and Teleconnect*USA on December 14, 1988, the financial statements reflect the aggregate operations of SouthernNet, Southland, Teleconnect, and Touch and Save, all of which have been accounted for as pooling of interests.

Telecom*USA reported an increase in revenue from $395.8 million* in 1987 to $523.7 million in 1988, a growth rate of 32 percent. This revenue increase is the combination of an increase in Telecom*USA's customer base and an increase in business from existing customers; billable minutes increased from 1,691 million in 1987 to 2,475 million in 1988. Also, the Company's private line business generated an increase in revenue from $16.5 million in 1987 to $28.6 million in 1988, an increase of 73 percent.

*All dollar amounts are in U.S. dollars.

Approximately 90 percent of Telecom*USA's revenue is related directly to its long distance business. Currently, Telecom*USA has access to the National Telecommunications Network's (NTN's) 18,000 miles of fiber-optic network.

The cost of communication services as a percentage of revenue remained relatively constant during 1987 and 1988—58.6 and 58.4 percent, respectively. Total operating income for 1988 was $46.5 million. The margin of operating income as a percentage of revenue grew from 8.2 percent in 1987 to 8.9 percent in 1988. Telecom*USA's bottom line improved significantly over 1988. Net income grew 83.2 percent, from $16.7 million in 1987 to $30.6 million in 1988. The sale of Southland Mobilcom, Inc., a wholly owned subsidiary, created an after-tax extraordinary gain of $2.2 million. Telecom*USA's improved revenue position combined with its internal cost control resulted in an increase in the after-tax profit margin, which rose from 4.2 percent in 1987 to 5.8 percent in 1988.

Telecom*USA offers 3,000 miles of digital/fiber-optic network and 15 switching centers that primarily use DEX-600 and DEX-400 switching equipment. Operations serve approximately 400,000 long distance customers in 31 states. Also, the Company has implemented Signaling Systems Seven (SS7) on a nationwide basis.

SouthernNet*USA is headquartered in Atlanta, Georgia, and operates in the Southeast with approximately 2,200 miles of digital/fiber-optic network and more than 50 points of presence. Teleconnect*USA is headquartered in Cedar Rapids, Iowa, and operates 800 miles of digital/fiber-optic facilities in the Midwest.

In an effort to facilitate close customer relations and quick responsiveness to the marketplace, the subsidiary companies, SouthernNet*USA and Teleconnect*USA, operate within their own regions,

independent from Telecom*USA. The holding company, Telecom*USA, coordinates efforts between the subsidiaries when leveraged operations are necessary (e.g., product development).

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Telecommunications Services

SouthernNet*USA consists of a group of companies that provide outgoing long distance services, private line services, 800 services, and operator services to both commercial and residential customers.

In addition to providing long distance services, Teleconnect*USA is segmented into subsidiaries that offer a variety of telecommunications services and products. Teleconnect*USA Telecommunication Systems Company offers telecommunications systems, such as telephone systems, digital call processing, voice mail systems, and facsimile systems.

Teleconnect*USA Data Base Marketing Company is divided into two organizations. Business Marketing Services provides Fortune 500 companies with direct selling, surveying, lead generation, and customer service. Development Services provides fund-raising services to the nonprofit sector.

Teleconnect*USA Directory Company offers phone directories, including yellow pages for advertisements.

Further Information

For further information about the Company's business segments, please contact the appropriate industry service.

Table 1
Three-Year Corporate Highlights* (Millions of U.S. Dollars)

	1986	1987	1988
Three-Year Revenue	$291.0	$395.8	$523.7
Percent Change	-	36.01	32.31
Net Income	($6.0)	$16.7	$30.6
Percent Change	-	-	83.23

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	N/A	N/A	N/A	N/A
Quarterly Profit	N/A	N/A	N/A	N/A

*On December 14, 1988, SouthernNet and Teleconnect merged operations. SouthernNet became the holding company and changed its name to Telecom*USA. Numbers for 1986 and 1987 are of aggregate operations of SouthernNet, Teleconnect, Southland, and Touch and Save.
N/A = Not Available

Source: Telecom*USA, Inc. Annual Reports
Dataquest
January 1990

Table 2
Revenue by Geographic Region (Percent)

Region	1986	1987	1988
North America	100.00	100.00	100.00
International	0	0	0

Source: Dataquest
January 1990

Table 3
Revenue by Distribution Channel (Percent)

Channel	1987	1988
Direct Sales	100.00	100.00
Indirect Sales	0	0

Source: Dataquest
January 1990

1988 SALES OFFICE LOCATIONS

North America—67

SUBSIDIARIES

All subsidiaries are wholly owned by Telecom*USA unless otherwise indicated.

United States

American Cellular Enterprises (49 percent)
Long Distance Telephone Savers, Inc.
Neural Systems, Inc.
SouthernNet Inc.
SouthernNet of North Carolina, Inc.
SouthernNet of South Carolina, Inc.
SouthernNet of Southeast, Inc.
SouthernNet Services, Inc.
SouthernNet Systems, Inc.
Southland Communications Corp.
Southland Fibernet, Inc.
Southland Financial Group
Southland Systems, Inc.
Southland Telephone Co.
Teleconnect Co.
Teleconnect Long Distance Services and Systems Co.
Teleconnect*USA Data Base Marketing Co.
Teleconnect*USA Directory Co.
Teleconnect*USA Telecommunication Systems Co.

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1988

NTN Consortium
Telecom*USA is a member of the National Telecommunications Network (NTN). The NTN Consortium is a joint venture between Advanced Telecommunications Corp., Consolidated Network Inc., Litel Telecommunications Corp., RCI Long Distance., Telecom*USA, and Williams Telecommunications Group. This relationship allows Telecom*USA to access NTN's 18,000 miles of operational network.

MERGERS AND ACQUISITIONS

1989

Western Union
Western Union's private line and switched long distance voice business was acquired.

American Communications, Inc.
American Communications, a manufacturer of fiber-optic network systems, was acquired.

Tele-Sav
Tele-Sav, an Illinois-based company that serves approximately 10,000 business and residential customers, was acquired.

Async Corp.
Telecom*USA acquired Async, a voice messaging company based in Georgia.

KEY OFFICERS

O. Gene Gabbard
Chairman of the board, chief executive officer

Clark E. McLeod
Vice chairman of the board, president

Larry W. Crain
Executive vice president

James E. Hoffman
Executive vice president

Gary M. Parsons
Executive vice president

Larry F. Williams
Executive vice president, chief financial officer

PRINCIPAL INVESTORS

MPX Systems Inc.—12.54 percent
IE Industries Inc.—9.27 percent
Lawrence M. Gressette, Jr.—12.55 percent
William B. Timmerman—12.54 percent

Table 4
Comprehensive Financial Statement
Fiscal Year Ending December (Millions of U.S. Dollars, except Per Share Data)

Balance Sheet	1986	1987	1988
Total Current Assets	N/A	$92.8	$138.0
Cash	N/A	15.4	31.3
Receivables	N/A	71.7	97.6
Other Current Assets	N/A	5.7	9.1
Net Property, Plants	N/A	$155.6	$190.2
Other Assets	N/A	$28.0	$31.3
Total Assets	N/A	$276.4	$359.5
Total Current Liabilities	N/A	$85.6	$94.4
Long-Term Debt	N/A	$94.3	$89.9
Other Liabilities	N/A	$4.9	$10.1
Total Liabilities	N/A	$184.8	$194.4
Total Shareholders' Equity	N/A	$91.6	$165.1
Converted Preferred Stock	N/A	2.8	0
Common Stock	N/A	N/A	N/A
Other Equity	N/A	N/A	N/A
Retained Earnings	N/A	(9.1)	21.4
Total Liabilities and Shareholders' Equity	N/A	$276.4	$359.5
Income Statement	**1986**	**1987**	**1988**
Revenue	$291.0	$395.8	$523.7
Cost of Communications Services	$182.3	$232.0	$305.7
R&D Expense	N/A	N/A	N/A
SG&A Expense	$86.9	$102.0	$139.9
Capital Expense	N/A	N/A	N/A
Pretax Income	($5.8)	$23.9	$40.2
Pretax Margin (%)	(1.99)	6.04	7.68
Effective Tax Rate (%)	N/A	N/A	N/A
Net Income	($6.0)	$16.7	$30.6
Shares Outstanding, Millions	19.4	22.0	25.6
Per Share Data			
Earnings	($0.33)	$0.75	$1.20
Book Value	0	$4.16	$6.45

Table 4 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending December (Millions of U.S. Dollars, except Per Share Data)

Key Financial Ratios	1986	1987	1988
Liquidity			
Current (Times)	N/A	1.08	1.46
Quick (Times)	N/A	1.08	1.46
Fixed Assets/Equity (%)	N/A	169.87	115.20
Current Liabilities/Equity (%)	N/A	93.45	57.18
Total Liabilities/Equity (%)	N/A	201.75	117.75
Profitability (%)			
Return on Assets	-	12.08	9.62
Return on Equity	-	36.46	23.84
Profit Margin	(2.06)	4.22	5.84

*On December 14, 1988, SouthernNet and Teleconnect merged operations. SouthernNet became the holding company and changed its name to Telecom*USA. Numbers for 1986 and 1987 are of aggregate operations of SouthernNet, Teleconnect, Southland, and Touch and Save.
N/A = Not Available

Source: Telecom*USA, Inc. Annual Reports and Forms 10-K
Dataquest
January 1990

Telefónica de España

Gran Via 28, E-28013
Madrid, Spain
Telephone: 34 (1) 532-78-38
Fax: 34 (1) 532-14-84
Dun's Number: 46-200-4128

Date Founded: 1924

CORPORATE STRATEGIC DIRECTION

Telefónica de España supplies a wide variety of telecommunications services including domestic and international telephone services, integrated business communications, mobile land and maritime services, and high-speed data transmission. The Spanish telephone network has over 11 million local lines in service. Through the Telefónica Group companies, Telefónica designs, manufactures, and markets a wide array of information services and products.

The Company earned Pta 612.5 billion (US$5.3 billion) in fiscal 1988, an increase of 13.3 percent over revenue of Pta 540.7 billion (US$4.4 billion) in fiscal 1987. (Percentage changes refer only to Pta amounts; US$ percentage changes will differ because of fluctuations in Dataquest exchange rates.)

Net income totaled Pta 62.8 billion (US$539.5 million) in fiscal 1988, an increase of 18 percent over net income of Pta 53.2 billion (US$430.6 million) in fiscal 1987. In fiscal 1988, capital expenditure rose 37.5 percent over fiscal 1987 to Pta 357.8 billion (US$3.1 billion).

This backgrounder contains information from 1988, the year of Telefónica's most recently published annual report.

BUSINESS SEGMENT STRATEGIC DIRECTION

Revenue from domestic automatic service represented 44 percent of revenue, subscriber service charges 27 percent, international service 14 percent, data and image transmission 9 percent, and fees from connection and other items the remaining 6 percent for fiscal 1988. The fastest-growing items were revenue from data and image transmission and international service, which rose 21.7 percent and 19.9 percent, respectively. The demand for new lines rose 19.5 percent in fiscal 1988 to 1.4 million lines.

Telefónica has participated in several joint ventures in order to expand its international presence.

Further Information

For further information about the Company's business segments, please contact the appropriate Dataquest industry service.

1989 SALES OFFICE LOCATIONS

Information is not available.

MANUFACTURING LOCATIONS

Europe

Madrid, Spain
Telecommunications equipment

SUBSIDIARIES

Europe

Cabinas Telefónicas, S.A. (Spain)
Comercial de Servicios Electrónicos, S.A. (Spain)

Entel, S.A. (Spain)
Hispano Radio Marítima, S.A. (Spain)
Playa de Madrid, S.A. (Spain)
Sistemas e Instalaciones de Telecomunicación, S.A. (Spain)
Telecomunicaciones Marinas, S.A. (Spain)
Telefonía y Finanzas, S.A. (Spain)
Teleinformátoca y Comunicaciones, S.A. (Spain)
T. J. Telefónico Internacional de España (Spain)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

AT&T
AT&T sold a stake in AT&T Network Systems International (ATT-NSI) to Telefónica in exchange for Telefónica's share of AT&T Microelectronica de España. The sale reduces AT&T's stake in ATT-NSI to 59 percent from 65 percent. Italtel holds 20 percent and Philips owns the remaining 15 percent of ATT-NSI. AT&T Microelectronica will be 100 percent owned by AT&T NSI.

Empresa Nacional de Telecomunicaciones
Telefónica won an equity stake in the Argentine telephone concern, Empresa Nacional de Telecomunicaciones, which the Argentine government is splitting into two companies, one for the northern half of the country and one for the southern part.

Telecosur SA
Telefónica will hold 10 percent of Telecosur SA, a company it has established with Techint SA (15 percent) and Citicorp (20 percent) to manage and finance its 60 percent stake in the southern zone of Argentina's Empresa Nacional de Telecomunicaciones. The other 55 percent of Telecosur will be held by Spanish and foreign banks.

Direccion General de Correos (The Spanish Post Office)
Telefónica and Correos will establish a telecommunications joint venture to run a data transmission network.

Servei de Telecomunicacions d'Andorra (STA)
Telefónica has signed a cooperative agreement with STA to establish compatibility between their respective automatic mobile phone services.

Eutelsat
Telefónica has increased its stake in Eutelsat, a European communications satellite system, to 22 percent.

Deutsche Bundespost Telekom
Telefónica and Deutsche Bundespost Telekom have signed a cooperation agreement to improve communications links between the two countries. The agreement covers the exchange of technology and possible joint ventures.

MERGERS AND ACQUISITIONS

Information is not available.

KEY OFFICERS

Cándido Velázquez-Gaztelu Ruis
Chairman

Germán Ancochea Soto
Managing director/general manager of Administration and Finance

Germán Ramajo Romero
General manager of Operations

Enrique Used Aznar
General manager of Sales, Services, and Networks

Antonio López-Barajas
General manager

PRINCIPAL INVESTORS

Information is not available.

FOUNDERS

Information is not available.

Teledyne Monolithic Microwave

Teledyne Monolithic Microwave
1274 Terra Bella Avenue
Mountain View, CA 94043
(415) 966-8632

Established 1984
Number of Employees: 24

BACKGROUND

Teledyne Monolithic Microwave was founded by Teledyne MEC, a subsidiary of Teledyne, Inc. Teledyne MEC manufactures microwave devices for use in electronic countermeasures. Teledyne, Inc. is a vertically integrated corporation involved in four major areas of work: aviation and electronics; machines and metals; engines, energy, and power; and commercial and consumer.

Teledyne MEC is supporting TMMIC in establishing a technical and business base, in preparation for TMMIC to spin off as an independent company. TMMIC introduced its first product, a 2- to 18-GHz MMIC amplifier, in the first half of 1986.

Teledyne is a member of the Raytheon/TI team, which received a Phase I award under the DARPA-sponsored MIMIC program.

COMPANY EXECUTIVES

- Executive Director—Dr. James Ewan
- Director, Technology—Dr. Steven Ludvik
- Director, Applications—Dr. Robert Mandel

FINANCIAL BACKING

Financing was provided by Teledyne MEC for an undisclosed amount.

SERVICES

- Design
- Manufacturing

Teledyne Monolithic Microwave

PROCESS TECHNOLOGY

The Company uses GaAs technology.

PRODUCTS

The Company produces MMIC subsystems that operate at microwave and/or millimeter-wave frequencies.

Applications

The products are used in EW systems such as EW, radar warning, and electronic countermeasures equipment.

FACILITIES

The Teledyne Monolithic Microwave plant is approximately 15,000 square feet, including a 4,000-square-foot design center and a 6,000-square-foot clean room in Mountain View, California. No wafer fab is included in this facility.

Teledyne Monolithic Microwave

Teledyne Monolithic Microwave
1274 Terra Bella Avenue
Mountain View, CA 94043
(415) 962-6944

Established 1984
Number of Employees: 15

BACKGROUND

Teledyne Monolithic Microwave was founded by Teledyne MEC, a subsidiary of Teledyne, Inc. Teledyne MEC manufactures microwave devices for use in electronic countermeasures. Teledyne, Inc. is a vertically integrated corporation involved in four major areas of work: aviation and electronics; machines and metals; engines, energy, and power; and commercial and consumer.

Teledyne MEC is supporting TMMIC in establishing a technical and business base, in preparation for TMMIC to spin off as an independent company in the 1988-1989 time frame. TMMIC introduced its first product, a 2- to 18-GHz MMIC amplifier in the first half of 1986.

COMPANY EXECUTIVES

- Executive Director—Dr. James Ewar
- Director of Technology—Dr. Steven Ludvik
- Director of Applications—Dr. Robert Mandel

FINANCIAL BACKING

Financing was provided by Teledyne MEC for an undisclosed amount.

SERVICES

- Design
- Manufacturing

Teledyne Monolithic Microwave

PROCESS TECHNOLOGY

The Company uses GaAs technology.

PRODUCTS

The Company produces MMICs, such as the TMM85001, and other wideband amplifiers.

Applications

The products are used in electronic countermeasures equipment.

FACILITIES

Teledyne Monolithic Microwave has a 4,000-square-foot design center in Mountain View, California.

Telefunken Electronic GmbH

Theresienstra 2
7100 Heilbronn
Federal Republic of Germany
Telephone: 07131 670
Telex: 728746
Fax: Not Available
Dun's Number: 31-526-2907

Founded: 1893

CORPORATE STRATEGIC DIRECTION

AEG-Telefunken was founded in 1893 and quickly grew to become Germany's second largest electrical group. Early in 1970, the Company started to face financial difficulties after it lost a nuclear power contract, and in September 1978, Siemens took over the Company's nuclear power activities by buying out AEG-Telefunken's stake in Kraftenwerk-Union.

AEG-Telefunken's semiconductor division, based in Heilbronn, Germany, suffered tremendously during this period. Although the division has many good designs—for example, it developed the first European microprocessor, the CP3-F—it was increasingly starved of funds from its ailing parent company. As a result, many new development programs had to be postponed or scrapped. In addition, the division was required to behave more like a captive supplier, building semiconductor devices that its parent wanted for its own end-equipment production. Many of these devices were relatively unsuccessful on the open semiconductor market.

In 1979, faced with near bankruptcy, AEG-Telefunken was rescued by a group of West German banks after the West German government refused to supply it with direct aid. The prime purpose of this rescue plan was to provide the Company with protection from its creditors while it carried out a major reorganization of its activities.

It was against this background, coupled with the global semiconductor recession of the early 1980s, that the semiconductor division sought to reestablish itself. This was achieved by forming an alliance with United Technologies Corporation (UTC) of Hartford, Connecticut, and its Texas-based subsidiary, Mostek Corporation.

Telefunken Electronic GmbH (TEG) was formed by an agreement in which UTC and AEG-Telefunken each held 49 percent of the Company, while the remaining 2 percent was held by the Sudeutsche Industrie-Beteiligung GmbH. Under the terms of this agreement, TEG was to continue the business activities of the former electronic components division of AEG-Telefunken and, at the same time, assume full ownership of the division's headquarters facility in Heilbronn and its production plants.

In April 1988, AEG-Telefunken announced it was repurchasing the 49 percent stake in TEG that it had sold to UTC in 1982 for an undisclosed sum. Because TEG is part of the AEG Group, financial information is not available. However, during 1989 strong growth was reported by TEG in the Microelectronics Division of AEG. Dataquest estimates that TEG's revenue for fiscal 1989 totaled DM 562.1 million (US$299 million).

BUSINESS SEGMENT STRATEGIC DIRECTION

Telefunken's electronic product range covers most of the semiconductor product categories, but its strongest areas are analog and MOS logic chips. Dataquest estimates that discrete semiconductors accounted for approximately 32 percent of TEG's worldwide revenue in 1989. Optoelectronic semiconductors accounted for an estimated 26 percent, while integrated circuits accounted for the remaining 42 percent.

Dataquest estimates that television and consumer IC products represent approximately 70 percent of

Telefunken's IC sales, with the major areas being front-end tuner ICs for televisions and FM radio. TEG supplies all noncaptive factories in Europe as well as some Far Eastern manufacturers in Europe.

Dataquest estimates that TEG had less than 1 percent of the total semiconductor worldwide market based on revenue. The Company had 1.1 percent of the worldwide analog market in 1989 based on DM 190 million (US$101 million) in revenue. In the total discrete market, TEG had 1.2 percent share and DM 177 million (US$95 million) for 1989. In the optoelectronic market, TEG had a 3 percent market share based on DM 147 million (US$78 million).

Further Information

For more information about the Company's business segments, please contact the appropriate Dataquest industry service.

1989 SALES OFFICE LOCATIONS

Information is not available.

MANUFACTURING LOCATIONS

Information is not available.

SUBSIDIARIES

Information is not available.

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

Information is not available.

MERGERS AND ACQUISITIONS

Information is not available.

KEY OFFICERS

Dipl-Ing. Grank Dieter Maier
Board member

Kipl-Ing. Klaus Bomhardt
Board member

Dipl-Kfm. Rolf Schlenker
Board member

Dr.-Ing. Jork Bretting
Senior executive officer

Dipl-Kfm. Lothar Jakobus
Board member

Dipl-Ing. (FH) Eugen Schmid
Board member

PRINCIPAL INVESTORS

Information is not available.

FOUNDERS

Information is not available.

Telefunken Electronic GmbH

Table 1

Estimated Worldwide Semiconductor Revenue by Calendar Year (Millions of Dollars)

	1983	1984	1985	1986	1987	1988
Total Semiconductor	134	161	170	219	273	289
Total Integrated Circuit	51	63	68	79	110	124
Bipolar Digital (Function)					15	19
Bipolar Digital Memory						
Bipolar Digital Logic					15	19
MOS (Function)	8	13	13	18	23	20
MOS Memory						
MOS Microdevices						
MOS Logic	8	13	13	18	23	20
Analog	43	50	55	61	72	85
Total Discrete	53	60	61	82	86	91
Total Optoelectronic	30	38	41	58	77	74

Table 2

Telefunken Electronic GmbH
1988 Worldwide Ranking by Semiconductor Markets
(Revenue in Millions of Dollars)

	1988 Rank	1987 Rank	1988 Revenue	Sales % Change 1987-1988	Industry % Change 1987-1988
Total Semiconductor	31	27	$289	5.9%	33.0%
Total Integrated Circuit	44	38	$124	12.7%	37.4%
Bipolar Digital (Function)	25	25	$ 19	26.7%	9.2%
Bipolar Digital Logic	25	25	19	26.7%	9.0%
MOS (Function)	68	58	$ 20	(13.0%)	54.5%
MOS Logic	52	40	20	(13.0%)	29.2%
Analog	26	27	$ 85	18.1%	16.0%
Total Discrete	21	20	$ 91	5.8%	14.4%
Total Optoelectronic	10	8	$ 74	(3.9%)	27.5%

Source: Dataquest
December 1989

Telefunken Electronic GmbH

Table 3

Telefunken Electronic GmbH
Estimated 1988 Semiconductor Revenue by Geographic Region
(Millions of Dollars)

	U.S.	Japan	Europe	ROW
Total Semiconductor	$21	$2	$217	$49
Total Integrated Circuit	$10	$2	$ 86	$26
Bipolar Digital (Function)			$ 19	
Bipolar Digital Memory				
Bipolar Digital Logic			19	
MOS (Function)			$ 15	$ 5
MOS Memory				
MOS Microdevices				
MOS Logic			15	5
Analog	$10	$2	$ 52	$21
Total Discrete	$ 7		$ 66	$18
Total Optoelectronic	$ 4		$ 65	$ 5

Source: Dataquest
December 1989

Telefunken Electronic GmbH

Telefunken Electronic GmbH
P.O.B. 1109 D-7100 Heilbronn
Federal Republic of Germany
(07131)67-0

Established 1982
No. of Employees: N/A

BACKGROUND

Telefunken Electronic GmbH began as an alliance of United Technologies Corporation (Hartford, CT) and AEG-Telefunken (Heilbronn, Federal Republic of Germany). AEG-Telefunken was founded in 1893; in 1979, it faced bankruptcy after it lost a nuclear power contract. Subsequently, it was rescued by a group of West German banks. In 1988, AEG-Telefunken repurchased its stake that was sold to UTC in 1982 for an undisclosed sum.

Total worldwide sales of semiconductors by Telefunken Electronic GmbH exceed $275 million annually, of which approximately 40 percent are optoelectronic and other compound semiconductor sales.

PROCESS TECHNOLOGY

- GaAs and AlGaAs VPE on GaAs, GaP, and other compound wafers

PRODUCTS

- Opto devices including LEDs, lasers, detectors, optocouplers
- GaAs MESFETs
- GaAs microwave ICs
- Fiber-optic transmitters and receivers
- Solar cells and solar panels

FACILITIES

- Heilbronn, Federal Republic of Germany
- Braunau, Austria
- Vocklabruch, Austria

Telefunken Electronic GmbH

OVERVIEW AND BACKGROUND

AEG-Telefunken

AEG-Telefunken was founded in 1893 and quickly grew to become West Germany's second-largest electrical group. Early in 1970, the Company started to face financial difficulties after it lost a nuclear power contract, and in September 1978, Siemens took over AEG-Telefunken's nuclear power activities by buying out AEG-Telefunken's stake in Kraftenwerk-Union.

AEG-Telefunken's semiconductor division, based in Heilbronn, West Germany, suffered tremendously during this period. Although the division had many good designs--for example, it developed the first European microprocessor, the CP3-F--it was increasingly starved of funds from its ailing parent company. As a result, many new development programs had to be postponed or scrapped. In addition, the division was required to behave more like a captive supplier, building semiconductor devices that its parent wanted for its own end-equipment production. Many of these devices were relatively unsuccessful on the open semiconductor market.

In 1979, faced with near bankruptcy, AEG-Telefunken was rescued by a group of West German banks after the West German government refused to supply it with direct aid. The prime purpose of this rescue plan was to provide the Company with protection from its creditors while it carried out a major reorganization of its activities.

It was against this background, coupled with the global semiconductor recession of the early 1980s, that the semiconductor division sought to reestablish itself. This was achieved by forming an alliance with United Technologies Corporation (UTC) of Hartford, Connecticut, and its Texas-based subsidiary, Mostek Corporation.

TELEFUNKEN Electronic GmbH

TELEFUNKEN Electronic GmbH (TEG) was formed by an agreement in which UTC and AEG-Telefunken each hold 49 percent of the Company, while the remaining 2 percent is held by the Süddeutsche Industrie-Beteiligung GmbH, a subsidiary of the Dresdner Bank AG, AEG-Telefunken's primary creditor. Under the terms of this agreement, TEG was to continue the business activities of the former electronic components division of AEG-Telefunken, and at the same time assume full ownership of the division's headquarters facility in Heilbronn, West Germany, together with the seven production plants spread throughout West Germany;

Telefunken Electronic GmbH

Vöcklabruck, Austria (TELEFUNKEN Electronic GesbH); and Manila, Philippines (TELEFUNKEN Semiconductors Philippines Inc.). Dataquest believes that UTC paid $40 million for its 49 percent share in TEG.

In February 1983, TEG acquired 43.6 percent of Eurosil Electronics GmbH, a Munich-based producer of complementary MOS (CMOS) integrated circuits. In August 1986, UTC sold its stake in Eurosil to TEG, which now has total management responsibility for the joint venture. Eurosil and TEG are trading processing information, but neither company receives technological inputs from Mostek any longer. (See ESIS Volume II, Section 4, Eurosil company profile, for further details.)

In 1983, its first full year of operation under new ownership, TEG returned to modest profitability. Dataquest believes that this achievement was aided by the general worldwide semiconductor recovery. Apart from its Eurosil investment, Dataquest estimates that TEG invested approximately $20 million in capital investment in 1985, and a further $14 million in R&D expenditure.

Tables 1 and 2, respectively, give Dataquest's estimates of TEG's European and worldwide semiconductor revenue for 1982 through 1986.

Table 1

TELEFUNKEN Electronic GmbH
ESTIMATED EUROPEAN SEMICONDUCTOR REVENUE BY PRODUCT LINE
(Millions of U.S. Dollars)

	1982	1983	1984	1985	1986
Total Semiconductor	$128	$109	$133	$133	$164
Total Integrated Circuit	$ 33	$ 35	$ 46	$ 46	$ 52
Bipolar Digital	0	0	0	0	0
MOS	4	7	11	11	12
Linear	29	28	35	35	40
Total Discrete	$ 75	$ 47	$ 54	$ 53	$ 68
Transistor	26	17	19	18	22
Diode	35	19	21	21	28
Thyristor	12	10	12	12	16
Other	2	1	2	2	2
Total Optoelectronic	$ 20	$ 27	$ 33	$ 34	$ 44
Exchange Rate: (DM/$)	2.43	2.54	2.85	2.94	2.17

Source: Dataquest
February 1987
Ref. 0187-05

Telefunken Electronic GmbH

Table 2

TELEFUNKEN Electronic GmbH
ESTIMATED WORLDWIDE SEMICONDUCTOR REVENUE BY PRODUCT LINE
(Millions of U.S. Dollars)

	1982	1983	1984	1985	1986
Total Semiconductor	$143	$134	$161	$172	$219
Total Integrated Circuit	$ 36	$ 51	$ 63	$ 68	$ 82
Bipolar Digital	0	0	0	0	0
MOS	5	8	13	13	19
Linear	31	43	50	55	63
Total Discrete	$ 82	$ 53	$ 60	$ 63	$ 84
Transistor	29	20	22	23	32
Diode	38	22	24	26	34
Thyristor	13	10	12	12	16
Other	2	1	2	2	2
Total Optoelectronic	$ 25	$ 30	$ 38	$ 41	$ 53
Exchange Rate: (DM/$)	2.43	2.54	2.85	2.94	2.17

Source: Dataquest
February 1987
Ref. 0187-05

PRODUCTS AND MARKETS SERVED

TELEFUNKEN Electronic's product range covers most of the semiconductor product categories, but its strongest areas are bipolar (linear) ICs, diodes, and transistor devices. Dataquest estimates that in 1985, discrete semiconductors accounted for approximately 37 percent of TEG's worldwide revenue. This revenue was primarily in high-frequency small-signal devices and high-voltage power transistors. The Company is also very strong in optoelectronic devices; products in this area include light emitting diodes (LEDs), LED displays, photocoupling devices, and IR components.

TEG also makes ICs for radio and audio applications, such as a single-chip radio IC and ICs for signal processing in television and video. More recently, the Company has developed ICs for automotive use (in ignition circuits, direction control indicators, and central door locks) and for telecommunications applications.

TEG relies on application-specific ICs (ASICS) more than it does on standard parts, and is now emphasizing bipolar CMOS.

In 1986, TEG announced a range of four new integrated circuits designed for switching and controlling mains-operated AC leads in a wide variety of applications. The basic module is U208B. Also in 1986, TEG fabricated MOSFETs for operation at up to 1.2 GHz, the world's first commercial parts made by X-ray exposure.

OUTLOOK

Dataquest believes that under TEG's new ownership, the Company is attempting to deemphasize its prior dependence on the television, hi-fi, and consumer end-user markets in favor of the higher-growth automotive and telecommunications areas. Furthermore, we believe that the Company will concentrate on special niche product areas, using predominantly bipolar technologies where there is less competition, rather than attempt to participate in the high-volume, standard product memory and microprocessor areas. With Eurosil concentrating more on ASICs, primarily in CMOS technology, product duplication between the companies has been minimized.

The UTC involvement should help TEG expand into the U.S. market and particularly into UTC's Automotive Division. However, with 51 percent of its ownership remaining in German hands, TEG can still enjoy the privileges of being a German company, including access to government funds and preferential treatment on government contracts.

Dataquest estimates that TEG's European revenue remained unchanged in 1984 and 1985. Dataquest also estimates that in 1984, 30 percent of TEG's worldwide revenue was attributable to new products. These two factors combined to make TEG profitable for its second successive year of new ownership.

With its undoubtedly good connections to a number of German and U.S. banks, its access to the leading-edge technologies and to the semiconductor know-how of UTC, and the recent increased activity by the West German government toward support of emerging high-technology industries, TEG's medium-term future seems assured.

Telefonaktiebolaget LM Ericsson

S-126 25 Stockholm, Sweden
Telephone: 46 8 719 00 00
Fax: (8) 719 19 76

Date Founded: 1876

CORPORATE STRATEGIC DIRECTION

Telefonaktiebolaget LM Ericsson (or LM Ericsson Telephone Company) is one of the world's leading telecommunications companies. Ericsson designs, manufactures, and markets telecommunications and information handling systems and equipment used in more than 100 countries. It is one of the few organizations able to deliver a complete telecommunications package—switching and transmission systems, cable, instruments, and peripheral equipment—for public, private, and military networks virtually anywhere in the world. Ericsson also specializes in advanced business communications and information processing systems.

Ericsson's operations are organized in six business areas: Public Telecommunications, Network Engineering and Construction and Cables, Radio Communications, Business Communications, Defense Systems, and Components. In 1988, Public Telecommunications was the leading group by far in terms of contribution to sales growth with $2.4 billion* in sales and 43.7 percent of the total sales. Network Engineering and Construction and Cables was second with 18.0 percent of the total sales, followed very closely by Radio Communications, which contributed to 15.2 percent of the Company's total revenue. Business Communications accounted for 11.3 percent and Defense Systems with 8.1 percent. Components contributed only 2.3 percent of the sales.

Ericsson's total revenue decreased 1.2 percent to $5.0 billion in fiscal 1988 from $5.1 billion in fiscal 1987. However, its net income increased 83.0 percent to $211.7 million in fiscal 1988 from $115.9 million in fiscal 1987. Ericsson employs slightly more than 65,000 employees and operates in 80 countries.

*All dollar amounts are in U.S. dollars.

The European, Asian, and Rest of World (ROW) sales contribution to the total revenue decreased to $4.7 billion in 1988. Sales to these regions accounted for 93 percent of total sales, up from 92 percent in 1987. Ninety-nine percent of the Company's 155 sales offices are in Europe, Asia, and ROW. Operations are concentrated in geographical areas where Ericsson can obtain large market shares. Ericsson operates as a domestic company in each market, often establishing local production and technical development facilities.

Research and development expenditures totaled $569.2 million in fiscal 1988, representing 11 percent of revenue. Capital expenditures totaled $280.4 million in fiscal 1988, representing 6 percent of revenue.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Telecommunications

Ericsson develops, manufactures, and markets a full range of telephone exchanges, transmission equipment, and support systems for telecommunications administration. Telephone exchanges accounted for 82 percent of the business; transmission equipment, 10 percent; and telex and data processing equipment, 2 percent.

The Company's major product in the telephone exchange area is the AXE digital public switching

system. By the end of 1988, the total orders for AXE were close to 28 million lines, from 75 countries; almost 1,800 AXE exchanges were in service in 62 countries. AXE exchanges are currently manufactured in 20 countries. In 1988, Ericsson ranked seventh in this market with 8.1 percent of the worldwide market share, according to Dataquest.

The Ericsson product range includes systems for cable, microwave, and optical fiber transmission. Ericsson not only offers fiber-optic systems but also terminal interface equipment and advanced equipment for field work on optical fibers. Dataquest estimates that Ericsson ranked fifth in both the carrier equipment and the multiplexing equipment segments of the industry. Market share was not available at publication time.

Network Engineering, Construction, and Cables

Ericsson expanded sharply in the network engineering, construction, and cables business area in 1988, with an increase of 40 percent in order bookings. Income rose for the fourth year in a row. A number of large contracts were received in the Middle East during the year, notably in Saudi Arabia, and business continued to expand in Southeast Asia. Network construction, including planning and construction of telecommunications networks, data networks, and telesignaling installations, accounted for 79 percent of this area's business. Signal systems, which include signaling and safety systems for rail traffic, as well as street and highway signaling systems accounted for the remainder of this area's business.

Ericsson intensified its restructuring of the Network Engineering and Construction business area during the latter part of 1988. The Swedish division within Ericsson Network Engineering AB was transferred to the newly formed company, Ericsson Sverige AB, and preparations were made to bring the Network Engineering and Construction and the Cables business areas closer together.

Ericsson is one of the world's largest manufacturers of power and telecommunications cables. The Company also is expanding its output of cables for local area networks (LANs). Ericsson has major production plants in Sweden and Latin America. Power cables used for the distribution of electric power accounted for 33 percent of total sales in this product area, telecommunications cable used to transmit telecommunications accounted for 20 percent, and specialty cables, including cables used in the data processing industry, accounted for 7 percent. Forty percent of the total sales were from harness cables and seat heaters, fiber-optical equipment and components, and electrical equipment wholesaling.

Radio Communications

Ericsson is a major player in the field of mobile communications, with particular strength and success in cellular mobile telephone systems, hot-line mobile telephones in car-mounted or pocket versions, mobile voice and data systems for vehicle fleets, and on-site pocket paging systems. Mobile telephone systems accounted for 51 percent of this segment's business; defense communications, 16 percent; mobile telephones, 13 percent; personal paging systems, 11 percent; mobile voice and data systems, 7 percent; and miscellaneous operations, 2 percent. Ericsson ranked fourth with 7.6 percent of the worldwide market share in 1988, according to Dataquest's estimate.

Business Communications

In business communications, Ericsson ranked tenth, according to Dataquest's estimate, with 1.2 percent of the worldwide market share in 1988. The Company offers a range of communications networks able to carry data text as well as voice traffic. These products are manufactured in 11 countries.

The Company's core product is the MD110 digital voice and data system. By the beginning of 1989, 2.5 million MD110 lines were in service in 35 countries. The MD110 subscriber exchange contributed 51 percent of the business activity in this group.

Other products in this range include the Eripax packet switching system, the automatic call distribution (ACD) system, and analog and digital systems telephones. Other subscriber exchanges contributed 26 percent of 1988 sales in this area; telephone instruments contributed 13 percent; and Eripax Data Network, modems, and other products contributed 10 percent.

Components

On March 1, 1988, Ericsson sold its capacitor business and the RIFA name to Finvest AB of Finland.

All component operations except the capacitor business were transferred to a new company called Ericsson Components AB. As a result, activities could be concentrated further on the strategic areas of microelectronics, which accounted for 42 percent of 1988 total sales in this business area, and power supply equipment, which accounted for 38 percent. Standard components accounted for 20 percent of the business. Dataquest estimates that Ericsson ranked seventy-first in the 1988 worldwide semiconductor market share ranking. This was a 26.8 percent improvement over 1987's ranking.

Defense Applications

Ericsson produces a range of advanced electronic defense systems for target detection and tracking, telecommunications, and command and control. The Company's principal areas are airborne electronics, which accounted for 40 percent of this business group's total 1988 sales; local mobile defense systems, which accounted for 26 percent; command and control systems, which accounted for 19 percent; and microwave and satellite communication systems, which accounted for 15 percent. Several of these activities have spin-off potential for nondefense applications—notably those related to satellite and microwave communications and weather radar.

Further Information

For further information about the Company's business segments, please contact the appropriate industry service.

Table 1
Five-Year Corporate Highlights (Millions of U.S. Dollars)

	1984	1985	1986	1987	1988
Five-Year Revenue	$3,550.3	$3,778.6	$4,444.4	$5,110.4	$5,047.9
Percent Change	-	6.43	17.62	14.99	(1.22)
Capital Expenditure	$265.0	$311.3	$230.7	$251.1	$280.4
Percent of Revenue	7.46	8.24	5.19	4.91	5.55
R&D Expenditure	$284.8	$325.3	$437.8	$505.4	$569.2
Percent of Revenue	8.02	8.61	9.85	9.89	11.28
Number of Employees	75,116	78,159	72,575	70,893	65,138
Revenue ($K)/Employee	$47.26	$48.35	$61.24	$72.09	$77.50
Net Income	$53.7	$97.4	$79.1	$115.9	$211.7
Percent Change	-	81.38	(18.79)	46.52	82.66

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	N/A	N/A	N/A	N/A
Quarterly Profit	N/A	N/A	N/A	N/A

N/A = Not Available

Source: Telefonaktiebolaget LM Ericsson
Annual Reports
Dataquest
January 1990

Table 2
Revenue by Geographic Region (Percent)

Region	1984	1985	1986	1987	1988
North America	12.31	9.89	9.90	8.10	7.10
International	87.69	90.11	90.10	91.90	92.90
Europe	55.70	57.50	64.70	71.60	67.60
Asia/Pacific	10.20	13.10	9.90	8.20	10.00
ROW	21.80	19.50	15.50	12.10	15.30

Source: Telefonaktiebolaget LM Ericsson
Annual Reports
Dataquest
January 1990

Table 3
Revenue by Distribution Channel (Percent)

Channel	1987	1988
Direct Sales	98.00	98.00
Indirect Sales	2.00	2.00
Dealers	1.00	1.00
Distributors	1.00	1.00

Source: Dataquest
January 1990

1988 SALES OFFICE LOCATIONS

North America—8
Japan—3
Europe—80
Asia/Pacific—26
ROW—37

MANUFACTURING LOCATIONS

Europe

Ericsson Paging Systems BV, Emmen, Netherlands
Subsidiary developing and manufacturing pocket paging equipment

Ericsson Telecommunicatie BV, Rijen, Netherlands
Subsidiary developing and manufacturing telecommunications equipment and mobile telephones

Ericsson Telecommunications, Ltd., United Kingdom
Subsidiary manufacturing telecommunications equipment for pocket paging equipment

Erictron Ltd., Athlone, Republic of Ireland
Subsidiary manufacturing telecommunications and information systems equipment

Erisys S.p.A., Italy
Subsidiary developing and manufacturing alarm and security equipment

FATME S.p.A., Rome, Italy
Subsidiary developing and manufacturing telecommunications equipment and manufacturing private business communications (250,000 lines per year manufactured for the domestic market)

FIAR S.p.A. (Fabbrica Italiana Apparecchiature Radioelettriche), Milano, Italy
Subsidiary developing and manufacturing defense electronics, artificial intelligence systems, and industrial robotics

Hasler AG, Switzerland
Licensee manufacturing AXE

Industrias de Telecomunicacion S.A. (INTELSA), Madrid, Spain
Subsidiary developing and manufacturing telecommunications equipment (manufactures approximately 1 million AXE lines a year)

Inelco S.p.A., Italy
Subsidiary developing and manufacturing alarm and security equipment

Integra, Switzerland
Licensee manufacturing radio base stations

Intracom SA, Greece
Licensee manufacturing AXE

MET S.A. (Matra Ericsson Telecommunications), Massy, France
Associate developing and manufacturing public telecommunications equipment

Oy LM Ericsson AB, Joruas, Finland
Subsidiary manufacturing telecommunications equipment, private business communications equipment, mobile telephones, and land mobile radio equipment

Production Control (Ericsson), Ltd., United Kingdom
Subsidiary designing AXE

Racal Carlton, Ltd., United Kingdom
Licensee manufacturing radio base stations

SIAP S.p.A., Bologna, Italy
Subsidiary developing and manufacturing air traffic control equipment

Serit S.p.A., Italy
Subsidiary developing and manufacturing advanced sensors

Shrack Elektronik AG, Austria
Licensee manufacturing private business communications equipment and mobile telephones

TESLA, Yugoslavia
Licensee manufacturing telecommunications equipment

Tecnospazio, Milano, Italy
Associate developing advanced meteorological sensing equipment

UNIS, Yugoslavia
Licensee manufacturing transmission equipment

Asia/Pacific

Beijing Wire Communications Plant, China
Manufacturing Ericsson's MD110 digital switching system by agreement

Ericsson Communications Ltd., Wellington, New Zealand
Subsidiary developing and manufacturing subscriber carrier and optical fiber systems and UPS systems

Ericsson Defense Systems Pty., Ltd., Preston, Australia
Subsidiary developing advanced electronic defense systems

Ericsson India Ltd., New Delhi, India
Associate manufacturing public telecommunications and business communication systems

LM Ericsson Pty. Ltd., Broadmeadows, Australia
Subsidiary developing and manufacturing public telecommunications and cellular mobile telephone systems and telephones

Oriental Telecommunications Company Ltd., Seoul, Republic of Korea
Associate manufacturing and marketing public telecommunications and business communications systems
Periwira Ericsson Sdn. Bhd., Shah Alam, Selangor, Malaysia
Associate manufacturing public telecommunications systems
SAB Electronic Devices Ltd., India
Associate manufacturing components
Singapore Engineering Software Pte. Ltd., Singapore
Associate developing real-time computer systems for telecommunications projects
Terico Ltd., Taipei, Taiwan
Associate developing cellular mobile telephone system

ROW

Conductores Latincasa S.A. de C.V., Mexico
Associate manufacturing cables
Ericsson Amazonia S.A., Manaus, Brazil
Associate manufacturing telephone instruments
Ericsson do Brazil Comercio e Industrias S.A., Sao Paulo, Brazil
Associate manufacturing telecommunications equipment
Facomec S.A., Cali, Colombia
Subsidiary manufacturing cables
Fios e Cabos Plasticos do Brasil S.A., Rio de Janeiro, Brazil
Associate manufacturing cables
Industria Electricas de Quilmes S.A., Argentina
Subsidiary manufacturing cables
MATEC, Brazil
Licensee manufacturing private business communications equipment
Telecomponentes Ericsson S.A. de C.V., Mexico, D.F., Mexico
Subsidiary manufacturing printed circuit board
Teleindustria Ericsson S.A., Mexico
Subsidiary manufacturing telecommunications and transmission equipment

SUBSIDIARIES

North America

Ericsson Communications Inc., Canada
Ericsson Components, Richardson, Texas
Ericsson, Inc., Richardson, Texas
Ericsson North America, Inc., Richardson, Texas
The Ericsson Corporation, New York

Japan

Ericsson Paging Systems BV, Tokyo
Ericsson Purchasing Japan AB, Tokyo
LM Ericsson International AB, Tokyo

Europe

AB Aulis, Stockholm, Sweden
Aktiebolaget LM Ericsson Finans, Stockholm, Sweden
CELTE S.p.A., Padova, Italy
C.E.S.I. Centro Elaborazioni e Studi Infomatici S.p.A., Rome, Italy
DPSA GmbH, Frankfurt, West Germany
EB Ericsson ANS, Oslo, Norway
EB. Ericsson Radio Systemer A/S, Oslo, Norway
ELLEMTEL Utvecklings AB, Stockholm, Sweden
EL. TE. Siciliana Electronica & Telecomunicazioni S.p.A., Palermo, Italy
E-P Data AB
Ericsson AG, Bruttisellen, Switzerland
Ericsson Business Communications GmbH, Dusseldorf, West Germany
Ericsson Business Communications Ltd., Dublin, Republic of Ireland
Ericsson Business Communications AB, Stockholm, Sweden
Ericsson Business, Brussels, Belgium
Ericsson Cables AB, Stockholm, Sweden
Ericsson Components A/S, Oslo, Norway
Ericsson Components AB, Stockholm, Sweden
Ericsson Components GmbH, Engen, West Germany
Ericsson Components S.r.l., Milano, Italy
Ericsson Composants S.A., Saint Quentin en Yvelines, France
Ericsson Expertise Ltd., Dublin, Republic of Ireland
Ericsson Finanz AG, Bruttisellen, Switzerland
Ericsson (Hellas) Telecommunications Equipment S.A., Athens, Greece
Ericsson Holding A/S, Oslo, Norway
Ericsson Ltd., Horsham, United Kingdom
Ericsson Network Engineering AB, Stockholm, Sweden
Ericsson Network Engineering Ltd., London, United Kingdom
Ericsson Paging Systems Zweigniederlassung Deutschland, Frankfurt, West Germany
Ericsson Programatic Sweden AB, Karlstad, Sweden

Ericsson Radar Electronics AB, Molndal, Sweden
Ericsson Radio Systems AB, Stockholm, Sweden
Ericsson Radio Systems A/S, Taastrup, Denmark
Ericsson Reinsurance S.A., Vianden, Luxemburg
Ericsson Sielte International S.p.A., Milano, Italy
Ericsson Sverige AB, Sundbyberg, Sweden
Ericsson Telecom AB, Stockholm, Sweden
Ericsson Telecom A/S, Oslo, Norway
Ericsson Treasury Ireland Ltd., Dublin, Republic of Ireland
Erictron Ltd., Athlone, Republic of Ireland
Erifin Servizi Finanziari S.p.A., Rome, Italy
Erisoft AB, Lulea, Sweden
FATME S.p.A., Rome, Italy
FIAR Advanced Processing, Assago, Italy
FIAR S.p.A., Milano, Italy
Industrias de Telecomunicacion S.A. (INTELSA), Madrid, Spain
Industrigruppen JAS AB, Stockholm, Sweden
Information Sistemi S.p.A., Assago, Italy
John Martensson Elmaterial AB, Helsingborg, Sweden
LM Ericsson A/S, Copenhagen, Denmark
LM Ericsson Data Services AB, Stockholm, Sweden
LM Ericsson Holdings Ltd., Athlone, Republic of Ireland
LM Ericsson Ltd., Athlone, Republic of Ireland
MET S.A., Massy, France
Magnetic AB, Stockholm, Sweden
Mellansvenska Elektiska AB, Stockholm, Sweden
N.V. Nira Communication Systems, Kortrijk, Belgium
Nira Deutschland Zweigniederlassung der Nira International BV, Frankfurt, West Germany
Nira S.A., Nanterre, France
Nordic Electronic Systems A/S, Oslo, Norway
Nueva Telet—Elettronic e Telecomunicazioni S.p.A., Torino, Italy
Oy LM Ericsson AB, Joruas, Finland
SETEMER S.p.A., Rome, Italy
SIAP S.p.A., Bologna, Italy
SIELTE PADANA—Elettronica e Telecomunicazioni S.p.A., Torino, Italy
SIELTE, S.p.A., Rome, Italy
Sistemas Avanzados de Telecomunicaciones S.A. (SATESA), Madrid, Spain
Svenska Elgrossist AB SELGA, Stockholm, Sweden
Swedish Ericsson Company Ltd., Horsham, United Kingdom
TEL.CA.—Telecomunicazioni Calabrese S.p.A., Cosenza, Italy
Telefonaktiebolaget LM Ericsson, Stockholm, Sweden
Tocksfors Verkstads AB, Tocksfors, Sweden

Asia/Pacific

AB Erifon, Seoul, Korea
Electroscon Network Engineering Sdn. Bhd., Selangor, Malaysia
Ericsson Communications Ltd., Bangkok, Thailand
Ericsson Communications Ltd., Hong Kong
Ericsson Communications Ltd., Wellington, New Zealand
Ericsson Components Pty. Ltd., Preston, Australia
Ericsson Defense Systems Pty. Ltd., Preston, Australia
Ericsson India Ltd., New Delhi, India
Ericsson Network Engineering (Brunei) Sdn. Bhd., Bandad Seri Begawan, Brunei
Ericsson Network Engineering Pte. Ltd., Singapore
Ericsson Telecom AB, Guangzhou, China
Ericsson Telecommunications Sdn. Bhd., Selangor, Malaysia
Ericsson Thai Networks Company Ltd., Bangkok, Thailand
LM Ericsson International AB, New Delhi, India
LM Ericsson Pty. Ltd., Broadmeadows, Australia
Nira Australia Pty. Ltd., Sydney, Australia
Oriental Telecommunication Company Ltd., Seoul, Korea
Periwira Ericsson Sdn. Bhd., Selangor, Malaysia
SAB Electronic Devices Ltd., New Delhi, India
Singapore Engineering Software Pte. Ltd., Singapore
TERICO Ltd., Taipei, Taiwan
Telefonaktiebolaget LM Ericsson, Beijing, China
Telefonaktiebolaget LM Ericsson, Dalian, China
Telefonaktiebolaget LM Ericsson, Shanghai, China

ROW

Compania Anonima Ericsson, Caracas, Venezuela
Compania Argentina de Telefonos S.A., Buenos Aires, Argentina
Compania Ericsson S.A.C.I., Buenos Aires, Argentina
Compania Ericsson S.A., Lima, Peru
Compania Ericsson S.A., Montevideo, Uruguay
Compania Ericsson de Chile S.A., Santiago, Chile
Conductores Latincasa S.A. de C.V., Mexico, D.F., Mexico
Empresa Tecnologica Ericsson S.A. de C.V, Mexico, D.F., Mexico
Ericsson Amazonia S.A., Manaus, Brazil
Ericsson de Colombia S.A., Bogota, Colombia
Ericsson de Costa Rica S.A., San Jose, Costa Rica
Ericsson de Guatemala S.A., Guatemala City, Guatemala
Ericsson do Brazil Comercio e Industrias S.A., Sao Paulo, Brazil

Ericsson Sebeke Insaati A.S., Istanbul, Turkey
FACOMEC S.A., Cali, Colombia
Fios e Cabos Plasticos do Brasil S.A., Rio de Janeiro, Brazil
Industria Electricas de Quilmes, Quilmes, Argentina
LM Ericsson Ltd., Lagos, Nigeria
SITEL—Societe Industrielle Algerienne de Telecommunications, Tiemcen, Algeria
Simco Ericsson Ltd., Tehran, Iran
Sistemas Ericsson C.A., Caracas, Venezuela
Sistemas Ericsson, S.A., Mexico, D.F., Mexico
Sociedade Ericsson de Portugal Lda., Linda-a-Velha, Portugal
Societe Libanaise de Telephones Ericsson, Beirut, Lebanon
Telecomponentes Ericsson S.A., Mexico, D.F., Mexico
Telefonaktiebolaget LM Ericsson, Abu Dhabi, United Arab Emirates
Telefonaktiebolaget LM Ericsson, Amman, Jordan
Telefonaktiebolaget LM Ericsson Bureaux Techniques d'Algerie, El Djazair, Algeria
Telefonaktiebolaget LM Ericsson Bureaux Techniques de Tunisie, Tunis, Tunisia
Telefonaktiebolaget LM Ericsson Delegation Technique du Projet au Maroc, Rabat—Agdal, Morocco
Telefonaktiebolaget LM Ericsson Egypt Branch, Cairo, Egypt
Telefonaktiebolaget LM Ericsson Iraq Branch, Baghdad, Iraq
Telefonaktiebolaget LM Ericsson, Kuwait, Kuwait
Telefonaktiebolaget LM Ericsson Libya Branch, Tripoli, Libya
Telefonaktiebolaget LM Ericsson, Panama, Panama
Telefonaktiebolaget LM Ericsson Sucursal El Salvador, San Salvador, El Salvador
Telefonos Ericsson C.A., Quito, Ecuador
Teleindustria Ericsson S.A., Mexico, D.F., Mexico

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1989

Willimijn Holding BV
LM Ericsson has licensed token-ring technology.

GE
The companies have a joint venture in mobile communications.

1988

Alsthom
Ericsson signed an agreement with Althsom, a French company, covering ATC (Automatic Train Control) equipment for the French State Railways.

Italtel
The two companies are cooperating in mobile telephony by supplying Ericsson's analog TACS 900-MHz cellular system to SIPO, the Italian telephone operating company.

Telebras
The companies engaged in a joint venture to specify and design equipment for the Brazilian implementation of ISDN.

Hasler
Hasler obtained a license for AXE digital exchanges for public networks for manufacturing purposes.

Intracom SA
Intracom obtained a license for local AXE manufacturing in Greece.

Finvest
Finvest bought the RIFA capacitor operation from Ericsson.

Alcatel
Alcatel bought Ericsson's copper exchange and fiber-optic operations.

Nokia
Nokia bought Ericsson's Data Systems division.

Cablec Corporation
Cablec bought Ericsson's Continental Wire and Cable unit.

MERGERS AND ACQUISITIONS

1989

Elektrisk Bureau AS
The companies agreed to swap business operations. Ericsson acquired most of Elektrisk Bureau AS's telecommunications operations and a 50 percent stake in the defense communications business. In return, Elektrisk Bureau AS acquired Ericsson's railway signaling business.

1988

Matra and Ericsson
The companies purchased CGCT to form MET (Matra/Ericsson Telecommunications).

Thorn EMI
Ericsson acquired Thorn's interest in Thorn Ericsson Telecommunications Ltd.

KEY OFFICERS

Bjorne Svedberg
Chief executive officer and president

Lars Ramqvist
Executive vice president

Carl Wilhelm Ros
Executive vice president and chief financial officer

Jan Stenberg
Executive vice president

PRINCIPAL INVESTORS

AB Industrivarden—22.3 percent
Forvaltnings AB Prvidentia—11.8 percent
AB Investor—11.8 percent
Allmanna Pensionsfonden Fjarde Fondstyrelsen—8.6 percent
Knut Och Alice Wallenbergs Stiftse—5.5 percent
Svenska Handelsbankens Pensions-Stiftelse—5.0 percent

Table 4
Comprehensive Financial Statement
Fiscal Year Ending December
(Millions of U.S. Dollars, except Per Share Data)

Balance Sheet	1984	1985	1986	1987	1988
Total Current Assets	$3,285.1	$3,065.2	$3,405.8	$3,759.6	$3,967.2
Cash	463.5	356.9	434.1	534.8	609.7
Receivables	1,319.5	1,234.4	1,332.6	1,614.4	1,638.5
Marketable Securities	0	0	0	0	0
Inventory	1,171.7	1,216.8	1,337.3	1,317.8	1,317.9
Other Current Assets	330.4	257.1	301.8	292.6	401.1
Net Property, Plants	$863.8	$877.8	$960.0	$1,069.1	$1,077.2
Other Assets	$401.4	$373.5	$442.0	$420.8	$540.2
Total Assets	$4,550.3	$4,316.5	$4,807.8	$5,249.5	$5,584.6
Total Current Liabilities	$2,092.1	$1,898.9	$1,773.9	$1,856.9	$2,088.4
Long-Term Debt	$925.9	$996.0	$1,231.5	$1,348.3	$1,248.3
Other Liabilities	$739.2	$619.2	$777.4	$866.5	$856.5
Total Liabilities	$3,757.2	$3,514.1	$3,782.8	$4,071.7	$4,193.2
Total Shareholders' Equity	$793.1	$802.4	$1,025.0	$1,177.8	$1,391.4
Converted Preferred Stock	0	0	0	0	0
Common Stock	223.1	214.8	267.9	300.9	308.2
Other Equity	487.5	461.8	624.7	718.4	819.0
Retained Earnings	82.5	125.8	132.4	158.5	264.2
Total Liabilities and Shareholders' Equity	$4,550.3	$4,316.5	$4,807.8	$5,249.5	$5,584.6

Income Statement	1984	1985	1986	1987	1988
Revenue	$3,550.3	$3,778.6	$4,444.4	$5,110.4	$5,047.9
U.S. Revenue	436.9	373.7	440.0	413.9	358.4
Non-U.S. Revenue	3,113.4	3,404.9	4,004.4	4,696.5	4,689.5
Cost of Sales	$1,943.2	$2,045.9	$2,340.6	$2,831.5	$2,835.3
R&D Expense	$284.8	$325.3	$437.8	$505.4	$569.2
SG&A Expense	$971.2	$1,145.6	$1,299.0	$1,378.9	$1,166.6
Capital Expense	$265.0	$311.3	$230.7	$251.1	$280.4
Pretax Income	$107.2	$145.3	$127.1	$182.8	$341.9
Pretax Margin (%)	3.02	3.85	2.86	3.58	6.77
Effective Tax Rate (%)	52.00	52.00	52.00	52.00	52.00
Net Income	$53.7	$97.4	$79.1	$115.9	$211.7
Shares Outstanding, Millions	36.9	36.9	38.0	38.2	38.2
Per Share Data					
Earnings	$2.40	$1.76	$2.42	$3.04	$4.48
Dividends	$1.08	$1.08	$1.26	$1.42	$1.69
Book Value	$21.49	$21.75	$26.97	$30.83	$36.42

Table 4 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending December
(Millions of U.S. Dollars, except Per Share Data)

Key Financial Ratios	1984	1985	1986	1987	1988
Liquidity					
Current (Times)	1.57	1.61	1.92	2.02	1.90
Quick (Times)	1.01	0.97	1.17	1.31	1.27
Fixed Assets/Equity (%)	108.91	109.40	93.66	90.77	77.42
Current Liabilities/Equity (%)	263.79	236.65	173.06	157.66	150.09
Total Liabilities/Equity (%)	473.74	437.95	369.05	345.70	301.36
Profitability (%)					
Return on Assets	-	2.20	1.73	2.30	3.91
Return on Equity	-	12.21	8.66	10.52	16.48
Profit Margin	1.51	2.58	1.78	2.27	4.19
Other Key Ratios					
R&D Spending % of Revenue	8.02	8.61	9.85	9.89	11.28
Capital Spending % of Revenue	7.46	8.24	5.19	4.91	5.55
Employees	75,116	78,159	72,575	70,893	65,138
Revenue ($K)/Employee	$47.26	$48.35	$61.24	$72.09	$77.50
Capital Spending % of Assets	5.82	7.21	4.80	4.78	5.02
Exchange Rate: US$1/SKr	SKr 8.27	SKr 8.60	SKr 7.12	SKr 6.34	SKr 6.20

Source: Telefonaktiebolaget LM Ericsson
Annual Reports
Dataquest
January 1990

TeleVideo Systems, Inc.

550 East Brokaw Road
P.O. Box 49048
San Jose, California 95161-9048
Telephone: (408) 954-8333
Fax: (408) 734-5758
Dun's Number: 06-069-8040

Date Founded: 1975

CORPORATE STRATEGIC DIRECTION

Dr. K. Philip Hwang founded TeleVideo Systems, Inc., in 1975 as a manufacturer of electronic games. In 1976, TeleVideo became a supplier of South Korean-manufactured CRTs to American game companies. The Company shifted its focus to the video display terminal market in 1978. Today, TeleVideo designs, manufactures, and markets a variety of video display terminals, IBM PC AT-compatible personal computers, and high-performance local area networks (LANs) aimed at office automation and data processing applications markets.

Televideo's total revenue decreased 39 percent to $47.4 million* for fiscal 1989 (ended October 31, 1989), down from $77.9 million in fiscal 1988. Net loss was $26.0 million for fiscal 1989, down from a net loss of $39.6 million in fiscal 1988. TeleVideo attributes the decrease in revenue to two primary factors. First, an increasingly competitive market resulted in lower prices and sales volumes for TeleVideo's products. Secondly, TeleVideo lost five major distributors because of product delivery delays and decreased profit margins for the Company's products.

To increase sales, TeleVideo is reviewing an aggressive product marketing plan. This includes increased marketing of its products through its direct sales force, and increased emphasis on developing sales and distribution in European markets, including the Soviet Union and Eastern European countries. The Company also plans to introduce its products into US government markets.

Increasing emphasis on international sales has been an important part of TeleVideo's marketing plan during the past five years. The share of sales represented by international business increased from 6.7 percent in fiscal 1985 to 26.1 percent in fiscal 1989. TeleVideo has international sales offices in the United Kingdom and the Netherlands. The Company also plans to reopen its offices in Germany and France in 1990. TeleVideo has distributors and representatives in South America, the Middle East, Africa, Australia, New Zealand, and the Far East.

The year 1989 reflected many changes for TeleVideo. In February, it relocated all US operations, excluding regional sales offices, to its corporate headquarters in San Jose, California. The Company expanded its US manufacturing operations to include final assembly, testing, and quality control of systems and components. In April 1989, TeleVideo sold 60 percent of its initial 100 percent equity interest in Kabil Electronics Co., Ltd. (formerly TeleVideo Computer Co., Ltd.). Although Kabil remains the main supplier of terminals to TeleVideo, the Company has arranged an alternate manufacturing source for terminals.

In August 1989, TeleVideo acquired the controller board and mass storage systems divisions of Scientific Micro Systems (SMS) from Chips & Technologies. The SMS Technologies Division was subsequently moved from Mountain View, California, and consolidated with the San Jose operations. As part of Televideo's cost reduction and consolidation program, 100 of the SMS employees were transferred to other positions within TeleVideo. Total employment at the end of fiscal 1989 totaled 426, approximately 55 percent less than the total reported at the end of fiscal 1988.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment

*All dollar amounts are in US dollars.

Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this backgrounder.

BUSINESS SEGMENT STRATEGIC DIRECTION

Video Display Terminals

TeleVideo competes in Segment 4 of the video display terminals market, which comprises the American Standard Code for Information Interchange (ASCII) market and the American National Standard Institute (ANSI) market. Dataquest estimates that TeleVideo holds over 6 percent of the 1989 North American display terminal market for ASCII/ANSI terminals, based on unit shipments. Dataquest currently ranks TeleVideo third in the Segment 4 market, behind Wyse Technology and Applied Digital Data Systems.

TeleVideo markets five models of video display terminals: three ASCII terminal models, one ANSI terminal model, and one ASCII/ANSI/PC-compatible terminal. TeleVideo's newest model, the 935, is its lowest-priced ASCII product. The 965, TeleVideo's most powerful and versatile terminal, operates as an ASCII, ANSI, or IBM PC-compatible terminal.

LAN Systems

TeleVideo sells a line of microprocessor-based LAN computer systems for business and professional applications. The LAN products are used as distributed processing and network file servers based upon Novell's Advanced NetWare system. TeleVideo utilizes industry-standard Ethernet LAN architecture to enable PC-to-mainframe communication and provide shared access to peripherals and access to a library of network applications programs.

TeleVideo's newest LAN system, the TS2 Telestation, is a diskless LAN PC AT workstation targeted for the Novell NetWare networks. The TS2 is based on the Intel 80286 microprocessor and is compatible with the MS-DOS versions 3.0 and 4.0. TeleVideo also provides components used to transform Televideo's PCs into platforms that can be used as file servers or networked PC workstations.

Personal Computers

TeleVideo markets personal computers based on Intel 80286 and 80386 microprocessors and PC AT bus architecture. The TelOAS line of PCs consists of the TelOAS II, the TelOAS III, and, most recently, the TelOAS IIIZ. The TelOAS models support MS-DOS, MS-OS/2, UNIX V.3, and XENIX operating systems. The TelOAS IIIZ also provides Novell NetWare software.

Other PC products include the Tele286SE, Tele386SX, and Tele/386/25. All three models use the MS-DOS operating system and support Ethernet communications protocols. The Tele/386/25, which is targeted at LAN file server, multiuser, and compute-intensive computer-aided design (CAD) applications, also provides support for Novell NetWare.

Further Information

For more information on TeleVideo's business segments, please contact Dataquest's Display Terminals Industry Service.

Table 1
Five-Year Corporate Highlights (Thousands of US Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	$103,088.0	$98,709.0	$98,920.0	$77,869.0	$47,419.1
Percent Change	-	(4.25)	0.21	(21.28)	(39.10)
Capital Expenditure	NA	NA	NA	NA	NA
Percent of Revenue	NA	NA	NA	NA	NA
R&D Expenditure	$8,704.0	$5,482.0	$6,056.0	$6,544.0	$4,484.0
Percent of Revenue	8.44	5.55	6.12	8.40	9.46
Number of Employees	751	781	996	955	426
Revenue ($K)/Employee	$137,268.00	$126,388.00	$99,317.00	$81,538.00	$111,312.00
Net Income	($19,184.0)	($2,315.0)	($8,905.0)	($39,640.0)	($25,976.0)
Percent Change	-	87.93	(284.67)	(345.14)	34.47

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	$15.80	$11.19	$14.10	NA
Quarterly Profit	($5.00)	NA	($8.99)	NA

NA = Not available

Source: TeleVideo Systems, Inc.
Annual Reports and Forms 10-K
Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
North America	93.30	76.82	79.27	69.47	73.87
International	6.70	23.18	20.73	30.53	26.13
Asia/Pacific	6.70	23.18	20.73	30.58	26.13

Source: TeleVideo Systems, Inc.
Annual Reports and Forms 10-K
Dataquest (1990)

Table 3
Revenue by Distribution Channel (Percent)

Channel	1988	1989
Direct Sales	5.00	5.00
Indirect Sales	95.00	95.00
Distributors	95.00	95.00

Source: TeleVideo Systems, Inc.
Annual Reports and Forms 10-K
Dataquest (1990)

1989 SALES OFFICE LOCATIONS

North America—9
Europe—2
Asia/Pacific—2

MANUFACTURING LOCATIONS

North America

San Jose, California
All products

SUBSIDIARIES

Asia/Pacific

TeleVideo of Korea Ltd. (South Korea)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

Information is not available.

MERGERS AND ACQUISITIONS

1989

Scientific Micro Systems, Inc. (SMS)
TeleVideo bought SMS' board business from Chips & Technologies in a cash transaction for $7.0 million.

1987

Delta Data Systems
TeleVideo acquired 51 percent of Delta Data Systems, a manufacturer of computers and data management systems.

Advanced Transducer Devices Systems
TeleVideo acquired Advanced Transducer Devices to make add-in boards and computer accessories for IBM PCs and compatibles.

KEY OFFICERS

Dr. K. Philip Hwang
Chairman and chief executive officer

Richard DuBridge
President

Sigmund Hartmann
Executive vice president

Fred Sohn
Vice president, Engineering and Production

PRINCIPAL INVESTORS

Dr. K. Philip Hwang—63.6 percent

FOUNDERS

Dr. K. Philip Hwang

Table 4
Comprehensive Financial Statement
Fiscal Year Ending October
(Thousands of US Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	$108,951.0	$113,919.0	$106,796.0	$72,782.0	$43,505.0
Cash	49,141.0	66,419.0	61,977.0	19,334.0	13,594.0
Receivables	37,944.0	23,479.0	20,503.0	17,816.0	7,732.0
Marketable Securities	NA	NA	NA	NA	3,117.0
Inventory	21,509.0	22,610.0	22,161.0	31,786.0	14,176.0
Other Current Assets	357.0	1,411.0	2,155.0	3,846.0	4,886.0
Net Property, Plants	$29,960.0	$30,182.0	$34,062.0	$37,231.0	$25,059.0
Other Assets	$6,692.0	$6,431.0	$12,452.0	$9,710.0	$4,877.0
Total Assets	$145,603.0	$150,532.0	$153,310.0	$119,723.0	$73,441.0
Total Current Liabilities	$21,418.0	$27,989.0	$38,497.0	$44,337.0	$25,130.0
Long-Term Debt	NA	$1,094.0	$518.0	$376.0	NA
Other Liabilities	$403.0	NA	$727.0	$558.0	NA
Total Liabilities	$21,821.0	$29,083.0	$39,742.0	$45,271.0	$25,130.0
Total Shareholders' Equity	$123,782.0	$121,449.0	$113,568.0	$74,452.0	$48,311.0
Converted Stock, Preferred	NA	NA	NA	NA	NA
Common Stock	98,053.0	98,117.0	97,828.0	96,652.0	95,862.0
Other Equity	(1,201.0)	(987.0)	326.0	NA	(47,551.0)
Retained Earnings	26,930.0	24,319.0	15,414.0	(22,200.0)	NA
Total Liabilities and Shareholders' Equity	$145,603.0	$150,532.0	$153,310.0	$119,723.0	$73,441.0
Income Statement	**1985**	**1986**	**1987**	**1988**	**1989**
Revenue	$103,088.0	$98,709.0	$98,920.0	$77,869.0	$47,419.1
US Revenue	96,181.2	75,823.4	78,411.6	54,093.0	35,030.3
Non-US Revenue	6,906.8	22,885.6	20,508.4	23,776.0	12,388.8
Cost of Sales	$101,281.0	$73,365.0	$72,587.0	$74,397.0	$49,532.0
R&D Expense	$8,704.0	$5,482.0	$6,056.0	$6,544.0	$4,484.0
SG&A Expense	$34,643.0	$28,318.0	$34,226.0	$35,066.0	$20,252.0
Capital Expense	NA	NA	NA	NA	NA
Pretax Income	($38,368.0)	($4,123.0)	($8,905.0)	($39,640.0)	($25,976.0)
Pretax Margin (%)	(37.22)	(4.18)	(9.00)	(50.91)	(54.78)
Effective Tax Rate (%)	NA	NA	NA	NA	NA
Net Income	($19,184.0)	($2,315.0)	($8,905.0)	($39,640.0)	($25,976.0)
Shares Outstanding, Thousands	41,701.0	47,697.0	47,669.0	47,390.0	45,657.0
Per Share Data					
Earnings	($0.46)	($0.05)	($0.19)	($0.84)	($0.57)
Dividend	NA	NA	NA	NA	NA
Book Value	$2.97	$2.55	$2.38	$1.57	$1.06

Table 4 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending October
(Thousands of US Dollars, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
Liquidity					
Current (Times)	5.09	4.07	2.77	1.64	1.73
Quick (Times)	4.08	3.26	2.20	0.92	1.17
Fixed Assets/Equity (%)	24.20	24.85	29.99	50.01	51.87
Current Liabilities/Equity (%)	17.30	23.05	33.90	59.55	52.02
Total Liabilities/Equity (%)	17.63	23.95	34.99	60.81	52.02
Profitability (%)					
Return on Assets	-	(1.56)	(5.86)	(29.04)	(26.90)
Return on Equity	-	(1.89)	(7.58)	(42.17)	(42.32)
Profit Margin	(18.61)	(2.35)	(9.00)	(50.91)	(54.78)
Other Key Ratios					
R&D Spending % of Revenue	8.44	5.55	6.12	8.40	9.46
Capital Spending % of Revenue	NA	NA	NA	NA	NA
Employees	751	781	996	955	426
Revenue ($K)/Employee	$137,268.00	$126,388.00	$99,312.00	$81,538.00	$111,312.00
Capital Spending % of Assets	0	0	0	0	0

NA = Not available

Source: TeleVideo Systems, Inc. Annual Reports and Forms 10-K Dataquest (1990)

Telmos, Inc.

THE COMPANY

Background

Telmos, Inc., was founded in January 1981 by Dr. Jean Hoerni and Dr. Luc O. Bauer to design, manufacture, and market custom, semicustom, and standard CMOS integrated circuits. In August 1982, Analogic Corporation, a manufacturer of data conversion and signal conditioning modules, agreed to acquire 38 percent of Telmos for $2.5 million. The transaction also included possible technology exchanges in the future. Analogic's share of the Company will drop to a predetermined level as other investors are brought in or as stock options are used to attract new employees. Other first-round financing came from private and venture capital sources including Arthur Rock. A second round of financing, totaling $3.6 million, was secured in December 1982. Seven venture companies and two private investors participated in the capitalization. The Company's products are mainly used in electronic data processing, military, and industrial products, although telecommunications products are expected to account for up to 20 percent of sales by 1985.

Operations

Telmos' corporate headquarters are in Sunnyvale, California. The Company established its wafer fabrication operation in this 25,000 square-foot facility in October 1982 and subsequently moved the corporate headquarters to the same location in November 1982. The Company also maintains a wholly owned subsidiary, Telmos GmbH, in Munich, West Germany, which provides marketing and circuit design capability for the European market.

Marketing

Telmos markets its products directly through Company headquarters and its European subsidiary as well as through independent sales respresentatives.

Telmos' marketing and sales headquarters are:

Telmos, Inc.
740 Kifer Road
Sunnyvale, CA 94086

Telephone: (408) 732-4882
TWX: 910-339-9623

The European design center is at:

Telmos GmbH
Ellingerweg 98
8000 Munchen 80
West Germany

Telephone: 49-89-432004

Telmos, Inc.

Customer Interface for Semi-custom Devices

Telmos can enter the gate array design cycle at any stage but prefers to work from a tested schematic. Telmos also encourages customers to perform their own design or to work with independent designers. Telmos offers design manuals for sale for each of the gate array families it produces. Although the Company has no formal training courses, it does offer on-site training to customers.

PRODUCTS

Telmos manufactures CMOS gate arrays using both metal-gate and silicon-gate technology, as well as standard products.

Products include:

- The TM6000 silicon-gate CMOS gate array series, which can implement systems requiring A/D and D/A conversion and precision analog signal processor interfacing. This process is also licensed to California Devices, Inc.
- The TM5000 gate array, mating silicon-gate CMOS with high-voltage n-channel lateral DMOS offering 300-volt open-drain output transistors
- A range of standard 7-bit flash converters for applications requiring low power levels and sampling speeds of up to 12 MHz
- The TM4000 series of six circuits ranging from 300 to 1,250 gates, which is licensed from California Devices, Inc.
- The TM3000 metal-gate CMOS gate array series, which is licensed from Master Logic

In 1982 Telmos' shipments profile showed 79 percent of its income derived from gate arrays. Custom circuits provided 16 percent of the Company's revenues, with the TML 1070 flash converter accounting for 5 percent. The Company's business plan calls for 50 percent of 1985 shipments to be standard product, with the remaining 50 percent divided equally between custom circuits and gate arrays. Standard product emphasis will be on the interface areas where Telmos' expertise in analog/digital combination integrated circuits and high voltage capability can best be exploited.

Financial Information

Telmos' sales started in June 1982, and total sales for the year were $600,000. The Company anticipates sales of $4 million in 1983, growing to $20 million in 1985.

Texas Instruments Incorporated

13500 N. Central Expressway
P.O. Box 655474
Dallas, Texas 75265
Telephone: (214) 995-2011
Fax: (214) 995-4360
Dun's Number: 00-732-1904

Date Founded: 1930

CORPORATE STRATEGIC DIRECTION

Texas Instruments Incorporated (TI) develops, manufactures, and markets a variety of electronic products for the industrial, government, and consumer markets. These products consist of components, defense electronics, and digital products. The company also produces metallurgical materials. TI's business is based principally on its broad semiconductor technology and on the application of this technology to selected electronic end-equipment markets. Founded in 1930, the company has an impressive record of industry firsts, ranging from the co-invention of the first integrated circuit (IC) to the first hand-held electronic calculator. In addition, TI has been a pioneer in speech synthesis.

TI's components segment consists of semiconductor integrated circuits, semiconductor discrete devices, semiconductor subassemblies, and electrical and electronic control devices. Texas Instruments sells these components primarily to original equipment manufacturers (OEMs) through its own marketing organizations and, to a lesser extent, through distributors. In 1990, components accounted for 48 percent of the company's total revenue.

Defense electronics consists of radar systems, navigation systems, infrared surveillance and fire control systems, defense suppression missiles, other weapon systems, missile guidance and control systems, electronic warfare systems, and other defense electronic equipment. Sales are made primarily to the U.S. government either directly or through prime contractors. Defense electronics accounted for 33 percent of company sales during 1990.

The company's digital products segment includes multiuser minicomputers, personal computers and workstations, software development tools, electronic data terminals and printers, industrial automation and control systems, electronic calculators, and learning aids. Digital products are used in a broad range of standalone and distributed network computing applications. TI markets these digital products through multiple channels, including systems suppliers, business equipment dealers, distributors, retailers, and direct sales to OEMs and end users. Digital products accounted for 19 percent of total revenue.

Metallurgical materials include clad metals, precision-engineered parts, and electronic connectors for use in a variety of applications such as appliances, automobiles, electronic components, and industrial and telecommunications equipment. These metallurgical materials are primarily sold directly to OEMs. This segment accounted for 2 percent of sales in 1990.

TI's fiscal year 1990 net revenue was $6.57 billion*, approximately even with 1989 results. The company reported a net loss of $39 million, compared with net income of $292 million in 1989. Losses in TI's semiconductor business, stemming from sharply lower memory prices and substantially higher investments in new products and capacity, were a main reason for the unfavorable changes in operating results. Margins in the company's defense electronics business were down slightly on relatively stable revenue, and losses were reduced in TI's new information technology business unit. Profitability declined in the materials and controls business, reflecting the weakness of the U.S. economy and increased investments. Capital expenditure rose to $909 million, representing 13.8 percent of revenue. The increase was primarily for new submicron CMOS wafer-fabrication facilitites in the components segment. R&D expenditure increased slightly to $540 million from $506 million in 1989. The company employs 70,318 people worldwide.

*All dollar amounts are in U.S. dollars

More detailed information is available in Tables 1 and 2, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region. Information on revenue by distribution channel is not available. Tables 3 through 6 present comprehensive financial information at the end of this backgrounder.

BUSINESS SEGMENT STRATEGIC DIRECTION

Semiconductors

According to Dataquest, TI ranked as the seventh-largest semiconductor company worldwide in 1990, with a 4.4 percent market share based on estimated factory revenue of $2.57 billion. TI is one of the world's broadest-range semiconductor manufacturers and offers products ranging from bipolar logic devices to gate arrays and advanced microprocessors. In the worldwide MOS microcomponents market, the company held a 3.2 percent market share based on estimated factory revenue of $320 million. Texas Instruments is among the leaders in bipolar logic integrated circuits and is also strong in linear and memory products. In addition, the company is a major supplier of 256K and 1Mb DRAMs. In 1990, TI rose to number eight in rank in the worldwide MOS logic market, with factory reveue of $306 million and a 3.4 percent market share. In the analog market, Dataquest estimates that TI ranked seventh, with factory revenue of $458 million and a 4.3 percent market share. In the MOS memory market, TI also ranked seventh with 95.7 percent market share based on an estimated $741 million in factory revenue.

TI is continuing to shift its product mix toward a greater percentage of differentiated semiconductor products such as application-specific integrated circuits (ASICs), applications processors, microcontrollers, advanced linear circuits, and differentiated memory products. The company achieved double-digit revenue growth in differentiated products in 1990 and has increased its semiconductor marketing resources to support these products.

Texas Instruments has recently made a large effort to increase capacity for submicron CMOS wafer fabrication. By 1992, TI will have submicron CMOS wafer fab facilities strategically located in the world's four major semiconductor markets—Japan, the United States, Europe, and the Asia-Pacific region. This capacity will represent a fourfold increase in submicron CMOS wafer starts over TI's capacity at the beginning of 1990. In early 1991, TI announced its new TGB1000 family of seven gate array products, which use new BiCMOS technology to achieve both high component densities and high speeds. The most notable product in the TGB1000 family is a gate array chip with 150,000 gates; it is expected to be used in telephone systems and computer workstations.

During 1990, TI began ramping up production of its 4Mb DRAMs in Miho, Japan, and pilot processing of 4MB DRAM wafers at its new facility in Avezzano, Italy. In addition, the TI/Acer Laboratories facility in Taiwan, expected to come on-line during 1991, will be used initially to produce 4MB DRAMs. Texas Insturments also began limited sampling of its 16MB DRAMs, manufactured at the company's submicron prototyping line in Dallas, Texas, and is proceeding on design work of its 64MB DRAMs.

Defense

Texas Instruments has supplied state-of-the-art defense electronics systems to the U.S. Department of Defense (DOD) and U.S. allies for more than 40 years. In defense electronics, the company's goal is to align the cost structure of this business with the reduced level of revenue expected in the future, and then to drive for market share gains in selected growth areas. TI is building on its technical base to strengthen its position in electro-optical sensors, antiarmor weapons, and airborne fire-control radars. Several key development programs, with the potential to be high-volume programs in the future, are in important markets for TI, including next-generation antitank weapons, solid-state phased-array radars, and intelligent weapons systems.

The high-speed antiradiation missile (HARM) continues to be the keystone of TI's weapons systems business. The HARM counteracts surface-to-air missiles by neutralizing their ground-based radar systems. Since production of the HARM began in 1982, the unit price has come down by a factor of more than two over that period. During 1991, TI will launch a major upgrade to this program; primary clients are the U.S. Navy and Air Force.

During 1990, Texas Instruments redesigned the F-111 terrain-following radar (TFR) for the air force to extend the life of the TFR beyond the year 2000. The system has a mean time between failure that exceeds specification by a factor of more than two, so it can be ready when needed. The company's APS-137 family of ocean surveillance and control radars provides over-the-horizon ship-classification and targeting capability through the use of inverse synthetic aperature radar (ISAR) processing to create a target image that can be classified from beyond visual range. TI's high-speed digital gallium arsenide components will be used to provide improved ISAR capability in the 1990s. For the U.S. army, TI is applying "fire-and-forget" guidance, now under development on the advanced antitank weapon system-medium (AAWS-M). This system meets the need for a portable weapon that provides greatly increased gunner safety.

Information Technology

The mission of the Information Technology Group (ITG), established in 1989, is to provide cost-effective technologies that help customers gain significant competitive advantage from the timely, effective use of information. Products in this group include integrated computer-aided software engineering (CASE) tools, multiuser computer systems using the UNIX operating system, portable personal computers, printers, industrial automation systems, and custom manufacturing services.

TI's Information Engineering Facility (IEF) product is an integrated CASE tool that allows application developers to design business systems using graphical models that describe business operations and to automatically generate business systems from those models. In mid-1990, the company began shipping IEF software products for the IBM OS/2, IBM's multitasking operating system for workstations. The IEF for OS/2 includes Planning, Analysis, Design, and a new workstation tool set called Construction (or PC code generation). TI is in the process of broadening the applicability of IEF to include Digital Equipment Corporation, Tandem, and UNIX environments in addition to IBM environments.

The most recent addition to TI's UNIX-based 1500 computer family of multiuser systems is the 25-MHz model 1507. The model 1507, which handles up to 64 active users, is a 68040-based version of the TI single-processor model 1505 and is binary compatible with the complete line of 1500 Series computers.

Texas Instruments has seen dramatic growth in its printers and portable computers as it continues to expand its product lines and distribution channels. The TravelMate 3000, TI's most recent notebook PC, features a 20-MHz Intel 80386SX processor, a 10-inch diagonal black-on-white VGA display, and a 1.44MB floppy and 20MB hard disk drive. The TravelMate 3000 is aimed at users that require the utmost in portability with the power requirements found in a 386SX PC. The company also manufactures a broad range of printers including the MicroLaser 35, a PostScript laser printer that comes with 35 fonts and 1.5MB of RAM (expandable to 4.5MB), and the MicroLaser XL, a personal-size 16-page-per-minute printer that comes with Hewlett-Packard LaserJet Series II emulation.

Manufacturers use TI industrial automation products and systems to monitor and refine their manufacturing processes. New products in this area announced in 1990 include the TI545 programmable logic controller (PLC) and the PLC-on-a-chip, which dramatically reduces size and cost and improves performance of the company's low-end PLCs. In April 1991, TI signed a letter of intent with Siemens Corporation, a wholly owned subsidiary of Siemens AG, for Siemens to acquire TI's Johnson City, Tennessee-based industrial controls business. This business unit designs, manufactures, and markets PLCs and related products. Included in this proposed transaction would be TI's products, facilities, equipment, and sales/support activities.

Further Information

For further information about the company's business segments, please contact Dataquest's Semiconductors *Worldwide* industry service.

Table 1
Five-Year Corporate Highlights (Millions of U.S. Dollars)

	1986	1987	1988	1989	1990
Five-Year Revenue	4,974	5,816	6,447	6,522	6,567
Percent Change	1.02	16.93	10.85	1.16	0.69
Capital Expenditure	447	459	656	863	909
Percent of Revenue	8.99	7.89	10.18	13.23	13.84
R&D Expenditure	406	428	494	506	540
Percent of Revenue	8.16	7.36	7.66	7.76	8.22
Number of Employees	77,270	77,984	75,685	73,854	70,318
Revenue ($K)/Employee	64.37	74.58	85.18	88.31	93.39
Net Income	63	321	366	292	(39)
Percent Change	-	409.52	14.02	(20.22)	(113.36)

1990 Fiscal Year	Q1	Q2	Q3	Q4
Quarterly Revenue	1,536	1,592	1,680	1,759
Quarterly Profit	13	11	(7)	(56)

Source: Texas Instruments Incorporated Annual Reports and Forms 10-K
Dataquest (October 1991)

Table 2
Revenue by Geographic Region (Percent)

	1986	1987	1988	1989	1990
North America	70.12	69.64	68.39	68.61	66.79
Europe	14.94	14.86	15.37	14.86	16.19
East Asia	10.78	12.19	14.72	14.90	15.64
All Others	4.16	3.31	1.52	1.63	1.38

Source: Texas Instruments Incorporated Annual Reports and Forms 10-K
Dataquest (October 1991)

1990 SALES OFFICE LOCATIONS

North America—46
Europe—14
Japan—9
ROW—12

MANUFACTURING LOCATIONS

North America

Attleboro, Massachusetts
Components, metallurgical materials
Austin, Texas
Defense electronics, digital products
Colorado Springs, Colorado
Defense electronics
Dallas, Texas
Components, defense electronics, digital products
Denton, Texas
Defense electronics
Houston, Texas
Components, digital products
Hunt Valley, Maryland
Digital products
Johnson City, Tennessee
Digital products
Lewisville, Texas
Defense electronics
Lubbock, Texas
Components, digital products
McKinney, Texas
Defense electronics
Midland, Texas
Components
Plano, Texas
Defense electronics, digital products
Sherman, Texas
Components, defense electronics
Temple, Texas
Digital products

Europe

Almelo, Netherlands
Components, digital products
Avezzano, Italy
Components
Bedford, United Kingdom
Components
Freising, Germany
Components
Nice, France
Components
Rieti, Italy
Components, digital products

Japan

Hatogaya, Japan
Components
Hiji, Japan
Components
Miho, Japan
Components
Oyama, Japan
Components

ROW

Baguio, Philippines
Components
Kuala Lumpur, Malaysia
Components
Singapore
Components
Taipei, Taiwan
Components

SUBSIDIARIES

North America

Texas Instruments Asia Limited (United States)
Texas Instruments Canada Limited (Canada)

Europe

Texas Instruments Belgium S.A./N.V. (Belgium)
Texas Instruments Denmark A/S (Denmark)
Texas Instruments Deutschland GmbH (Germany)
Texas Instruments Equipamento Electronico Lda. (Portugal)
Texas Instruments España, S.A. (Spain)
Texas Instruments France S.A. (France)
Texas Instruments Holland B.V. (Netherlands)
Texas Instruments International Trade Corporation (Sweden)

Texas Instruments (Ireland) Limited (Ireland)
Texas Instruments Italia S.p.A. (Italy)
Texas Instruments Limited (United Kingdom)
Texas Instruments Norge A/S (Norway)
Texas Instruments OY (Finland)
Texas Instruments Switzerland AG (Switzerland)

Japan

Texas Instruments Japan Limited

ROW

Texas Instrumentos Electronicos do Brasil LTDA (Brazil)
Texas Instruments Australia Limited (Australia)
Texas Instruments China Incorporated (China)
Texas Instruments de Mexico, S.A. de C.V. (Mexico)
Texas Instruments Hong Kong Limited (Hong Kong)
Texas Instruments Korea Limited (Korea)
Texas Instruments Malaysia Sdn. Bhd. (Malaysia)
Texas Instruments (Philippines) Incorporated (Philippines)
Texas Instruments Private Limited (India)
Texas Instruments Singapore Pte. Limited (Singapore)
Texas Instruments Taiwan Limited (Taiwan)
Texas Instruments Trade and Investment Company, S.A. (Panama)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1991

TranSwitch Corporation

Under terms of a licensing agreement, TI will manufacture and market TranSwitch's line of very large scale integrated (VLSI) circuits designed for operating in the DS3 and SONET telecommunications environments.

Canon Incorporated, Hewlett-Packard Company (HP), and the Singapore Economic Development Board

The four companies will jointly construct and own a $330 million dollar wafer fab plant, to be located in Singapore and called TECH Semiconductor Singapore Pte. Ltd. The new plant will use submicron CMOS manufacturing technology to produce DRAMs and possibly logic chips. TI and the Singapore Economic Development Board will each own 26 percent of the new venture, while Canon and HP will own 24 percent each.

Anthem Electronics

TI signed a semiconductor distribution agreement with Anthem as part of its long-term strategy to increase its market penetration. Along with Anthem, TI's distributors now include Alliance Electronics, Arrow, Hall-Mark, Lex Electronics, Marshall and Wyle, and Zeus Components.

Matsushita Electric Industrial Co. Ltd. and NEC Corporation

Texas Instruments reached basic patent cross-licensing agreements with Matsushita and NEC. The agreements, which involve the Kilby patent that covers basic semiconductor technology, are similar to previous pacts with both companies that expired at the end of 1990. As of July 1991, the final agreements had not yet been signed.

Mentor Graphics Corporation

The two companies reached a multiyear agreement that will incorporate design-for-manufacture (DFM) software developed by TI's Information Technology Group into Mentor's Falcon Framework, resulting in the first software to integrate device and board-level DFM concerns at system level. Mentor will handle all marketing, sales, and support for the new technology.

1990

Oki Electric Industry Co. Ltd. and Samsung Electronics Co. Ltd.

TI reached new five-year agreements with Oki and Samsung involving the cross-licensing of semiconductor patents that incorporate TI technology. The agreements replace separate five-year pacts that expired in 1990. The Oki and Samsung agreements are subject to the approval of the governments of Japan and Korea, respectively.

Toshiba Corporation

TI announced a 10-year patent licensing agreement with Toshiba, whereby TI will receive royalties on the sale of Toshiba semiconductors. The pact replaces a five-year agreement, which expired in 1990, resulting from a 1986 patent infringement lawsuit filed by TI against eight Japanese companies and one Korean firm.

Force Computers
The two companies signed an agreement to jointly design a 64-bit, packet-mode Futurebus protocol controller that incorporates cache coherency mechanisms.

Kobe Steel Ltd.
TI and Kobe Steel established a joint-venture company, KTI Semiconductor Ltd., to manufacture advanced semiconductors in Japan. The company will manufacture primarily CMOS logic devices, including VLSI circuits and ASICs.

Sony Corporation
TI will produce most of the linear and other types of ICs that Sony uses in its electronic home appliances marketed in Europe. The chips—manufactured by TI at its Freising, Germany, plant—will be marketed under Sony's brand name.

Philips Components-Signetics
Philips Components-Signetics and TI signed a multiyear BiCMOS alternate-sourcing and development agreement that will initially revolve around bus interface logic. TI and Signetics are not transferring process technology, but are instead agreeing on the performance specifications of each device as it is designed.

AST Research
AST Research and the Information Technology Group of TI will provide service to users of AST computer systems. This alliance follows an OEM agreement signed by the two companies under which AST is developing custom computer systems for TI.

Toshiba Corporation
Toshiba has obtained a TI licensing agreement that will allow Toshiba to sell laser diode semiconductors made with a TI-patented process in the United States.

FSI International
TI licensed its 150mm photoresist processing system to FSI International. FSI will build and distribute the equipment under the agreement.

Delco Electronics
Delco and TI entered into an agreement to jointly define and develop a new generation of microcontrollers for automotive applications.

1989

Silicon Compiler Systems (SCS)
The two companies agreed to jointly develop advanced IC CAD software technology for the physical verification of integrated circuits. The result of this agreement will be IC-design products to be marketed and supported worldwide exclusively by SCS.

Toppan Printing Company
TI and Toppan (Tokyo) signed an agreement that will bring Toppan Printronics USA into being as a joint venture in order to acquire TI's internal phtomask operation. Toppan will own 85 percent of the new company, and TI will have a 15 percent interest. The new company will be a major supplier of photomasks to TI and will also supply the product to other North American and European semiconductor manufacturers.

Nippon Hoso Kyokai (NHK)
TI signed an agreement with NHK for its MUSE, or "Hi-vision," advanced television receiver technology. TI will use this acquired system knowledge to develop chip sets to participate in three high-definition television (HDTV) markets.

Micron Technology Inc.
The two companies entered into a cross-licensing agreement encompassing the semiconductor patents of both companies.

Acer Incorporated
The two companies agreed to create a privately held joint venture company in Taiwan to manufacture 1Mb and 4Mb DRAMs.

Hitachi Ltd.
Hitachi and TI entered into an agreement to jointly develop a common 16Mb DRAM technology and allow access to each other's DRAM technology as it relates to the development of the 16Mb DRAM device.

1988

Actel
Actel and TI announced a seven-year agreement covering Actel's desktop-configurable, channeled gate arrays and proprietary PLICE antifuse technology.

Cypress Semiconductor Corporation
The two companies will codevelop and second source SPARC-related microprocessors, floating-point processors, and other peripherals.

Sun Microsystems Inc.
Sun Microsystems and TI signed a comprehensive, long-term licensing and cooperative development agreement in which Sun will license to TI a broad range of its products and technology, including SPARC chips. TI and Sun will also codevelop the next generation of SPARC microprocessors.

Altera Corporation
The two companies signed a long-term agreement that encompasses a seven-year technology exchange and supply arrangement for high-performance, high-density, erasable programmable logic devices.

Raytheon Company
Raytheon and TI are one of four teams selected by the U.S. Department of Defense to develop and produce GaAs circuits.

VoxTron
TI will incorporate its hardware and voice verification technology with VoxTron's Veriton Series 1000, a voice-activated access-control system.

MERGERS AND ACQUISITIONS

1991

James Martin Associates
TI purchased the European CASE operations of JMA in a deal worth approximately $30 million. JMA is best known for its involvement with TI in the marketing of TI's IEF CASE package in the United Kingdom.

1989

Microsemi
Microsemi acquired the complete military discrete power and small-signal product lines of TI, including radiation-hardened technologies.

KEY OFFICERS

Jerry R. Junkins
Chairman of the board, president, and chief executive officer

William I. George
Executive vice president

William B. Mitchell
Executive vice president

William P. Weber
Executive vice president

Richard J. Agnich
Senior vice president, secretary, and general counsel

William A. Aylesworth
Senior vice president, treasurer, and chief financial officer

PRINCIPAL INVESTORS

Northern Trust Corporation—11.2 percent

FOUNDERS

Cecil Green
Patrick Haggerty
Erik Jonsson
Eugene McDermott

Table 3
Balance Sheet
Fiscal Year Ending in December
(Millions of U.S. Dollars)

Balance Sheet	1986	1987	1988	1989	1990
Cash	207	422	541	418	403
Receivables	670	848	942	943	944
Short-Term Investments	7	241	239	219	9
Inventory	610	739	770	806	887
Other Current Assets	288	53	57	60	62
Total Current Assets	1,782	2,303	2,549	2,446	2,305
Net Property, Plants	1,437	1,520	1,726	2,130	2,480
Other Assets	118	135	153	228	263
Total Assets	3,337	3,958	4,428	4,804	5,048
Total Current Liabilities	1,113	1,236	1,199	1,303	1,479
Long-Term Debt	192	487	624	617	715
Other Liabilities	305	349	361	399	496
Total Liabilities	1,610	2,072	2,184	2,319	2,690
Converted Preferred Stock	300	300	300	300	300
Common Stock	26	79	81	82	82
Other Equity	362	355	433	478	486
Retained Earnings	1,039	931	1,209	1,404	1,269
Converted Money Market	0	221	221	221	221
Total Shareholders' Equity	1,727	1,886	2,244	2,485	2,358
Total Liabilities and Shareholders' Equity	3,337	3,958	4,428	4,804	5,048

Source: Texas Instruments Incorporated Annual Reports and Forms 10-K
Dataquest (October 1991)

Table 5
Consolidated Income Statement
Fiscal Year Ending in December
(Millions of U.S. Dollars, except Per Share Data)

Income Statement	1986	1987	1988	1989	1990
Revenue	4,974	5,816	6,447	6,522	6,567
U.S. Revenue	3,488	4,050	4,409	4,475	4,386
Non-U.S. Revenue	1,486	1,766	2,038	2,047	2,181
Cost of Sales	4,035	4,410	4,836	5,090	5,327
R&D Expense	406	428	494	506	540
SG&A Expense	827	909	1,017	1,045	1,183
Capital Expense	446	459	656	863	909
Pretax Income	87	402	516	355	(21)
Pretax Margin (%)	1.75	6.91	8.00	5.44	(0.32)
Effective Tax Rate (%)	NA	NA	NA	NA	NA
Net Income	63	321	366	292	(39)
Shares Outstanding, Thousands	75,942	82,023	84,820	84,934	81,614
Per Share Data					
Earnings	0.69	3.74	4.05	3.04	(0.92)
Dividend	0.67	0.71	0.72	0.72	0.72
Book Value	22.74	22.99	26.46	30.30	31.05

NA = Not available

Source: Texas Instruments Incorporated
Annual Reports and Forms 10-K
Dataquest (October 1991)

Table 6
Key Financial Ratios
Fiscal Year Ending in December

Key Financial Ratios	1986	1987	1988	1989	1990
Liquidity					
Current (Times)	1.60	1.86	2.13	1.88	1.56
Total Assets/Equity (%)	193.23	209.86	197.33	193.32	214.08
Current Liabilities/Equity (%)	64.45	65.54	53.43	52.43	62.72
Total Liabilities/Equity (%)	93.23	109.86	97.33	93.32	114.08
Profitability (%)					
Return on Assets	1.89	8.11	8.27	6.08	(0.77)
Return on Equity	3.65	17.02	16.31	11.75	(1.65)
Profit Margin	1.27	5.52	5.68	4.48	(0.59)
Other Key Ratios					
R&D Spending % of Revenue	8.16	7.36	7.66	7.76	8.22
Capital Spending % of Revenue	8.97	7.89	10.18	13.23	13.84
Employees	77,270	77,984	75,685	73,854	70,318
Revenue ($K)/Employee	64.37	74.58	85.18	88.31	93.39
Capital Spending % of Assets	13.37	11.60	14.81	17.96	18.01

Source: Texas Instruments Incorporated
Annual Reports and Forms 10-K
Dataquest (October 1991)

Texas Instruments, Inc.

13500 N. Central Expressway
Dallas, Texas 75265
Telephone: (214) 995-6611
Fax: (214) 995-4360
Dun's Number: 00-732-1904

Date Founded: 1951

CORPORATE STRATEGIC DIRECTION

Texas Instruments, Inc. (TI), was formed in 1951 by Erik Jonsson, Cecil Green, and Patrick Haggerty as a manufacturing division of Geophysical Service, Inc. In 1952, TI moved into the semiconductor industry by purchasing the licenses to manufacture the transistor invented at Bell Laboratories. By 1953, TI had become a volume producer of transistors. The Company has an impressive record of industry firsts, ranging from the coinvention of the first integrated circuit (IC) to the first hand-held electronic calculator. In addition, TI has been a pioneer in speech synthesis. In 1985, TI's management underwent a significant restructuring with Jerry Junkins replacing Fred Bucy as president and CEO. Although many semiconductor manufacturers were pulling out of dynamic RAM (DRAM) production, TI was stepping up DRAM production, which resulted in significant sales of semiconductors. In 1986, TI began sampling 1MB DRAMs. In 1988, the Company sold a majority interest in its previously wholly owned geophysical subsidiary, GSI, through which the Company provided seismic services. The sale agreement includes options for the possible future sale of the Company's remaining 19.7 percent interest in the business.

TI develops, manufactures, and markets a variety of electronic products for the industrial, government, and consumer markets. These products consist of components, defense electronics, metallurgical materials, and digital products. TI's business is based principally on its broad semiconductor technology and application of this technology to selected electronic end-equipment markets.

Components consist of semiconductor integrated circuits, semiconductor discrete devices, semiconductor subassemblies, and electrical and electronic control devices. The Company sells these components primarily to original equipment manufacturers (OEMs), principally through its own marketing organizations and to a lesser extent through distributors. Components accounted for 49 percent of sales.

Defense electronics consists of radar systems, navigation systems, infrared surveillance and fire control systems, defense suppression missiles, other weapon systems, missile guidance and control systems, electronic warfare systems, and other defense electronic equipment. Sales are made primarily to the US government either directly or through prime contractors. Defense electronics accounted for 33 percent of sales.

Metallurgical materials include clad metals, precision-engineered parts, and electronic connectors for use in a variety of applications such as appliances, automobiles, electronic components, and industrial and telecommunications equipment. These metallurgical materials are primarily sold directly to OEMs. This segment accounted for 3 percent of sales.

Digital products include multiuser minicomputers, personal computers and workstations, software development tools, electronic data terminals and printers, industrial automation and control systems, electronic calculators, and learning aids. Digital products are used in a broad range of standalone and distributed network computing applications. TI markets these digital products through multiple channels, including systems suppliers, business equipment dealers, distributors, retailers, and direct sales to OEMs and end users. Digital products accounted for 15 percent of sales.

In 1989, TI announced the formation of a new business unit, the Information Technology Group (ITG), aimed at the emerging market need for more advanced information and automation systems in the

1990s. The new group combines CASE technologies, industrial automation, and custom manufacturing with computing activities into a single worldwide business strategy focusing on advanced productivity software tools.

TI's 1989 sales of $6.5 billion* represented an increase of 1 percent over 1988 revenue of $6.4 billion. Net income for fiscal 1989 decreased 20 percent to $292 million. Capital expenditure rose to $863 million, representing 13 percent of revenue. Most of the $207 million increase was for advanced semiconductor wafer fabrication facilities and equipment. To meet the market requirements in the early 1990s for submicron logic and memory, TI plans to increase capital spending in 1990 to about $1 billion. R&D expenditure increased slightly to $506 million from $494 million in 1988. The company employs 73,854 people.

More detailed information is available in Tables 1 and 2, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region. Information on revenue by distribution channel is not available. Table 3, a comprehensive financial statement, is at the end of this backgrounder.

BUSINESS SEGMENT STRATEGIC DIRECTION

Semiconductors

TI ranked as the sixth largest semiconductor company worldwide with 4.9 percent of the market and was the leading nondomestic supplier to the Japanese market in 1989. TI is one of the world's broadest-range semiconductor manufacturers and offers products ranging from discrete transistors to gate arrays and advanced microprocessors. The Company ranked number seven in the worldwide MOS microcomponent market and earned revenue of $252 million with 3.1 percent of the market in 1989. The Company is the market leader in bipolar logic integrated circuits and is also strong in linear and memory products. It is a major supplier of 256K DRAMs. TI ranked number six in the worldwide MOS memory market with revenue of $1.1 billion and 6.7 percent of the market. In the analog market, TI ranked sixth with revenue of $417 million and 4.4 percent of the market. In the MOS logic market, TI ranked tenth with 3.0 percent of the market and $256 million in revenue.

TI, the first US company to operate and own a semiconductor company in Japan, has always pursued aggressive regional investment. In early 1990, Kobe Steel and TI announced the establishment of a joint venture in Japan to manufacture VLSI ICs and ASICs. Construction of the $350 million wafer fab is expected to commence in 1991 and be completed within the year. Kobe Steel will provide the majority of the equity capital and will own a majority interest in the joint venture. TI will provide the technical assistance in the form of design and manufacturing technology required to build and operate the plant and will provide some additional funding. TI will have the option to increase its ownership in the joint venture, although no specific terms have been divulged. Both companies will contribute personnel to the venture, which is called KTI Semiconductor Ltd. The semiconductor output from KTI will be sold exclusively to TI, which will have worldwide sales and distribution rights. TI's goal is to increase its percentage of differentiated products to more than half of its semiconductor revenue by the end of the decade.

Defense

The high-speed antiradiation missile (HARM) continues to be the keystone of TI's weapons systems business. The HARM counteracts surface-to-air missiles by neutralizing their ground-based radar systems. Net revenue under HARM systems contracts, primarily for the US Navy and the US Air Force, accounted for approximately 9 percent of TI's net revenue in 1989. In December 1989, TI was awarded a $297 million contract relating to fiscal year 1990 procurement of HARM missile systems for the navy and air force and the Federal Republic of Germany. Using gallium arsenide microwave IC technology, TI is part of a joint venture that is providing the solid-state phased array radar for the air force's new Advanced Tactical Fighter. Based on field tests of competing prototypes, the army selected the team of TI and Martin Marietta in 1989 as prime contractor for full-scale development of the Advanced Antitank Weapon System-Medium (AAWS-M). Under a contract with the navy, TI will provide a new radar system that will enable pilots on reconnaissance and surveillance missions to spot hostile naval vessels beyond the horizon. TI is currently working with Italian and German contractors on development and coproduction of the emitter location system (ELS) for the Electronic Combat and Reconnaissance Tornado aircraft.

*All dollar amounts are in US dollars.

Software

TI established the Information Technology Group during 1989. This strategic business unit combines TI's skills in computing hardware and software and companywide management information systems. TI is focusing these skills on a single worldwide business strategy that emphasizes software and system productivity tools. TI's CASE product, the Information Engineering Facility (IEF), exemplifies this strategy. IEF is a software tool that allows management information systems to be developed more quickly, improves the quality of these systems, and reduces maintenance costs. IEF has gained widespread customer acceptance both in the United States and abroad, with more than 200 customer accounts currently in place. Revenue from this business has doubled annually over the past three years. TI anticipates an increasing share of revenue in the digital segment to come from software and related services.

Further Information

For further information about the Company's business segments, please contact the appropriate Dataquest industry service.

Table 1
Five-Year Corporate Highlights (Millions of US Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	$4,924	$4,974	$5,595	$6,447	$6,522
Percent Change	-	1.02	12.48	15.23	1.16
Capital Expenditure	$515	$447	$459	$656	$863
Percent of Revenue	10.46	8.99	8.20	10.18	13.23
R&D Expenditure	$402	$406	$428	$494	$506
Percent of Revenue	8.16	8.16	7.65	7.66	7.76
Number of Employees	77,872	77,270	77,984	75,685	73,854
Revenue ($K)/Employee	$63.23	$64.37	$71.75	$83.17	$88.31
Net Income	($119)	$63	$321	$366	$292
Percent Change	-	(152.94)	409.52	14.02	(20.22)

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	$1,596.90	$1,630.00	$1,570.70	$1,724.40
Quarterly Profit	$84.60	$106.10	$65.00	$35.90

Source: Texas Instruments, Inc.
Annual Reports and Forms 10-K
Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

	1985	1986	1987	1988	1989
North America	71.00	70.00	68.00	67.00	69.00
International	29.00	30.00	32.00	33.00	31.00
Europe	15.00	15.00	15.00	16.00	15.00
Asia/Pacific	8.00	11.00	13.00	15.00	15.00
All Others	6.00	4.00	4.00	2.00	2.00

Source: Texas Instruments, Inc.
Annual Reports and Forms 10-K
Dataquest (1990)

1989 SALES OFFICE LOCATIONS

North America—50
Europe—14
Asia/Pacific—16
  Japan—10
ROW—3

MANUFACTURING LOCATIONS

North America

Attleboro, Massachusetts
  Components, metallurgical materials
Austin, Texas
  Defense electronics, digital products
Colorado Springs, Colorado
  Defense electronics
Dallas, Texas
  Components, defense electronics
Denton, Texas
  Defense electronics
Houston, Texas
  Components, digital products
Hunt Valley, Maryland
  Digital products
Johnson City, Tennessee
  Digital products
Lewisville, Texas
  Defense electronics
Lubbock, Texas
  Components, digital products
McKinney, Texas
  Defense electronics
Midland, Texas
  Components
Plano, Texas
  Defense electronics
Sherman, Texas
  Components, defense electronics
Temple, Texas
  Digital products

Europe

Almelo, Netherlands
  Components, digital products
Bedford, United Kingdom
  Components
Freising, Germany
  Components
Nice, France
  Components
Rieti, Italy
  Components, digital products

Asia/Pacific

Baguio, Philippines
  Components
Hiji, Japan
  Components
Kuala Lumpur, Malaysia
  Components
Miho, Japan
  Components
Singapore
  Components
Taipei, Taiwan
  Components

TI's facilities in the United States contained approximately 21.3 million square feet as of December 31, 1988, of which approximately 6.8 million square feet were leased. Facilities outside the United States contained approximately 5.3 million square feet as of December 31, 1988, of which approximately 1.8 million square feet were leased.

SUBSIDIARIES

North America

Texas Instruments Canada Limited (Canada)

Europe

Texas Instruments Belgium S.A./N.V. (Belgium)
Texas Instruments Denmark A/S (Denmark)
Texas Instruments Deutschland GmbH (Germany)
Texas Instruments Equipamento Electronico Lda. (Portugal)
Texas Instruments Espana, S.A. (Spain)
Texas Instruments France S.A. (France)
Texas Instruments Holland B.V. (Netherlands)
Texas Instruments International Trade Corporation (Sweden)
Texas Instruments (Ireland) Limited (Ireland)
Texas Instruments Italia S.p.A. (Italy)
Texas Instruments Limited (United Kingdom)
Texas Instruments Norge A/S (Norway)
Texas Instruments OY (Finland)
Texas Instruments Switzerland AG (Switzerland)

Asia/Pacific

Texas Instruments Australia Limited (Australia)
Texas Instruments China Incorporated (China)
Texas Instruments Hong Kong Limited (Hong Kong)
Texas Instruments Japan Limited (Japan)
Texas Instruments Korea Limited (Korea)
Texas Instruments Malaysia Sdn. Bhd. (Malaysia)
Texas Instruments (Philippines) Incorporated (Philippines)
Texas Instruments Private Limited (India)
Texas Instruments Singapore Pte. Limited (Singapore)
Texas Instruments Taiwan Limited (Taiwan)

ROW

Texas Instrumentos Electronicos do Brasil Limitada (Brazil)
Texas Instruments Argentina S.A.I.C.F. (Argentina)
Texas Instruments de Mexico, S.A. de C.V. (Mexico)
Texas Instruments Trade and Investment Company, S.A. (Panama)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

Kobe Steel Ltd.
TI and Kobe Steel established a joint-venture company, KTI Semiconductor Ltd., to manufacture advanced semiconductors in Japan. The venture will manufacture primarily complementary metal-oxide semiconductor (CMOS) logic devices, including very large-scale integrated (VLSI) circuits and application-specific integrated circuits (ASICs).

Sony
TI will produce most of the linear and other types of ICs that Sony uses in its electronic home appliances marketed in Europe. The chips produced by TI in the German plant will be marketed under Sony's brand name.

Philips Components-Signetics
Philips Components-Signetics and TI signed a multiyear BiCMOS alternate-sourcing and development agreement that will initially revolve around bus interface logic. TI and Signetics are not transferring process technology, but are instead agreeing on the performance specifications of each device as it is designed.

AST Research
AST Research and the Information Technology Group (ITG) of TI formed a worldwide alliance under which TI will provide service to users of AST computer systems. This alliance follows an OEM agreement signed by the two companies under which AST is developing custom computer systems for TI.

Toshiba
Toshiba has obtained a TI licensing agreement that will allow Toshiba to sell laser diode semiconductors made with a TI-patented process in the United States.

FSI International
TI licensed its 150mm photoresist processing system to FSI International. FSI will build and distribute the equipment under the agreement.

Toppan Printing Company
TI and Toppan (Tokyo) signed an agreement that will bring Toppan Printronics USA into being as a joint venture to acquire TI's internal photomask operation. Toppan will own 85 percent of the new company and TI will have a 15 percent interest. The company will be a major supplier of photomasks to TI and will also supply the product to other North American and European semiconductor manufacturers.

Delco Electronics
Delco and TI entered into an agreement to jointly define and develop a new generation of microcontrollers for automotive applications.

1989

Silicon Compiler Systems (SCS)
TI and SCS agreed to jointly develop advanced IC CAD software technology for the physical verification of integrated circuits. The result of this agreement will be IC-design products to be marketed and supported worldwide exclusively by SCS.

Toppan Printing Company
TI and Toppan established a jointly owned US company that would acquire and manage TI's internal photomask operation in Dallas. Toppan is currently the principal external supplier of photomasks for TI.

Nippon Hoso Kyokai (NHK)
TI signed an agreement with NHK for its MUSE or "Hi-vision" advanced TV receiver technology. TI will use this acquired system knowledge to develop chip sets to participate in three high-definition television (HDTV) markets.

Micron Technology Inc.
Micron Technology and TI entered into a cross-licensing agreement encompassing the semiconductor patents of the two companies.

Acer Laboratories
Acer Laboratories and TI agreed to create a privately held joint venture company in Taiwan to manufacture 1MB and 4MB DRAMs.

Altera
TI introduced second-source versions of Altera's 610 and 910 PLDs.

Hitachi
Hitachi and TI entered into an agreement to jointly develop a common 16MB DRAM technology and allow access to each other's DRAM technology as it relates to the development of the 16MB DRAM device.

1988

NEC, U.K. Ltd.
TI announced plans to buy 256K DRAMs from NEC, U.K. for resale primarily to TI customers throughout Europe.

Actel
Actel and TI announced a seven-year agreement covering Actel's desktop-configurable, channeled gate arrays and proprietary PLICE antifuse technology.

Cypress Semiconductor
Cypress Semiconductor and TI will codevelop and second source SPARC-related microprocessors, floating-point processors, and other peripherals.

Sun Microsystems
Sun Microsystems and TI signed a comprehensive, long-term licensing and cooperating development agreement in which Sun will license to TI a broad range of its products and technology, including SPARC chips. TI and Sun will codevelop the next generation of SPARC microprocessors.

TI is implementing Sun's Network File System (NFS) on its Explorer. The NFS implementation allows transparent access to files on Sun's UNIX-based workstation and TI's LISP-based Explorer system, thereby providing users with a development environment that includes both AI and UNIX tools.

Altera Corp.
Altera and TI signed a long-term agreement that encompasses a seven-year technology exchange and supply arrangement for high-performance, high-density erasable programmable logic devices (EPLDs).

Raytheon Company
Raytheon and TI are one of four teams selected by the US Department of Defense to develop and produce GaAs circuits.

Signetics
TI and Signetics signed an agreement to expand a codeveloped ACL family with 47 new functions.

Sony
TI Japan and Sony jointly developed the CX1144AP high-performance digital filter LSI device for digital audio equipment.

Apple Computer
The MicroExplorer, a Macintosh II that uses TI's symbolic processing chip technology, is a joint product of TI and Apple Computer and will be marketed by TI.

Gold Hill Computers, Inc.
TI distributes Gold Hill Computers' Golden Common LISP.

Unisys
TI's Explorer II is marketed by Unisys.

Apollo Computer
TI is integrating its Explorer LISP technology into Apollo's DOMAIN networking environment, allowing AI application developers using Explorer technology to coexist on a network of Apollo workstation users.

VoxTron
TI is incorporating its hardware and voice verification technology with VoxTron's Veriton Series 1000, a voice-activated access-control system.

MERGERS AND ACQUISITIONS

1989

Microsemi
Microsemi acquired the complete military discrete power and small-signal product lines of TI, including radiation-hardened technologies.

1987

Rexnord Automation
TI acquired the control systems and industrial systems business of Rexnord Automation.

KEY OFFICERS

Jerry R. Junkins
Chairman of the board, president, chief executive officer

William A. Aylesworth
Senior vice president, treasurer, chief financial officer

William I. George
Executive vice president

William B. Mitchell
Executive vice president

William P. Weber
Executive vice president

George H. Heilmeier
Senior vice president, chief technical officer

Liston M. Rice, Jr.
Vice president, Corporate Communications/Marketing

PRINCIPAL INVESTORS

NCNB Texas Corporation—11.7 percent
The Capital Group, Inc.—5.2 percent

FOUNDERS

Erik Jonsson
Cecil Green
Patrick Haggerty

Table 3
Comprehensive Financial Statement
Fiscal Year Ending December
(Millions of US Dollars, except per Share Data)

Balance Sheet	1985	1986*	1987*	1988*	1989
Total Current Assets	$1,858	$1,789	$2,303	$2,549	$2,446
Cash	274	207	422	541	418
Receivables	794	670	848	942	943
Short-Term Investments	0	7	241	239	219
Inventory	489	610	739	770	806
Other Current Assets	301	295	53	57	60
Net Property, Plants	$1,481	$1,437	$1,520	$1,726	$2,130
Other Assets	$84	$111	$134	$153	$228
Total Assets	$3,423	$3,337	$3,957	$4,428	$4,804
Total Current Liabilities	$1,412	$1,113	$1,236	$1,199	$1,303
Long-Term Debt	$381	$191	$486	$624	$618
Other Liabilities	$90	$306	$350	$361	$399
Total Liabilities	$1,883	$1,610	$2,072	$2,184	$2,320
Total Shareholders' Equity	$1,540	$1,727	$1,885	$2,244	$2,484
Converted Preferred Stock	0	300	300	300	300
Common Stock	1,540	26	79	81	81
Other Equity	0	362	354	433	478
Retained Earnings	0	1,039	931	1,209	1,404
Converted Money Market	0	0	221	221	221
Total Liabilities and Shareholders' Equity	$3,423	$3,337	$3,957	$4,428	$4,804
Income Statement	**1985**	**1986***	**1987***	**1988***	**1989**
Revenue	$4,924	$4,974	$5,595	$6,447	$6,522
US Revenue	3,729	3,488	3,829	4,409	4,475
Non-US Revenue	1,195	1,486	1,766	2,038	2,047
Cost of Sales	$4,071	$4,035	$4,383	$4,835	$5,090
R&D Expense	$402	$406	$428	$494	$506
SG&A Expense	$817	$827	$909	$1,017	$1,045
Capital Expense	$515	$447	$459	$656	$863
Pretax Income	($115)	$87	$402	$516	$355
Pretax Margin (%)	(2.34)	1.75	7.18	8.00	5.44
Effective Tax Rate (%)	NA	35.00	35.00	35.00	NA
Net Income	($119)	$63	$321	$366	$292
Shares Outstanding, Millions	24.95	75.9	82.0	84.8	84.9
Per Share Data					
Earnings	($4.76)	$1.14	$3.59	$4.05	$3.04
Dividend	$2.00	$2.00	$0.71	$0.72	$0.72
Book Value	$57.22	$68.26	$27.40	$26.46	$29.26

Table 3 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending December
(Millions of US Dollars, except per Share Data)

Key Financial Ratios	1985	1986*	1987*	1988*	1989
Liquidity					
Current (Times)	1.32	1.61	1.86	2.13	1.88
Quick (Times)	0.97	1.06	1.27	1.48	1.26
Fixed Assets/Equity (%)	96.17	83.21	80.64	76.92	85.75
Current Liabilities/Equity (%)	91.69	64.45	65.57	53.43	52.46
Total Liabilities/Equity (%)	122.27	93.23	109.92	97.33	93.40
Profitability (%)					
Return on Assets	-	1.86	8.80	8.73	6.33
Return on Equity	-	3.86	17.77	17.73	12.35
Profit Margin	(2.42)	1.27	5.74	5.68	4.48
Other Key Ratios					
R&D Spending % of Revenue	8.16	8.16	7.65	7.66	7.76
Capital Spending % of Revenue	10.46	8.99	8.20	10.18	13.23
Employees	77,872	77,270	77,984	75,685	73,854
Revenue ($K)/Employee	$63.23	$64.37	$71.75	$83.17	$88.31
Capital Spending % of Assets	15.05	13.40	11.60	14.81	17.96

*1986, 1987, and 1988 have been restated to reflect a new accounting standard relating to income taxes.
NA = Not available

Source: Texas Instruments, Inc. Annual Reports and Forms 10-K
Dataquest (1990)

Texas Instruments, Inc.

13500 N. Central Expressway
Dallas, Texas 75265
Telephone: (214) 995-6611
Fax: (214) 995-4360
Dun's Number: 00-732-1904

Date Founded: 1951

CORPORATE STRATEGIC DIRECTION

Texas Instruments, Inc. (TI), was formed in 1951 by Erik Jonsson, Cecil Green, and Patrick Haggerty as a manufacturing division of Geophysical Service, Inc. In 1952, TI moved into the semiconductor industry by purchasing the licenses to manufacture the transistor invented at Bell Laboratories. By 1953, TI had become a volume producer of transistors. The Company has an impressive record of industry firsts, ranging from the coinvention of the first integrated circuit (IC) to the first hand-held electronic calculator. In addition, TI has been a pioneer in speech synthesis. In 1988, TI sold its 80.3 percent interest in Geophysical Service to Halliburton Company.

TI develops, manufactures, and markets a variety of electronic products for the industrial, government, and consumer markets. TI's product segments include components, defense electronics, digital products, and metallurgical materials. Components constitute 48 percent of sales; defense electronics, 34 percent; digital products, 15 percent; and metallurgical materials, the remaining 3 percent of sales.

In 1985, TI's management underwent a significant restructuring with Jerry Junkins replacing Fred Bucy as president and CEO. Mr. Junkins faced a great challenge: TI suffered a loss of $119 million* on sales of nearly $5 billion in 1985. Cost-cutting measures began with the paring of 7,000 employees, the indefinite freezing of wages, capacity consolidations, and the reduction of expenses across the company. Within the semiconductor group, a wafer-processing facility in Houston, Texas, was closed, along with an assembly and test site in El Salvador. TI began reorganizing and reevaluating its position in all of its businesses.

*All dollar amounts are in U.S. dollars.

In 1985, while many semiconductor manufacturers were pulling out of dynamic RAM (DRAM) production, TI was stepping up DRAM production, which resulted in significant sales of semiconductors. In 1986, TI began sampling 1Mb DRAMs.

On January 24, 1986, TI filed patent-infringement lawsuits in the Federal District Court in Dallas, Texas, against one Korean and eight Japanese semiconductor firms. TI believed that the DRAM chips sold in the United States by these companies violated its patents and should have been under a licensing agreement.

In September 1989, TI announced the formation of a new business unit, the Information Technology Group (ITG), aimed at the emerging market need for more advanced information and automation systems in the 1990s. The new group combines CASE technologies, industrial automation, and custom manufacturing with computing activities into a single worldwide business strategy.

TI, which employed 75,685 people during 1988, comprises four main groups: Semiconductors, Defense Systems and Electronics, Material and Controls, and Data Systems. The semiconductor group is the largest and most important in the Company. TI has leveraged its strength in semiconductors to enter such product markets as calculators, computers, learning aids, terminals, peripherals, and programmable controllers. Areas of emerging importance for TI are artificial intelligence (AI) and industrial automation.

Texas Instruments' 1988 sales of $6.3 billion represented an increase of 12.5 percent over 1987 revenue of $5.6 billion. Net income for fiscal 1988 increased 14 percent to $366 million.

In terms of capital spending, the Company's main focus has been on the support of new semiconductor products, specifically new memory and logic products and manufacturing productivity improvement. Capital expenditures for fiscal 1988 rose to $656 million, representing 10 percent of revenue. Research and development expenditures increased slightly to $494 million, or 7.8 percent of revenue.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Semiconductors

TI is one of the world's broadest-range semiconductor manufacturers and offers products ranging from discrete transistors to gate arrays and advanced microprocessors. TI maintained its number five ranking in the worldwide semiconductor market from 1987 to 1988. The Company is the market leader in bipolar logic integrated circuits and is also strong in linear and memory products. It is a major supplier of 256K DRAMs. The Company is also in volume production of 1Mb DRAMs, which added to its U.S. capacity during 1988. The Company serves all market segments, the major users being industrial, computer, and consumer goods manufacturers. Recent product developments have permitted even more involvement with the industrial and telecommunications markets, although TI has sustained its presence in the government and military end-user segments. TI also is investing in AI and industrial automation as emerging areas of opportunity.

MilAero

Texas Instruments recently won a $112 million award from the U.S. Air Force for a five-year contract with the Microelectronics Manufacturing Science and Technology (MMST) program. Under the contract, TI will develop the equipment and systems for cost-effective manufacturing of low-volume military integrated circuits, microwave devices, and sensors. The program will include the development of advanced processes, process equipment (such as dry chemical cleaning systems), process sensors, process control expert systems, and an integrated factory control system that can be scaled and adapted to a variety of fabrication facilities. These elements will be integrated into a pilot fabrication facility.

TI hopes to push the state of the art in computer-integrated manufacturing (CIM) by research in processing and in situ sensors, VHDL-compatible simulation, modeling, symbolic computing, and AI computer-integrated processing.

Computer Systems

In August 1988, TI introduced three new members of its Explorer family of symbolic processing workstations: the Explorer MP, the Explorer II Plus, and the Explorer II Plus LX. Like other members of the Explorer family, the Explorer MP is based on the 32-bit, processor-independent NuBus architecture.

The Explorer II Plus and Explorer II Plus LX both operate on a 40-MHz processor that is eight times faster than the original Explorer. This latest 40-MHz version of TI's Explorer LISP microprocessor operates at 80-MHz clock frequency and can execute at a rate of 40 million microinstructions per second.

In March 1988, TI introduced its MicroExplorer computer system, which combines TI's AI software environment and Explorer AI microprocessor with Apple Computer's Macintosh II personal computer system. The MicroExplorer utilizes a specially developed coprocessor board that includes TI's LISP microprocessor.

Software

Texas Instruments intends to provide an integrated, next-generation, networked software development environment that combines the advanced software technologies of AI, computer-aided software engineering (CASE), and object-oriented programming software/database (OOPS/DB). TI plans to provide the hardware and software needed to perform combined symbolic processing and conventional computing. It will target this development environment to operations management applications developers.

The operations management applications will be offered in the context of four vertical markets: manufacturing, transportation, health care, and automotive dealerships. TI believes that there are literally tens of thousands of operations management problems within just these four vertical markets that can be addressed by combining the capabilities of various advanced software technologies.

The Company's AI activities in manufacturing and transportation initially opened up this class of operations management problems. Now TI is developing more commercial applications, using AI as only one of the enabling technologies that make up the total solution strategy.

Display Terminals

In the display terminal market, TI holds less than 1 percent of market share.

Further Information

For further information about the Company's business segments, please contact the appropriate industry service.

Table 1
Five-Year Corporate Highlights (Millions of U.S. Dollars)

	1984	1985	1986	1987	1988
Five-Year Revenue	$5,742	$4,924	$4,974	$5,595	$6,295
Percent Change	-	(14.25)	1.02	12.48	12.51
Capital Expenditure	$722	$515	$447	$459	$656
Percent of Revenue	12.57	10.46	8.99	8.20	10.42
R&D Expenditure	$367	$402	$406	$428	$494
Percent of Revenue	6.39	8.16	8.16	7.65	7.85
Number of Employees	86,563	77,872	77,270	77,984	75,685
Revenue ($K)/Employee	$66.33	$63.23	$64.37	$71.75	$83.17
Net Income	$316	($119)	$63	$321	$366
Percent Change	-	(137.66)	(152.94)	409.52	14.02

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	$1,561.1	$1,563.5	$1,538.50	N/A
Quarterly Profit	$84.60	$106.10	$65.00	N/A

N/A = Not Available

Source: Texas Instruments Annual Reports
Dataquest
January 1990

Table 2
Revenue by Geographic Region (Percent)

	1984	1985	1986	1987	1988
North America	71.00	71.00	70.00	68.00	67.00
International	29.00	29.00	30.00	32.00	33.00
Europe	15.00	15.00	15.00	15.00	16.00
Asia/Pacific	10.00	8.00	11.00	13.00	15.00
All Other	4.00	6.00	4.00	4.00	2.00

Source: Texas Instruments Annual Reports
Dataquest
January 1990

Table 3
Revenue by Distribution Channels (Percent)

Channel	1988
Direct Sales	N/A
Indirect Sales	N/A

N/A = Not Available

Source: Dataquest
January 1990

4/3

1988 SALES OFFICE LOCATIONS

North America—50
Japan—10
Europe—14
Asia/Pacific—6
ROW—3

MANUFACTURING LOCATIONS

North America

Attleboro, Massachusetts
Components, metallurgical materials
Austin, Texas
Defense electronics, digital products
Colorado Springs, Colorado
Defense electronics
Dallas, Texas
Components, defense electronics
Denton, Texas
Defense electronics
Houston, Texas
Components, digital products
Hunt Valley, Maryland
Digital products
Johnson City, Tennessee
Digital products
Lewisville, Texas
Defense electronics
Lubbock, Texas
Components, digital products
Mckinney, Texas
Defense electronics
Midland, Texas
Components
Plano, Texas
Defense electronics
Sherman, Texas
Components, defense electronics
Temple, Texas
Digital products

Japan

Components

Europe

Almelo, Netherlands
Components, digital products
Bedford, United Kingdom
Components
Freising, Germany
Components
Italy
Components
Nice, France
Components

TI's facilities in the United States contained approximately 21.3 million square feet as of December 31, 1988, of which approximately 6.8 million square feet were leased. Facilities outside the United States contained approximately 5.3 million square feet as of December 31, 1988, of which approximately 1.8 million square feet were leased.

SUBSIDIARIES

Japan

Texas Instruments Japan Limited

Europe

Texas Instruments Deutschland Gmbh (West Germany)
Texas Instruments Equipamento Electronico Portugal Lda. (Portugal)
Texas Instruments France S.A. (France)
Texas Instruments Holland B.V. (Netherlands)
Texas Instruments Italia S.p.A. (Italy)
Texas Instruments Limited (United Kingdom)

Asia/Pacific

Texas Instruments Asia Limited
Texas Instruments Malaysia Sdn. Bhd. (Malaysia)
Texas Instruments Singapore Pte. Limited (Singapore)
Texas Instruments Taiwan Limited (Taiwan)

ROW

Texas Instruments Electronicos do Brasil Limitada (Brazil)
Texas Instruments Trade and Investment Company, S.A. (Panama)

5/3

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

September 1989

Nippon Hoso Kyokai (NHK)
TI signed an agreement with NHK for its MUSE or "Hi-vision" advanced TV receiver technology. TI will use this acquired system knowledge to develop chip sets to participate in three high-definition television (HDTV) markets.

May 1989

Micron Technology Inc.
Micron Technology and TI entered into a cross-licensing agreement encompassing the semiconductor patents of the two companies.

May 1989

Acer Laboratories
Acer Laboratories and TI agreed to create a privately held joint venture company in Taiwan to manufacture 1MB and 4MB DRAMs.

February 1989

Altera
TI introduced second source versions of Altera's 610 and 910 PLDs.

January 1989

Hitachi
Hitachi and TI entered into an agreement to jointly develop a common 16Mb DRAM technology and allow access to each other's DRAM technology as it relates to the development of the 16Mb DRAM device.

December 1988

NEC, UK Ltd.
TI announced plans to buy 256K DRAMs from NEC, UK for resale primarily to TI customers throughout Europe.

November 1988

Actel
Actel and TI announced a seven-year agreement covering Actel's desktop-configurable, channeled gate arrays and proprietary PLICE antifuse technology.

August 1988

Cypress Semiconductor Corp.
Cypress Semiconductor and TI will codevelop and second source SPARC-related microprocessors, floating-point processors, and other peripherals.

Sun Microsystems
Sun Microsystems and TI signed a comprehensive, long-term licensing and cooperating development agreement in which Sun will license to TI a broad range of its products and technology, including SPARC chips. TI and Sun will codevelop the next generation of SPARC microprocessors.

July 1988

Altera Corp.
Altera and TI signed a long-term agreement that encompasses a seven-year technology exchange and supply arrangement for high-performance, high-density erasable programmable logic devices (EPLDs).

May 1988

Raytheon Company
Raytheon Company and TI are one of four teams selected by the DOD to develop and produce GaAs circuits under Phase 1 of the MMIC program.

April 1988

Signetics
TI and Signetics signed an agreement to expand a codeveloped ACL family with 47 new functions.

March 1988

Sony
TI Japan and Sony jointly developed the CX1144AP high-performance digital filter LSI device for digital audio equipment.

6/33

1988

Apple Computer
The MicroExplorer, a Macintosh II that uses TI's symbolic processing chip technology, is a joint product of TI and Apple and will be marketed by TI.

Gold Hill Computers, Inc.
TI distributes Golden Common LISP.

Unisys
TI's Explorer II is marketed by Unisys.

Sun Microsystems
TI is implementing Sun's Network File System (NFS) on its Explorer. The NFS implementation allows transparent access to files on Sun's UNIX-based workstation and TI's LISP-based Explorer system, thereby providing users with a development environment that includes both AI and UNIX tools.

Apollo Computer
TI is integrating its Explorer LISP technology into Apollo's DOMAIN networking environment, allowing AI application developers using Explorer technology to coexist on a network of Apollo workstation users.

VoxTron
TI is incorporating its hardware and voice verification technology with VoxTron's Veriton Series 1000, a voice-activated access-control system.

MERGERS AND ACQUISITIONS

January 1989

Microsemi
Microsemi acquired the complete military discrete power and small-signal product lines of TI including radiation-hardened technologies.

1987

Rexnord Automation
TI acquired the control systems and industrial systems business of Rexnord Automation.

KEY OFFICERS

Jerry R. Junkins
Chairman of the board, president, chief executive officer

William I. George
Executive vice president

William B. Mitchell
Executive vice president

William P. Weber
Executive vice president

George H. Heilmeier
Senior vice president, chief technical officer

Liston M. Rice, Jr.
Vice president, Corporate Communications/ Marketing

PRINCIPAL INVESTORS

NCNB Texas Corporation—11.7 percent
The Capital Group, Inc.—5.2 percent

7/3

Table 4
Comprehensive Financial Statement
Fiscal Year Ending December
(Millions of U.S. Dollars, except per Share Data)

Balance Sheet	1984	1985	1986*	1987*	1988*
Total Current Assets	$1,531	$1,858	$1,789	$2,303	$2,549
Cash	159	274	207	422	541
Receivables	620	794	670	848	942
Short-Term Investments	0	0	7	241	239
Inventory	448	489	610	739	770
Other Current Assets	304	301	295	53	57
Net Property, Plants	$1,450	$1,481	$1,437	$1,520	$1,726
Other Assets	$95	$84	$111	$134	$153
Total Assets	$3,076	$3,423	$3,337	$3,957	$4,428
Total Current Liabilities	$1,129	$1,412	$1,113	$1,236	$1,199
Long-Term Debt	$382	$381	$191	$486	$624
Other Liabilities	$138	$90	$306	$350	$361
Total Liabilities	$1,649	$1,883	$1,610	$2,072	$2,184
Total Shareholders' Equity	$1,427	$1,540	$1,727	$1,885	$2,244
Converted Preferred Stock	0	0	300	300	300
Common Stock	1,427	1,540	26	79	81
Other Equity	0	0	362	354	433
Retained Earnings	0	0	1,039	931	1,209
Converted Money Market	0	0	-	221	221
Total Liabilities and Shareholders' Equity	$3,076	$3,423	$3,337	$3,957	$4,428

Income Statement	1984	1985	1986*	1987*	1988*
Revenue	$5,742	$4,924	$4,974	$5,595	$6,295
U.S. Revenue	4,087	3,729	3,488	3,829	4,258
Non-U.S. Revenue	1,655	1,195	1,486	1,766	2,037
Cost of Sales	$4,190	$4,071	$4,035	$4,383	4,818
R&D Expense	$367	$402	$406	$428	$494
SG&A Expense	$858	$817	$827	$909	$1,017
Capital Expense	$722	$515	$447	$459	$656
Pretax Income	$487	($115)	$87	$402	$516
Pretax Margin (%)	8.48	(2.34)	1.75	7.18	8.20
Effective Tax Rate (%)	35.00	N/A	35.00	35.00	35.00
Net Income	$316	($119)	$63	$321	$366
Shares Outstanding, Millions	24.21	24.95	75.9	82	84.8
Per Share Data					
Earnings	$13.05	($4.76)	$1.14	$3.59	$4.05
Dividends	$2.00	$2.00	$2.00	$0.71	$0.72
Book Value	$63.63	$57.22	$68.26	$27.40	N/A

8/33

Table 4 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending December
(Millions of U.S. Dollars, except per Share Data)

Key Financial Ratios	1984	1985	1986*	1987*	1988*
Liquidity					
Current (Times)	1.36	1.32	1.61	1.86	2.13
Quick (Times)	0.96	0.97	1.06	1.27	1.48
Fixed Assets/Equity (%)	101.61	96.17	83.21	80.64	76.92
Current Liabilities/Equity (%)	79.12	91.69	64.45	65.57	53.43
Total Liabilities/Equity %	115.56	122.27	93.23	109.92	97.33
Profitability (%)					
Return on Assets	-	(3.66)	1.86	8.80	8.73
Return on Equity	-	(8.02)	3.86	17.77	17.73
Profit Margin	5.50	(2.42)	1.27	5.74	5.81
Other Key Ratios					
R&D Spending % of Revenue	6.39	8.16	8.16	7.65	7.85
Capital Spending % of Revenue	12.57	10.46	8.99	8.20	10.42
Employees	86,563	77,872	77,270	77,984	75,685
Revenue ($K)/Employee	$66.33	$63.23	$64.37	$71.75	$83.17
Capital Spending % of Assets	23.47	15.05	13.40	11.60	14.81

*The years 1986 through 1988 have been restated to reflect a new accounting standard relating to income taxes.
N/A = Not Available

Source: Texas Instruments Annual Reports and Forms 10-K
Dataquest
January 1990

9/3

Summary of Selected Financial Data

Years ended December 31	1989	1988	1987	1986	198
Millions of Dollars					
Net revenues	$6,521.9	$6,446.9	$5,816.2	$4,988.4	$4,92
Operating costs and expenses	6,202.5	5,944.6	5,403.8	4,874.9	5,01
Profit (loss) from operations	319.4	502.3	412.4	113.5	(8
Other income (expense) net	59.0	47.5	10.0	(2.2)	
Interest on loans	23.6	33.4	20.7	24.1	4
Income (loss) before provision for income taxes and extraordinary item	354.8	516.4	401.7	87.2	(12
Provision for income taxes	63.1	150.1	80.3	13.3	2
Income (loss) before extraordinary item	291.7	366.3	321.4	73.9	(14
Extraordinary item: debenture redemption	—	—	—	(10.8)	
Net income (loss)	$ 291.7	$ 366.3	$ 321.4	$ 63.1	$ (14
Earnings (loss) per common and common equivalent share:					
Income (loss) before extraordinary item	$3.04	$4.05	$3.74	$ .83	$(1.
Net income (loss)	3.04	4.05	3.74	.69	(1.
Dividends declared per common share	.72	.72	.71	.67	
Average common and common equivalent shares outstanding during year, in thousands	84,934	84,820	82,023	75,942	74,8

As of December 31	1989	1988	1987	1986	198
Millions of Dollars					
Working capital	$1,143.6	$1,349.2	$1,066.9	$ 413.3	$ 127
Property, plant and equipment (net)	2,129.7	1,726.1	1,519.7	1,437.0	1,450
Total assets	4,804.4	4,427.5	3,957.2	3,015.8	2,740
Long-term debt	617.5	623.8	486.5	191.4	381
Stockholders' equity	2,484.9	2,243.6	1,885.2	1,359.9	1,033
Employees	73,854	75,685	77,984	77,270	77,8
Stockholders of record	36,096	35,344	32,914	33,194	34,4

See Notes to Financial Statements and Management Discussion and Analysis of Financial Condition and Results of Operations. Fo the four years ended 1988, royalty revenue of $152 million, $222 million, $14 million and $5 million, and for the three years ended 1988, royalty expense of $18 million, $27 million and $3 million have been reclassified from other income/expense to net revenues and cost of revenues, respectively.

Dataquest
a company of
The Dun & Bradstreet Corporation

Research Newsletter

TEXAS INSTRUMENTS' CAPITAL SPENDING: INNOVATIVE AND GLOBAL

Texas Instruments (TI) has one of the world's biggest semiconductor capital spending plans for 1990, and it will finance this plan in innovative ways. TI, a U.S. company, will spend a large portion of its capital spending funds outside of the United States. Texas Instruments is an example, par excellence, of a company that has embraced the globalization of manufacturing, and this newsletter examines how it has done that.

FINANCING FABS: SHARE THE BURDEN

Texas Instruments plans to double the number of its submicron CMOS memory and advanced logic fabs by 1991. To do this, it plans to spend about $780 million of its own money on semiconductor property, plant, and equipment (PPE) in 1990. This amount is not all that TI will spend on semiconductor PPE in 1990, however; TI is able to obtain funding from others such as its customers, local governments, and joint-venture partners. Counting others' money, Dataquest estimates that TI will spend approximately $1 billion on semiconductor PPE this year—more than any other company in the world.

For example, the company's new DRAM facility under construction in Avenzanno, Italy, at a reported cost of $250 million, is funded in part by its customers and in part by local European governments. Some of TI's DRAM customers (the exact list is highly proprietary) pay for their devices in advance with the understanding that these funds will be used for building DRAM capacity. Local governments in Europe have financed a large fraction of the Avenzanno facility in order to bolster the local economy.

The TI/ACER joint venture in Taiwan is another example of TI's innovation in financing expensive state-of-the-art facilities. This fab will cost $250 million also and will produce 4Mb DRAMs. Under the joint-venture agreement with ACER, ACER will provide most of the funding for the facility and TI will provide the technology. Output from the fab will be sold exclusively to TI, and TI, in turn, will guarantee up to 50 percent of the output to ACER.

CAPITAL SPENDING: A GLOBAL SCOPE

Although TI is a U.S.-based company, a large fraction of its production and capital spending takes place outside of the United States. Table 1 lists the locations and status of the company's submicron CMOS memory and advanced logic fabs. Only one of the six locations is in the United States.

In order to maintain its competitive position in memory and advanced logic, TI has had to aggressively expand its company-funded capital spending in recent years. Its spending level rose 65 percent in 1989 over 1988, increasing from $388 million to $641 million (see Table 2 and Figure 1). TI plans to increase its company-funded capital spending a further 22 percent in 1990, to $780 million. As TI has increased its company-funded spending, its ratio of capital spending to revenue has increased and now exceeds the U.S. semiconductor industry average (see Figure 1).

VIRTUAL INTEGRATION: A NEW ALTERNATIVE?

The cost of advanced semiconductor manufacturing has become truly staggering—and it will become more so in the future. Companies need to be large and need to have help to carry this

Dataquest Incorporated, 1290 Ridder Park Drive, San Jose, CA 95131-2398 / (408) 437-8000 / Telex 171973 / Fax (408) 437-0292

burden; most of today's leading DRAM manufacturers are part of large vertically integrated electronics companies that have had the help of government policies designed to nurture advanced semiconductor manufacturing. TI's innovative financing is global in scope and integrates the contributions of customers, governments, and joint-venture partners. Perhaps it is an alternative to the models that have been so successful for European, Japanese, and South Korean manufacturers, as well as an alternative to the recently demised unsuccessful U.S. model: U.S. Memories.

George Burns

TABLE 1
Texas Instruments' Submicron CMOS Memory and Advanced Logic Fabs

Location	Product Type	Status
Avenzanno, Italy	4Mb DRAM	Under construction
Frising, West Germany	Advanced logic	Upgrading
Miho, Japan	4Mb DRAM	Upgrading
Hiji, Japan	4Mb DRAM	Upgrading
Dallas, Texas	4Mb DRAM, advanced logic	Upgrading
Taiwan	4Mb DRAM	Under construction

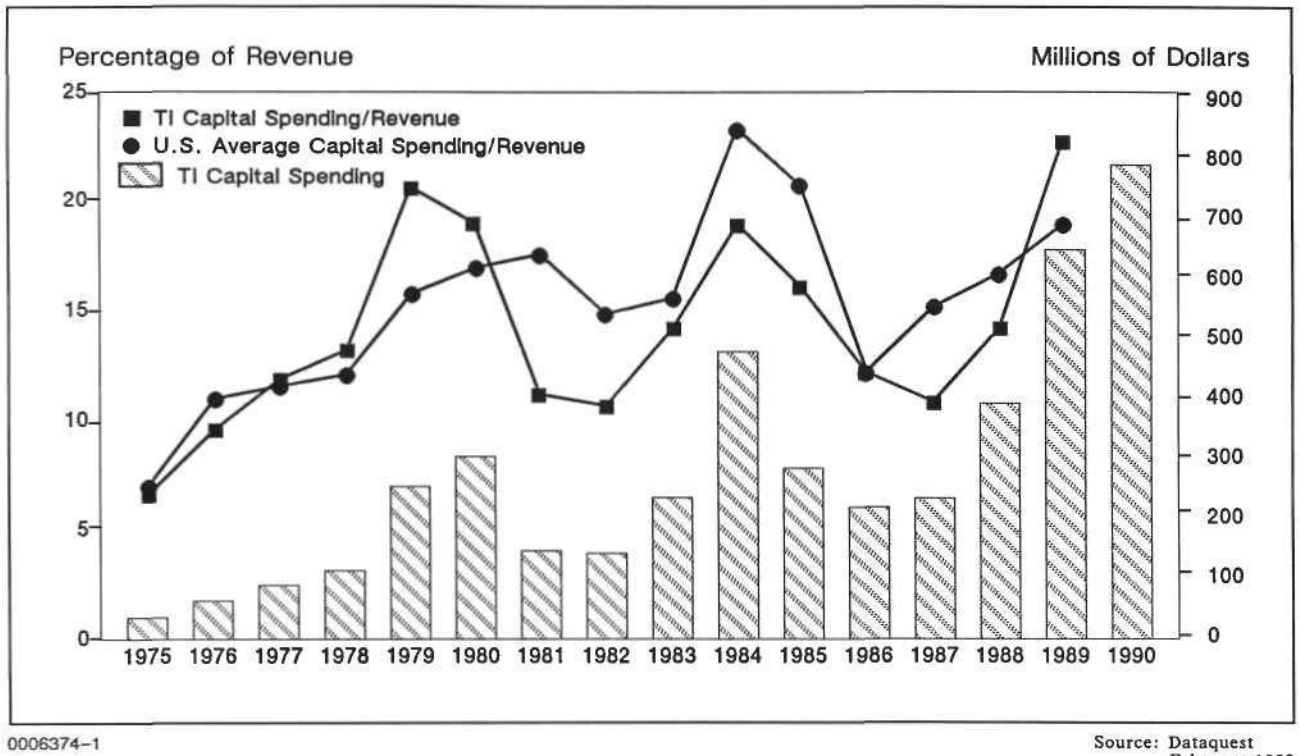
Source: Dataquest
February 1990

TABLE 2
Texas Instruments' Worldwide Capital Spending (Millions of Dollars)

Year	Expenditure	Year	Expenditure
1975	35	1983	232
1976	62	1984	472
1977	88	1985	281
1978	122	1986	217
1979	251	1987	231
1980	300	1988	388
1981	145	1989	641
1982	140	1990	780

Source: Dataquest
February 1990

FIGURE 1
Texas Instruments' Worldwide Semiconductor Capital Spending



0006374–1

Source: Dataquest
February 1990

Dataquest
a company of
The Dun & Bradstreet Corporation

Research *Bulletin*

TI ALLIANCE TARGETS HDTV: THE CONSUMER MARKET BECKONS

INTRODUCTION

Anyone who has read a newspaper, not to mention a trade press periodical, in the last year must know by now that the advent of improved-definition TV (IDTV), enhanced-definition TV (EDTV), and high-definition TV (HDTV) has refocused U.S. interest on an estimated $170 billion 1988 consumer market largely lost to the Japanese. Texas Instruments (TI) has announced an important next step in its overall strategy to penetrate the advanced vision systems (AVS) segment of the semiconductor consumer market, which it believes will be the system's technology driver of the 1990s.

THE AGREEMENT

Texas Instruments Japan, Limited, has signed an agreement with Nippon Hoso Kyokai (NHK), the Japan Broadcast Corporation, for its MUSE or "Hi-vision" advanced TV receiver technology. Transferring NHK's technology to TI will involve an explanation of the decoder, transfer of the transistor-level logic circuit diagrams and enabling memory codes, and review of the circuits comprising the MUSE system. TI will use this acquired system knowledge to develop chip sets to participate in these three HDTV markets based on different standards: MUSE in Japan, HD-MAC in Europe, and the future U.S. HDTV standard. Financial details of the agreement were not revealed, although it was made known that TI will pay for the technology transfer.

TI'S STRATEGY

Why is TI pursuing this market? The significance of HDTV cuts across many of TI's strategic thrusts, particularly as it concerns the following:

- TI's identity as a Japanese supplier
- The importance of the consumer electronics market
- The technology benefits of HDTV to TI's semiconductor business

In 1988, TI's semiconductor sales to the Japanese market totaled approximately $600 million, an increase over the previous year of almost 50 percent. TI is now the 10th largest Japanese semiconductor supplier and the largest U.S. participant in the Japanese semiconductor market. Given TI's identity as a Japanese company, its thrust into the AVS market is headed by Masa Hayashida of TI Japan, who will be supported by TI's worldwide resources. From a trade perspective, TI's approach answers one of the product deficiencies often cited by Japanese companies as reasons for not purchasing more U.S. semiconductors—that U.S. semiconductor companies do not produce the consumer devices they need.

Although it may not be associated readily with the consumer electronics market, TI recognizes that this is a market it cannot afford to ignore—for many reasons. Aside from the sheer dollar volume represented by this market, the economies of scale associated with it are in keeping with TI's role as a commodity semiconductor manufacturer. As Pat Weber, president of TI's Semiconductor Group, noted during the company's recent Technology Trends Seminar, "The consumer market hones TI's quality and cost performance." From the standpoint of specific semiconductor product areas, TI believes that the consumer market will be increasingly important to success in analog ICs. Even in a product area like DRAMs, so closely identified with the data processing market,

SIS Newsletters 1989: July-September Executive Issues

0005075

TI believes that noncomputer applications will account for approximately 40 percent of the memory market by the mid-1990s.

THE RIPPLE EFFECT

Aside from its importance to consumer electronics, HDTV, in TI's words, "will emerge as a large market with broad implications for the entire electronics industry." Dataquest believes, as does TI, that HDTV will permeate other industries such as training and simulation, films, medicine, telecommunications, and the military/aerospace industry. Through this agreement, TI will also pursue complementary AVS segments including high-performance audio systems, video camcorders, advanced cameras, and video tape recorders. With roughly one-third of its business coming from the defense industry, a market currently in decline, addressing these other markets takes on added significance for TI.

Also significant are the spin-off semiconductor technologies that will be driven by HDTV—technologies that address a spectrum of TI's product offerings in memories, microcomponents, DSP, and analog. Examples of such products include 200- to 300-MBps processors, video processor chips, A/D converters, video frame storage devices, fiber-optic transceivers, and advanced compression and processing algorithms for signal processing.

Perhaps most important to TI's position in data processing is its vision of HDTV as the vehicle by which computers will become pervasive in the home—integrating telecommunications, entertainment, and data processing. This convergence would represent a quantum leap over the personal/home computer as we understand it today. With the market opportunities that this would create, it is not surprising that TI seems to be positioning itself to be a major supplier of components to the PC market. Evidence of this can be gleaned from current activities at TI, which include:

- The development of software automation tools aimed at creation of object-oriented data bases
- The relationship between TI's concept of hypermedia as the new user-interface paradigm and its efforts in high-performance PC chip sets, graphics chip sets, DSP, and speech synthesis
- Its entry into 32-bit RISC microprocessors through an alliance with Sun Microsystems
- TI's contract from the Defense Advanced Research Procurement Agency (DARPA) to develop a semiconductor process technology for display generation

DATAQUEST CONCLUSIONS

Dataquest believes that HDTV and the intermediate markets of IDTV and EDTV represent a significant opportunity for U.S. companies. More is at stake than the considerable revenue associated with the consumer TV market. Although the ancillary market opportunities are strategically important, the long-term implications for the mainstay of the U.S. electronics market—data processing—makes U.S. participation in this market a strategic imperative. These issues are discussed in detail in a Dataquest report entitled *High-Definition Video Technology: The Collision between Television and Computers.*

Michael Boss
Patricia Galligan

Texas Instruments

Texas Instruments, Inc.
13500 N. Central Expressway
Dallas, TX, U.S. 75265
(214) 995-2011 (Headquarters)
(214) 997-3300 (Opto marketing)
(214) 995-3043 (Foundry)

Established 1960 (GaAs materials work)
1973 (GaAs FETs)
No. of Employees: N/A

BACKGROUND

Texas Instruments (TI) is a vertically integrated producer of semiconductor materials, devices and circuits, electronics, and other hardware including instrumentation, calculators, radar systems, ordinance , computers and terminals. TI's Central Research Lab (CRL) has done work in GaAs technology for more than 25 years. By 1975, TI had demonstrated 8- to 10-GHz FETs. In 1982, the Company's Defense Systems and Electronics Group (DSEG) established a pilot production capability for MMICs and discrete power devices capable of operation to 18 GHz. CRL has pushed analog GaAs circuit operating frequency to more than 100 GHz and is developing a 4K ECL-compatible SRAM. CRL demonstrated a 1K SRAM with the smallest cell reported as of November 1985.

TI established its MMIC foundry in 1986 and has invested more than $40 million in GaAs design and production facilities. One of its products, the TGA8014, is claimed to be the first true power amplifier available as a GaAs MMIC, delivering 400mW from 6 to 18 GHz. In 1987, TI reported performance and yield data on its single-chip X-band radar transceiver, which contains a four-bit phase shifter, three-stage LNA and four-stage power amp.

The TI/Raytheon joint venture is developing 14 GaAs ICs under the Phase I MIMIC initiative; six are for EW applications, four are for use at 20-50 GHz, and four are for radar applications.

COMPANY EXECUTIVES

- Laboratory Director--Dr. William R. Wisseman (head of Central Research Laboratories)
- Optoelectronics Marketing Director--Milt Hogan
- Foundry Operations Manager--Ray Toole
- MMIC Marketing Manager--Paul Schurr

Texas Instruments

STRATEGIC ALLIANCES

TI and Raytheon have a joint venture in GaAs technology; the joint venture was awarded Phase 0 and Phase I contracts under the U.S. DOD MIMIC initiative.

SERVICES

TI provides a full-service GaAs MMIC foundry.

PROCESS TECHNOLOGY

- 0.5u GaAs MESFET on ion-implanted 3-inch wafers (foundry)
- Three doping profiles: power, low-noise, and intermediate

PRODUCTS

- Opto devices including LEDs, displays, and optocouplers
- LNAs and power FETs:
  - TGA monolithic amplifier series
  - TGF GaAs FET series
- Single-chip radar transceivers
- Custom digICs including RISC microprocessors
- MMICs

Applications

- Military and aerospace
- Instrumentation
- EDP
- Communications

- Transportation
- Consumer electronics

FACILITIES

In Dallas, Texas, TI has a 9,000-square-foot clean room at DSEG with capacity for more than 100 3-inch GaAs wafer starts per week.

Texas Instruments, Inc.

Table 4

Texas Instruments, Inc.
FINANCIAL STATEMENT HISTORY 1979-1986
(Percent)

		Fiscal Year Ending December 31									
		1979	1980	1981	1982	1983	1984	1985	1986	CAGR	LSQR
BALANCE SHEET											
1	CASH & LIQUID SECURITIES	6.11	5.79	6.49	15.96	6.81	8.02	5.16	6.43	0.72	(0.53)
3	RECEIVABLES	28.72	26.09	25.56	24.39	24.49	23.18	20.16	20.07	(4.99)	(4.75)
4	INVENTORY	17.83	18.34	16.10	13.68	12.37	14.29	14.55	18.27	0.35	(1.71)
5	OTHER CURRENT ASSETS	4.10	3.60	3.65	4.00	9.83	8.80	9.89	8.63	11.20	17.84
7	EXCESS FUNDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	TOTAL CURRENT ASSETS	56.76	53.83	51.80	58.03	53.50	54.29	49.76	53.39	(0.87)	(0.90)
9	GROSS P P E	66.85	71.38	83.92	79.19	83.53	75.28	90.23	86.60	3.77	3.28
10	ACCUMULATED DEPRECIATION	24.27	25.92	36.07	37.53	39.34	32.01	43.09	43.54	8.71	7.82
11	NET P P E	42.58	45.47	47.85	41.66	44.19	43.26	47.14	43.07	0.16	0.02
12	MISC ASSETS	0.66	0.70	0.35	0.31	2.31	2.45	3.10	3.55	27.18	37.96
15	*TOTAL ASSETS*	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	(0.00)
16	NOTES PYBLE & CURR LTD	9.40	7.06	1.40	1.88	1.37	1.35	0.96	2.38	(17.81)	(21.19)
17	ACCOUNTS PAYABLE	28.13	26.12	26.59	29.79	38.73	32.79	33.31	29.85	0.75	2.99
18	ACCRUED TAXES	5.25	3.82	2.90	2.81	2.85	3.94	1.84	0.77	(24.03)	(17.44)
19	ACCRUED LIABILITIES	2.77	2.76	1.64	1.69	1.96	2.80	0.17	0.14	(34.67)	(32.47)
20	CURR OBL CAP LEASE	0.00	0.02	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	OTHER CURRENT LIABILITIES	8.60	8.48	8.51	8.45	8.44	8.36	8.41	8.43	(4.75)	(4.93)
22	TOTAL CURRENT LIABILITIES	46.24	40.25	33.10	36.43	45.35	41.25	36.70	33.36	(4.56)	(2.20)
23	LTD & NONCURR CAP LSES	8.92	8.77	9.16	8.13	8.30	11.12	12.42	5.74	29.87	19.76
24	DEFERRED TAXES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	MISC LIABILITIES	0.90	0.53	0.39	0.26	0.14	0.21	0.00	0.00	0.00	0.00
26	MINORITY INTEREST	2.00	2.21	2.80	3.46	1.89	2.42	4.47	9.14	24.21	16.86
27	DEFICIT FUNDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	TOTAL LIABILITIES	58.06	51.75	45.46	48.29	55.67	55.00	53.59	48.24	(0.53)	0.75
29	PREFERRED STOCK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	COMMON STOCK	1.21	0.97	1.03	0.90	0.89	0.72	0.82	0.77	(6.23)	(5.83)
31	CAPITAL SURPLUS	5.65	6.19	7.84	7.09	8.03	8.39	11.13	20.22	19.98	15.61
32	RETAINED EARNINGS	44.16	41.79	46.32	44.35	35.89	36.26	34.87	31.15	(4.87)	(4.99)
33	TREASURY STOCK	(1.08)	(0.71)	(0.65)	(0.63)	(0.49)	(0.37)	(0.41)	(0.37)	(14.09)	13.51
34	TOTAL EQUITY	49.94	48.25	54.54	51.71	44.33	45.00	46.41	51.76	0.51	(0.80)
35	*TOTAL LIAB & EQUITY*	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	(0.00)
36	NET WORKING CAPITAL	10.52	13.58	18.70	21.59	8.15	13.03	13.06	20.03	9.63	2.72
INCOME & EXPENSES											
38	SALES	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	(0.00)
40	COST OF GOODS	59.94	58.68	61.70	61.39	68.80	57.03	61.18	61.64	0.40	0.34
41	GROSS PROFITS	40.06	41.32	38.30	38.61	31.20	42.97	38.82	38.36	(0.62)	(0.57)
42	S G & A EXPENSE	15.99	15.63	16.03	16.17	19.67	14.95	16.59	16.63	0.56	0.67
43	R&D EXPENSE	4.17	4.63	5.22	5.47	6.57	6.39	8.16	8.16	10.08	10.44
44	OTHER OPER EXPENSES	2.38	2.37	0.96	1.10	1.28	2.93	1.38	0.20	(30.05)	(18.32)
45	OPERATING PROFIT	17.52	18.70	16.10	15.87	3.68	18.71	12.76	13.37	(3.78)	(5.57)
46	DEPRECIATION	5.81	6.31	7.92	7.82	7.67	7.36	10.48	8.57	5.71	6.16
47	LEASE PAYMENTS	1.80	2.12	2.17	2.60	2.29	2.19	2.85	2.76	6.24	5.33
48	INTEREST EXPENSE	0.61	1.09	0.98	0.77	0.79	0.85	0.82	0.48	(3.13)	(3.93)
49	MISC EXPENSE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
51	MINRTY INT IN ADJ SUBS	0.28	0.11	(0.87)	0.24	0.02	0.17	(0.95)	0.42	6.17	0.00
53	PRETAX PROFIT	9.58	9.30	4.15	4.93	(7.06)	8.47	(2.34)	1.98	(20.14)	0.00
54	INCOME TAXES	4.21	4.09	1.58	1.60	(3.88)	2.97	0.08	1.18	(16.60)	0.00
55	EXTRAORDINARY ITEMS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.00
56	NET PROFIT	5.36	5.21	2.57	3.33	(3.17)	5.50	(2.41)	0.59	(27.13)	0.00
57	EPS AFTER PFD DIVIDENDS	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	(0.00)
58	COMMON DIV PER SHARE	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	(0.00)

Source: Texas Instruments, Inc.
Annual Reports
Dataquest
May 1987

Texas Instruments, Inc.

Table 5

Texas Instruments, Inc.
FUNDS FLOW HISTORY 1979-1986
(Percent)

		Fiscal Year Ending December 31									
		1979	1980	1981	1982	1983	1984	1985	1986	CAGR	LSQR
SOURCES											
56	NET PROFIT	172 89	212.20	108 20	144 00	(145 40)	316.00	(116.70)	29 10	(22 47)	0 00
46	DEPRECIATION	187 24	257 00	333.30	338 50	351 40	422 60	515.90	426.20	12 47	12.63
61	NEW LONG TERM DEBT	0 25	194 54	1.30	2 30	11 10	155 60	1 20	0.00	0.00	0.00
62	NEW EQUITY	4.32	45.46	34 37	3.92	35.02	70.22	55.80	270.30	80.57	50 46
63	INCR OTHER LIABILITIES	12.80	10.73	7.80	24 00	(42.90)	35 00	47.60	167.50	44.39	0 00
66	TOTAL SOURCES	377.50	719.92	484.97	512 72	209.22	999.42	501.80	893.10	13.09	6 76
*											
USES											
67	P P E EXPENDITURES	427 06	541.93	341.40	329.30	454 10	704.70	484.80	413.20	(0.47)	2 05
68	REPAYMENT LONG TERM DEBT	12 09	1.75	0.40	1.30	0.00	0.00	0 00	190.50	48 27	0.00
69	PREFERRED DIVIDENDS	0.00	0.00	0.00	0.00	0.00	0 00	0.00	0.00	0 00	0 00
70	COMMON DIVIDENDS	45.60	46.04	46.97	47 22	47.72	48 42	49.90	0 00	0 00	0 00
71	INCR OTHER ASSETS	(19.35)	4.43	(8.90)	0 10	54.40	21 30	11.50	22.90	0 00	0.00
72	INCR WORKING CAPITAL	(87.89)	125.76	105 10	134.80	(347.00)	225.00	(44 40)	266.50	0 00	0 00
74	TOTAL USES	377.51	719.92	484 97	512.72	209.22	999 42	501.80	893.10	13.09	6.76
75	EXCESS/DEFICIT	0.00	0 00	0 00	0.00	0.00	0 00	0 00	0.00	0 00	0 00
76	CUMULATIVE SUR/DEF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0 00	0.00	0.00

Source: Texas Instruments, Inc.
Annual Reports
Dataquest
May 1987

Texas Instruments, Incorporated

Texas Instruments, Incorporated
13500 N. Central Expressway
Dallas, Texas 75265
Telephone: (214) 995-2011
(Millions of Dollars except Per Share Data)

Balance Sheet (December 31)

	1983	1984	1985	1986	1987
Working Capital	$ 221	$ 446	$ 402	$ 668	$ 1,316
Long-Term Debt	$ 225	$ 381	$ 382	$ 191	$ 487
Shareholders' Equity	$1,203	$ 1,541	$ 1,428	$ 1,727	$ 2,246
After-Tax Return on Average Equity (%)	(11.3)	23.0	(8.0)	1.8	15.6

Operating Performance (Fiscal Year Ending December 31)

	1983	1984	1985	1986	1987
Revenue	$4,580	$ 5,742	$ 4,925	$ 4,974	$ 5,595
U.S. Revenue	$3,295	$ 4,087	$ 3,506	$ 3,488	$ 3,829
Non-U.S. Revenue	$1,285	$ 1,655	$ 1,419	$ 1,486	$ 1,766
Cost of Revenue	$3,607	$ 3,823	$ 3,710	$ 3,629	$ 3,955
R&D Expense	$ 301	$ 367	$ 402	$ 406	$ 428
SG&A Expense	$ 901	$ 858	$ 840	$ 827	$ 909
Pretax Income	($ 323)	$ 487	($ 115)	$ 99	$ 415
Pretax Margin (%)	N/A	8.5	N/A	2.0	7.4
Effective Tax Rate (%)	N/A	35.1	N/A	59.6	38.1
Net Income	($ 145)	$ 316	($ 119)	$ 29	$ 309
Average Shares Outstanding (Millions)	71.59	72.63	74.84	75.94	82.02
Per Share					
Earnings	$ 2.03	$ 4.35	($ 1.59)	$ 0.24	$ 3.59
Dividends	$ 0.67	$ 0.67	$ 0.67	$ 0.67	$ 0.71
Book Value	$16.80	$ 21.22	$ 19.08	$ 22.74	$ 27.39
Price Range	$33.67-58.67	$ 37.25-49.83	$ 28.75-43.92	$ 34.25-49.42	$ 36.25-80.25
Total Employees	80,696	86,563	77,872	77,270	77,984
Capital Expenditures	$478.0	$ 722.0	$ 515.0	$ 447.0	$ 459.0

N/A = Not Applicable
*Per share amounts and average shares have been retroactively adjusted for the three-for-one stock split in 1987.

Source: Texas Instruments, Incorporated
Annual Reports
Dataquest
April 1988

(Page intentionally left blank)

Texas Instruments, Incorporated

EXECUTIVE SUMMARY

Background

Texas Instruments, Incorporated (TI), was formed in 1951 by Erik Jonsson, Cecil Green, and Patrick Haggerty, having begun as a manufacturing division of Geophysical Service, Inc. TI's involvement in the semiconductor business began in 1952 with the purchase of licenses to manufacture the transistor, invented at Bell Laboratories in 1949. By 1953, TI had become a volume producer of transistors. In only one year, the delivery cost of these devices made inexpensive transistor radios a reality and ushered in the consumer electronics boom. The Company has an impressive record of industry firsts, ranging from invention of the first integrated circuit (IC) to the first hand-held electronic calculator. In addition, TI has been a pioneer in speech synthesis.

In 1985, TI's management underwent a significant restructuring with Jerry Junkins replacing Fred Bucy as president and CEO. Mr. Junkins faced a great challenge: TI suffered a loss of $119 million on sales of nearly $5 billion in 1985. Cost-cutting measures began with the paring of 7,000 employees, the indefinite freezing of wages, capacity consolidations, and the reduction of expenses across the company. Within the semiconductor group, a wafer-processing facility in Houston, Texas, was closed, along with an assembly and test site in El Salvador. TI began reorganizing and reevaluating its position in all of its businesses.

After more than two years under new management, TI has made demonstrable progress. Like many other semiconductor manufacturers, TI did not experience its best year in 1986; however, the company was profitable and began to pull out of the industry slump. Net income for TI's total operation was $29.1 million on sales of $4.974 billion in 1986.

On January 24, 1986, TI filed patent-infringement lawsuits in the Federal District Court in Dallas, Texas, against one Korean and eight Japanese semiconductor firms. TI believed that the dynamic random access memory (DRAM) chips sold in the United States by these companies violated its patents and should have been under a licensing agreement. As a result of out-of-court settlements with the companies named in the lawsuits, TI received royalty payments of $191 million in 1987.

Company Organization

TI, which employs approximately 77,984 people, is composed of four main groups: Semiconductors, Defense Systems and Electronics, Materials and Controls, and Data Systems. The semiconductor group is the largest and most important in the Company. It is jointly headed by William Weber, president of the Semiconductor Group, and Wally Rhines, executive vice president of the Semiconductor Group, in charge of Systems Products. The group is estimated to account for at least one-third of the total work force. TI has leveraged its strength in semiconductors to enter such product markets

as calculators, computers, learning aids, terminals, peripherals, and programmable controllers. Areas of emerging importance for TI are artificial intelligence and industrial automation.

FINANCIAL INFORMATION

Texas Instruments' 1987 sales of $5.595 billion represented an increase of 12 percent over 1986 revenue of $4.974 billion. Net income for 1987 jumped from $29 million in 1986 to $309 million. Major factors contributing to improved performance in 1987 include significantly improved profitability in the semiconductor segment, reduced losses in the services segment, and lower depreciation costs. The 1987 results also include royalty income from settlement of DRAM patent litigation.

OPERATIONS

The four organizational groups reflect management structure rather than the operating lines of business shown in Table 1. The Components Segment represents financial grouping and includes semiconductors and other components. Much of the improved profit from operations is attributed to increased profitability in the Components Segment. Although TI's defense electronics segment achieved record net sales billed, profitability remained largely unchanged from 1986. The Semiconductor Segment, or Components Segment, is the largest revenue-generating group in the Company, followed closely by the Defense Electronics Segment, as can be seen from Table 1. Semiconductor revenue grew to $2.125 billion in 1987, an increase of 19.3 percent over 1986.

Texas Instruments, Incorporated

Table 1

Texas Instruments, Incorporated
Estimated Revenue by Operating Group
(Millions of Dollars)

	Fiscal Year Ending December 31					
	1983	1984	1985	1986	1987	1988
Semiconductor Group	$1,638	$2,484	$1,742	$1,781	$2,12.	2,741
Digital Products Group	1,109	1,147	1,000	931	891	967
Defense Electronics Group	1,236	1,417	1,480	1,717	1,979	2,148
Materials and Electrical Products Group	460	483	486	464	481	539
Services Group	440	431	407	259	240	—
Intracompany Sales	(303)	(220)	(191)	(178)	(121)	(100)
Total Revenue	$4,580	$5,742	$4,924	$4,974	$5,595	6,295
NET INCOME		316	(119)	52	301	336

Source: Texas Instruments, Incorporated
Annual Reports
Dataquest
April 1988

Manufacturing Facilities

Table 2 describes Texas Instruments' manufacturing facilities according to the classification scheme followed by Dataquest's Semiconductor Equipment and Materials Service (SEMS).

Texas Instruments, Incorporated

Table 2

Texas Instruments, Incorporated
Semiconductor Manufacturing Facilities

Location	Type	Clean Room (Sq. Ft.)	Products	Technology
Dallas	R	18,000	4Mb DRAM	CMOS MOS
Dallas	F	5,000	Internal Opto	Focal Plane Array
Dallas	F	30,000	Logic, ASIC	Bipolar, MOS
Dallas	F	25,000	Linear	CMOS
Dallas	F	30,000	MIL STD, MPUs, AI	Bipolar
Dallas	F	5,000	Logic, 4K Arrays Linear	GaAs, CMOS
Dallas	F	30,000	256K 1Mb DRAM	CMOS
Dallas	F	13,000	1Mb DRAM	CMOS
Dallas	F	10,000	MIL STD	Bipolar
Dallas	F	5,000	Opto	HgCdTe*
Houston	F	20,000	ADV Bipolar	Bipolar
Houston	F	15,000	16K SRAM	Bipolar, BICMOS
Lubbock	F	30,000	EEPROM, 1Mb EPROM, Logic	MOS
Sherman	F	20,000	Logic, MPR	Bipolar TTL
Sherman	F	20,000	ADV Schottky	Bipolar
Bedford, England	F		Discrete, LSI	Discrete, MOS, Opto
Villeneuve-Loubet, France		66,000	Custom LSI	MOS
Freising, West Germany		N/A	Digital Linear	Bipolar Linear
Hatogaya, Japan	F	N/A	32-bit MPU, Logic	MOS
Hatogaya, Japan	F	N/A	Memory	MOS
Hiji, Japan	F	N/A	Bipolar, Logic, Linear, 32-bit Lisp Processor	Bipolar, CMOS
Miho, Japan	F	N/A	256K 1Mb DRAM	MOS
	F	N/A	Dev. 4Mb DRAM	
Miho, Japan	F	N/A	256K DRAM	MOS

R = Semiconductor Research Facility
F = Fab (Front-End Processing)
N/A = Not Available
*Mercuric cadmium telluride

Source: Dataquest
April 1988

Texas Instruments, Incorporated

Capital Expenditures and R&D Spending

In terms of capital spending, the company's main focus has been on the support of new semiconductor products, specifically new memory and logic products and manufacturing productivity improvement. Capacity additions in 1985 permitted the reduction of capital spending for semiconductors in 1986. Capital spending increased again in 1987. Table 3 provides details of TI's capital spending and R&D spending in semiconductors.

Table 3

Texas Instruments, Incorporated
Semiconductor Spending by Calendar Year
(Millions of Dollars)

	1983	1984	1985	1986	1987
Semiconductor Revenue	$1,638	$2,484	$1,742	$1,781	$2,125
Semiconductor Capital Spending	$ 232	$ 472	$ 281	$ 213	$ 240
Percent of Semiconductor Revenue	14.2%	19.0%	16.1%	12.0%	11.3%
Percent Change in Capital Spending	65.7%	103.4%	(40.5%)	(24.2%)	12.7%
Semiconductor R&D Spending	$ 163	$ 195	$ 214	$ 256	$ 270
Percent of Semiconductor Revenue	10.0%	7.0%	12.3%	14.4%	12.7%
Percent Change in R&D Spending	27.3%	19.6%	9.7%	19.6%	5.5%

Source: Dataquest
April 1988

Texas Instruments, Incorporated

MARKET ANALYSIS

Products and Markets

Texas Instruments participates in all major semiconductor product areas: logic devices, memories, microcomponents, linear circuits, discrete devices, and optoelectronics. TI maintained its number five ranking in the worldwide semiconductor market from 1986 to 1987. Table 4 shows a history of the Company's semiconductor revenue by major product area, and Table 5 describes its market share by product categories and changes in revenue between 1986 and 1987.

Table 4

Texas Instruments, Incorporated
Estimated Worldwide Semiconductor Revenue by Product
1983–1987
(Millions of Dollars)

	1983	1984	1985	1986	1987*
Total Semiconductor	1,638	2,484	1,742	1,781	2,125
Total Integrated Circuit	1,535	2,375	1,653	1,689	2,022
Bipolar Digital (Technology)	667	1,077	796	826	908
TTL	650	1,056	786	814	897
ECL					
Other Bipolar Digital	17	21	10	12	11
Bipolar Digital (Function)	667	1,077	796	826	908
Bipolar Digital Memory	50	70	44	48	54
Bipolar Digital Logic	617	1,007	752	778	854
MOS (Technology)	572	889	522	511	728
NMOS	461	752	428	418	552
PMOS	91	97	46	24	29
CMOS	20	40	48	69	147
MOS (Function)	572	889	522	511	728
MOS Memory	371	670	349	286	405
MOS Micro Devices	135	117	88	92	139
MOS Logic	66	102	85	133	184
Linear	296	409	335	352	386
Total Discrete	48	59	56	58	64
Transistor	45	57	54	58	64
Total Optoelectronic	55	50	33	34	39

*1987 Preliminary

Source: Dataquest
April 1988

Table 5

Texas Instruments, Incorporated
Worldwide Ranking—Semiconductor Markets
(Millions of Dollars)

	1986 Rank	1987 Rank	Revenue % Change 1986-1987	Industry % Change 1986-1987
Total Semiconductor	5	5	19.3%	24.3%
Integrated Circuit	3	4	19.7%	26.8%
Bipolar Digital	1	1	9.9%	9.7%
MOS Digital	8	8	42.5%	36.3%
Linear	5	6	9.7%	18.7%
Discrete	24	24	10.3%	15.9%
Optoelectronic	16	15	14.7%	16.6%

Source: Dataquest
April 1988

International Activities

TI has been a leader in developing international markets. Early on, the Company took steps to penetrate markets outside the United States by establishing factories in regional markets. The fact that more than half of TI's business is outside the United States attests to its success. Table 6 details 1987 semiconductor revenue by geographic region.

Table 6

Texas Instruments, Incorporated
Estimated 1987 Semiconductor Revenues by Geographic Region
(Millions of Dollars)

	United States	Japan	Europe	Rest of World	Total
Total Semiconductor	980	396	525	224	2,125
Integrated Circuit	931	395	480	216	2,022
Bipolar Digital	443	217	180	68	908
MOS	332	92	184	120	728
Linear	156	86	116	28	386
Discrete	28	1	30	5	64
Optoelectronic	21		15	3	39

Source: Dataquest
April 1988

Texas Instruments, Incorporated

Market Positioning

Memories

Texas Instruments has been an industry leader in the memory market for many years. The Company offers memories in TTL, NMOS, and CMOS process technologies. Dataquest estimates that TI sold approximately $405 million in memory products in 1987. TI's biggest portion of market share stems from DRAM products, which are offered in 64K, 256K, and 1-Mbit densities. TI's strategy in the DRAM market is to stay a major manufacturer but not to dominate the market. More important to TI, DRAM products and processes are used as technology drivers for much of the Company's manufacturing and could be considered the backbone of TI's semiconductor products. TI has experienced major difficulties in the DRAM market during the past couple of years as a result of Japanese competition. Nevertheless, although the Company lost market share, it did not choose to leave the market, as did many other U.S. DRAM manufacturers. In fact, with approximately $290 million of the $2.6 billion market, TI ranks as the fourth-largest DRAM producer in the world. Most of this revenue is generated by sales of 256K DRAMs. TI's major competitors in this market segment are Toshiba, NEC, and Hitachi. In order to contend with what TI terms the 1-micron barrier, the Company moved to a CMOS process technology and opted to employ a trench capacitor approach for production of the 1-Mbit DRAM. Currently, the 1-Mbit DRAM is in volume production in Miho, Japan, and in low-volume production in Dallas, Texas.

TI entered the EPROM market in 1976 with a 16K EPROM. The Company currently produces 16K, 32K, 64K, 128K, 256K, and 512K EPROMS, emphasizing both standard and high-performance, high-speed parts. TI's 1987 EPROM sales, estimated at almost $82 million of the $1.2 billion market, made it the seventh-largest EPROM producer last year. EPROMs represent the Company's CMOS process driving force. TI plans to expand this family by adding new devices, including a 1-Mbit part.

Among TI's bipolar products are programmable read-only memories (PROMs), random access memories (RAMs), and first-in first-out memories (FIFOs). TI produces these products mainly for the military in high-performance ECL technology. Earning approximately $54 million in bipolar memory sales in 1987, Texas Instruments was the world's fifth-largest bipolar memory producer in the $640 million market, which is led by Fujitsu and AMD.

TI also has recently reentered the SRAM market with an emphasis on military applications. The Company is in the process of introducing a full line of fast SRAMs with densities ranging from 16K to 256K, with access times varying from 45ns to 25ns. This will put it in competition with other military SRAM suppliers such as Integrated Device Technology and Cypress Semiconductor. Still questionable, however, is when, or even if, TI will enter the fast SRAM commercial market.

Texas Instruments also produces memory modules. The Company was among the first to participate in the SIMM (Single-in-line memory module) market. TI offers 64x4, x5, x8, and x9 SIMMs, as well as 256x4, x8, and x9 SIMMs.

Texas Instruments, Incorporated

Memories represent a key part of the Company's semiconductor strategy not only as TI's process technology driver but also because they drive excellence in manufacturing. In the last two years, TI has completed two advanced wafer fabrication facilities in Miho, Japan, and Dallas, Texas. From the yield improvement in its Dallas facility, TI's manufacturing yields have brought high-density MOS memory products on a par with the best semiconductor companies in Japan. While DRAMs remain TI's strongest memory interest, new memory products are gaining support. Growing ASIC activity has enabled Texas Instruments to reap the proceeds from a color palette graphics chip, special cache memory chips, and video RAMs. Special-application products such as these represent growth opportunities for the Company.

Microcomponents

For the microcomponent market, TI produces a selection of microprocessors (MPUs), microcontrollers (MCUs), and microperipherals (MPRs), including communications chips and digital signal processors (DSP). Based on projected 1987 Dataquest market share estimates, Texas Instruments garnered $139 million of the approximately $5.0 billion microcomponent market. TI is not considered to be a major participant in the general-purpose microcoprocessor market, and that is by design. TI is targeting application-specific processors so that although the Company has a low profile in MPUs and MCUs, it is the world's largest supplier of digital signal processors.

The first microcontroller introduction for TI was the TMS1000 4-bit MCU, which made TI a dominant supplier. The popular TMS1000 was used in calculators, watches, and other consumer products. The Company was late in introducing its TMS7000 8-bit MCU, however. Because Intel and Motorola already had well established their 8-bit MCU product offerings, TI's 8-bit MCU did not become a dominant factor in the market. Recently, however, TI announced a new product family, the TMS 370 that will target the MCU market with renewed vigor. The family of performance-oriented 8-bit MCUs will offer on-chip options such as EEPROM and an A/D converter. The product family is designated configurable because the modular design methodology used to develop the product permits the customer to configure devices comprising different function modules to address specific application requirements. Although TI is a second source for National Semiconductor's 32000 series of 32-bit microprocessors, it is not considered a major supplier.

In order to become a larger player in the microcomponent area, TI's strategy was to focus on the application-specific processor market, where it has achieved some notable successes. These successes include the following:

- TMS320 product family—Digital signal processors (DSPs)
- TMS340 product family—Graphics processors
- TMS380 product family—Local area networks (LANs)
- TI888 product family—Bit-slice processors

TI's TMS320 DSP family is designed to support a wide range of high-speed or numeric-intensive DSP applications. As stated previously, TI is the world's largest supplier of single-chip digital signal processors, and the Company already has introduced a third generation of compatible DSP devices. TI's DSP revenue is estimated by Dataquest to be approximately $45 million for 1987. In the graphics processing area, a major product is the advanced high-performance CMOS 32-bit coprocessor, the TMS34010. This device has gained market acceptance because of its high level of performance and its general-purpose nature, which allows flexibility. The Company also recognized the importance of providing extensive development support. Several new products will be added this year to extend TI's capability in graphics processing. The LAN adapter chip set, developed jointly with IBM, provides computer, peripherals, and telecommunications equipment manufacturers with a verified chip set for connecting to the IBM Token-Ring LAN. TI's first bit-slice processor was the ECL-TIE100888 8-bit bit-slice; it received popular market acceptance early in 1986, but design-ins tapered off later in the year. TI also offers the 74AS8832, a bipolar 32-bit processor.

Linear

The linear segment is one of the major components of TI's semiconductor product line. TI's linear group started in the early 1970s and has grown to be one of the world's leading suppliers of linear integrated circuits. This product line is one of the broadest in the marketplace, including interface circuits, op amps, regulators, comparators, data converters, and high-voltage power integrated circuits. TI is the fifth-largest linear producer in the world, with estimated sales of $386 million in the almost $6.9 billion market. Of U.S. producers, only National Semiconductor sold more linear products in 1987.

Texas Instruments has seen significant changes occur in the linear marketplace, such as increased analog performance, the growth of digital signal processing, total system solution requirements, the merging of analog and digital on a single chip, and reduced design cycles. The Company's LinASIC library presently contains approximately 30 analog cells in CMOS and 300 digital cells. TI's strategy in this market is to emphasize the development of analog CAD/CAM tools. The advanced linear strategy is focused on addressing the demands of its customers in this rapidly changing market. The data conversion area addresses three primary categories:

- High-precision converters with resolutions of 12 bits and beyond to support DSP requirements
- High-speed flash analog to digital (A/D) converters
- Video digital-to-analog converters (DACs) to support video and graphics solutions

Texas Instruments, Incorporated

Logic

With an estimated $854 million in bipolar logic revenue in 1987, TI was the leading supplier worldwide, with a market share almost twice the size of its nearest competitor, National Semiconductor. In MOS logic, TI's revenue amounts to approximately $184 million, placing the Company just short of the top 10.

Application-Specific Integrated Circuits

As computer-aided design technology and manufacturing techniques have advanced, standard logic products have increasingly been replaced by application-specific integrated circuits (ASICs) manufactured to meet individual customer specifications. In 1987, ASICs represented a $6.0 billion total available market. TI's revenue of approximately $230 million in ASICs placed it among the top 10 ASIC suppliers worldwide. Presently, TI offers two families of CMOS standard cells. The first family, introduced in 1984, is the 3-micron CircuitCell library featuring approximately 278 cells. The newer cell library is the SystemCell series, which initially comprised about 320 cells. TI is increasing density and performance in VLSI logic, while extending its position in standard logic with the introduction in 1986 of a new family of 1-micron CMOS logic circuits in which the Company has begun implementing customers' designs for gate arrays.

In 1987, TI's combined bipolar and MOS gate array shipments totaled almost $20.0 million, essentially remaining flat over 1986 in a market that grew approximately 28 percent to total $2.2 billion in 1987. Of TI's 1987 revenue, 65 percent was generated from CMOS gate arrays, reflecting a decline in the Company's bipolar revenue for the year due to phasing out of TTL products while ECL is still ramping up. TI uses double-level metal, silicon-gate CMOS technology, a 2.8-micron H series, and a 2.3-micron VH series utilizing automated layout capability with three programming layers.

Texas Instruments is a significant force in the programmable logic device (PLD) market, ranking second only to the formidable combination of AMD/MMI. TI's 1987 revenue was approximately $50.0 million in a total market of $440.0 million. The Company offers bipolar TTL PLDs, CMOS PLDs, ECL PLDS, and advanced architecture arrays.

TI made an important addition to its ASIC capability in July 1987 through a joint venture agreement with Intel. The two companies plan to build a common cell library and common gate array macro library to take advantage of TI's advanced logic and specific-application processor capabilities and of Intel's microcontroller, microprocessor, and peripherals designs. The agreement further stipulates that joint testing, packaging, and design rules will be developed. A compatible 1.0-micron CMOS process will be used to produce ASIC products developed through the agreement.

Texas Instruments, Incorporated

Business Strategies

Over the past eight years, TI has lost market share in several product areas where it competes, as compared with industry growth rates. This was partly due to some product strategies being tied to in-house systems products and partly due to expensive forays into consumer electronics, that were not always well accepted. However, as considerable restructuring has occurred at TI, the company expects to be better positioned for the future. In its semiconductor operations, TI will address two challenges:

- To compete with well-financed vertically integrated Far East manufacturers in an increasingly global market
- To effectively deal with the boom-and-bust characteristics of the semiconductor market

TI's strategies to meet these challenges are:

- Increase design automation to shorten time to market and to lower costs
- Maintain manufacturing process leadership through focused R&D efforts and aggressive moves into new technologies
- Develop closer relationships with customers
- Penetrate the market in the following five product areas where TI can provide system-level solutions:
  - Application-specific integrated circuits (ASICs)
  - Application processors
  - Advanced linear devices
  - Military semiconductors
  - Very large scale integration (VLSI) logic

The Company predicts that the above five product areas will make up 50 percent of its semiconductor revenue by 1990.

TI has established a new business objective that builds on the synergy between its semiconductor and defense electronics business and expands its military components product offering to include gallium arsenide circuits, very high speed integrated circuits (VHSIC), and high-density power supplies. Research and development capital is also being invested toward a higher level of systems capability in some specific target businesses. The major investments will be in VLSI (very large scale integration), defense electronics, artificial intelligence, and industrial automation technology. TI believes that artificial intelligence and industrial automation can support a much larger business

and strengthen the systems capability across the Company. TI has developed an AI-based system that brings advanced technology to training and maintenance and boosts productivity in a wide variety of applications. In early 1987, Texas Instruments announced the development of the first artificial intelligence (AI) microprocessor, which lies at the heart of TI's Compact Lisp Machine, a set of four module boards being developed by the Company under government contract. TI expects the Lisp chip to greatly expand the range of AI applications in both commercial and defense systems.

TECHNOLOGY TRENDS/EMERGING AREAS

One of TI's driving forces for the future is what is termed MegaChip Technologies. Not one chip, process, or service, MegaChip Technologies is rather the culmination of a number of new requirements for creating, manufacturing, and supporting highly sophisticated ICs. Manufacturing MegaChip-class products begins with the latest 1-micron and submicron processing capabilities.

The following are examples of MegaChip-class processes developed and in use at TI:

- EPIC (Enhanced performance implanted CMOS) is an outgrowth of the 1-micron CMOS process developed at TI to support its 1-Mbit dynamic random access memory (DRAM).

- IMPACT-X (Implanted Advanced Composed Technology) is an extension of TI's 2-micron bipolar IMPACT process technology. This process is capable of delivering 10,000+ gates per chip and a speed/power product of less than 0.1 picojoule per gate.

- ExCL is a new advanced ECL (emitter-coupled logic) bipolar process. ExCL reduces the RB parameter through the use of a silicided polysilicon base-contracting layer and shortens the distance between emitter and base to boost switching speed. ExCL is currently used in TI's TGE8000 ECL gate array and will be used for high-density ECL static RAMs in the future. Also in development is a higher-breakdown version intended for the Company's line of programmable logic devices.

TI's AS88XX chipset utilizes both the EPIC and IMPACT-X processes, permitting the optimum technology to be used for each member of the family. Greater focus will be placed on the BICMOS process for such devices as SRAMs, gate arrays, MPUs, and logic in the 1990s. MegaChip-class products utilizing EPIC include TI's high-density memories, application-specific processors for graphics and digital signal processing, and the Explorer Lisp microprocessor. IMPACT-X is also being used in TI's new Advanced CMOS logic (ACL) family.

Texas Instruments continues to invest heavily in automation. To stay at the leading edge of process technology, the Company emphasizes the manufacturing of DRAMs and EPROMs.

ALLIANCES

Nowhere is the change in philosophy at Texas Instruments more in evidence than in the realm of alliances, where previously the Company has not been very active. In order to broaden its product base and increase market share, TI has come to the realization that it cannot go it alone. Consequently, the Company has entered into a number of agreements with other semiconductor vendors and with customers. Table 7 provides a summary of the companies involved, the types of activity, and the products. The first company designation represents either TI or, where applicable, the company providing the product in the agreement. Following the summary table is a short abstract containing more detail about each agreement.

Table 7

Texas Instruments, Incorporated
Summary of Alliances

	Providing* Company	Receiving* Company	Type	Products	Date
1.	TI	Hyundai	C	256K DRAM	08/87
2.	TI	NMB Semiconductor	C	FRAMs	08/87
3.	TI	Intel	JD	ASICs	07/87
4.	TI	Linear Technology	SS	Linear ICs	03/87
5.	TI	Ericsson	JD	ISDN	02/87
6.	TI & Philips	European Silicon Structures.	PT	Cell-based ICs	02/87
7.	TI	Raytheon	JD	MIMIC	02/87
8.	Digital Equipment	TI	SS	MPR	11/86
9.	TI	Philips-Signetics	JD	CMOS Logic	01/86
10.	Signetics	TI	JD	CMOS Logic	02/85
11.	TI	NTT	JD	CMOS process	02/85
12.	TI	National Semiconductor	TE	PLD	01/85
13.	IBM	TI	JD	MPR	09/84
14.	Signetics	TI	JD	Std. cell	09/84
15.	Western Digital	TI	SS	MPRs	06/84
16.	TI	GI	TE	DSP, MCU	05/84
17.	National	TI	TE	MPUs, MPRs	05/84
18.	Fujitsu	TI	SS	Gate arrays	01/84
19.	TI	Mitsubishi	IV	64K EPROM	03/83

FA = Foundry Agreement
JD = Joint Development
MA = Marketing Agreement
PT = Prototyping
SS = Second Source
TE = Technology Exchange
IV = Purchase Resale
C = Contract Award

*Where applicable

(Continued)

Table 7 (Continued)

Texas Instruments, Incorporated
Summary of Alliances

1. TI and Hyundai

   Hyundai will supply TI with 256K DRAMs designed by TI. Under an OEM agreement, Hyundai is expected to supply more than $100 million in 1988.

2. TI and NMB Semiconductor

   NMB will supply TI with TI-designed 1Mb field RAMs (FRAMs). The chip is used in video equipment such as digital TVs and VCRs, as well as copiers, printers, and facsimiles. Initially, NMB is expected to supply 100,000 units per month. TI will manufacture 1Mb versions that use its advanced trench capacitor technology in Miho, Japan, while NMB produces the more conventional planar technology. TI will also add 1Mb production to the 256K production in Dallas.

3. TI and Intel

   TI and Intel announced an agreement to develop a common cell library and common gate array macro library. The agreement may also include provisions for common testing, packaging, and design rules. Both suppliers will develop specifications for compatible CMOS processes that will facilitate alternate sourcing.

4. TI and Linear Technology Corporation (LTC)

   In March 1987, TI and LTC signed a five-year agreement. TI can select six of LTC's circuits every six months for the duration of the agreement. TI will make semiannual $500,000 payments to LTC and also pay royalties on a descending scale for a 10-year period on any LTC circuits that TI produces. This represents part of TI's high-performance linear strategy. As for LTC, this establishes a strong second-source supplier in the high-performance segment of the linear IC market.

5. TI and Ericsson

   TI and Ericsson formed a joint alliance to develop and produce telecommunication components that meet Integrated Services Digital Network (ISDN) standards.

(Continued)

Table 7 (Continued)

Texas Instruments, Incorporated
Summary of Alliances

6. TI, Philips, and European Silicon Structures

Philips and TI concluded an agreement with European Silicon Structures to extend prototyping services for the SystemCell range of CMOS standard cell ASICs. Under the agreement, European Silicon Structures, using E-beam direct-write techniques, will supply European customers with fast, lower-cost prototypes and low-volume quantities in a SystemCell-compatible process.

7. TI and Raytheon

Raytheon and TI formed a joint venture to aid in developing and producing large quantities of microwave/millimeter wave monolithic integrated circuit (MIMIC) components for the U.S. Department of Defense. Total funding for this four-phase program, which will run from 1987 to 1992, is planned to be in excess of $135 million. The components will have applications in radar, communications, smart weapons, and electronic warfare systems. The joint venture allows both companies to share information and tap each other's specialized capabilities.

8. Digital Equipment Corporation and TI

TI was licensed by Digital Equipment as an alternate source for its 78808 octal universal asynchronous receiver transmitter (UART). TI will market the device as its part number TCM78808.

9. TI and Philips-Signetics

TI and Philips-Signetics announced in January 1986 the intention of jointly developing and manufacturing an advanced CMOS logic (ACL) family that is three times faster than high-speed CMOS ICs and provides 24mA of output drive current. Each company has the responsibility to design a specific function in the 1-micron logic family, and it is the intention of the companies to exchange design in order to quickly introduce a new, alternate-sourced product family.

10. Signetics and TI

Joint development of a 1-micron CMOS logic family.

11. TI and NTT

TI and NTT are involved in joint development of a buried-oxide technique for building CMOS devices.

(Continued)

Table 7 (Continued)

Texas Instruments, Incorporated
Summary of Alliances

12. TI and National Semiconductor

National Semiconductor agreed to produce TI's IIFPLA839/840 programmable logic array. In exchange, TI will produce National's ultrafast ECL PAL.

13. IBM and TI

TI and IBM pooled design-automation and verification methodologies to develop a five-chip set that is an adaptor for the token-passing local network devised by IBM.

14. Signetics and TI

TI and Signetics will develop an electronic design interchange format (EDIF). The companies signed an open-ended standard-cell agreement. No money will exchange hands, nor will any technology transfer occur.

15. Western Digital and TI

TI will second-source Western Digital's storage and communication controllers.

16. TI and GI

GI will second-source TI's TMS320 32-bit digital signal processor and TMS 7000 series. TI will transfer design information and product tooling to GI, and GI will develop a CMOS version of the TMS320.

17. National and TI

TI and NSC signed a long-term agreement covering advanced 32-bit MPUs and peripherals. TI acquired the right to manufacture National's high-end Series 32000 MPU family.

18. Fujitsu and TI

TI will second-source Fujitsu's gate arrays, which include B-240, B350, B-600, and B-110 bipolar Schottky TTL arrays in a nonexclusive alternate-source arrangement.

19. TI and Mitsubishi

Sometime prior to March 1983, Mitsubishi supplied both loose dice and packaged 64K EPROMs to Texas Instruments (TI) to be sold through TI's distribution channel and with TI markings. TI would continue to produce its own part at full capacity.

Source: Dataquest
April 1988

PRODUCTS

Semiconductor Products

Texas Instruments participates in all major semiconductor product areas, as explained in the "Products and Markets" section of this company profile.

Nonsemiconductor Products

As mentioned earlier in this profile, TI is involved in many businesses besides semiconductors. The following paragraphs present a brief summary of TI's other business activities.

Metallurgical Materials

Includes clad metals, precision-engineered parts, and electronic connectors for use in a variety of applications such as appliances, automobiles, electronic components, and industrial and telecommunications equipment. These metallurgical materials are primarily sold directly to original equipment manufacturers.

Services

Includes collection and processing of seismic data, including employment of three-dimensional seismic technology in connection with petroleum exploration. This data is primarily collected using equipment manufactured by TI. These services are provided to the petroleum industry, including national oil companies. During the fourth quarter of 1987, TI and Halliburton signed a letter of intent whereby Halliburton will purchase a 60 percent interest in Geophysical Service Inc. (GSI), with provisions for possible complete ownership within a few years. GSI had been making losses for the past four years.

Defense Systems and Electronics

Products from this group are widely diversified within the government electronics business segment. The complex defense systems and equipment designed, developed, and produced by this group include missile systems, tactical weapons, and electro-optics systems. TI's Defense Systems and Electronics group is also at the forefront of applying advanced technologies such as VHSIC, artificial intelligence, gallium arsenide, microprocessors, and sensors to meet the expanding needs of the defense community.

As a leader in radar systems, TI is developing and producing terrain-following/terrain-avoidance radar systems for the newest and most advanced aircraft in the military inventory. Also in development are ocean search and surveillance radars and magnetic anomoly detection systems for both carrier-based and land-based fixed-wing aircraft and helicopters. TI has been awarded contracts in the HARM, ASW radar, and LANTIRN projects, as well as in classified projects.

Texas Instruments, Incorporated

Data Systems

This category includes the manufacturing and making of extensive array and commercial computing products worldwide. The group's three product divisions are as follows:

- Advanced Systems Division
- Computer Systems Division
- Peripheral Products Division

The Advanced Systems Division (ADS) is focusing on the artificial intelligence technologies developed at TI. ASD is responsible for TI's widely acclaimed Explorer Lisp workstation, as well as software packages that allow personal computers to solve increasingly complex problems and emulate human reasoning. This division also has introduced speech and natural language products to make computers easier to use. Products of the Advanced Systems Division include:

- The Explorer
- Personal Consultant expert system development tool
- TI-Speech hardware and software
- Arborist and NaturalLink software

In a recent development, the Data Systems Group announced the new microExplorer computer system. Under an agreement with Apple Computer, TI will purchase Macintosh II PCs from Apple and incorporate a specially developed coprocessor board based on the Explorer Lisp microprocessor and its advanced software environment.

The Computer Systems Division offers a cohesive, expandable product line that provides business computing solutions for 1 to 128 users. Products of the Computer Systems Division include:

- TI Professional Computer
- Business-Pro Computer
- Business Systems 100, 300, 600, 800, and 1,000

Texas Instruments, Incorporated

The Peripheral Products Division offers a wide range of printers and terminals. TI's first patented thermal printing data terminal was introduced in 1969. Today, the silent 700 is a leader in the market pioneered by that technology. Products of the Peripheral Products Division include:

- PC Printers
- Systems Printers
- Portable Data Terminals

Texas Instruments, Inc.

Texas Instruments, Inc.
13500 N. Central Expressway
P.O. Box 225474
Dallas, Texas 75265
(214) 995-2011
(Millions of Dollars Except Per Share Data)

Balance Sheet (December 31)

	1978	1979	1980	1981	1982
Working Capital	$ 304	$ 201	$ 328	$ 432	$ 568
Long-Term Debt	$ 19	$ 18	$ 212	$ 212	$ 214
Shareholders' Equity	$ 821	$ 953	$1,165	$1,260	$1,361
After-Tax Return on Average Equity (%)	18.2	19.5	20.0	8.9	11.0

Operating Performance (Fiscal Year Ending December 31)

	1978	1979	1980	1981	1982
Revenue	$2,450	$3,224	$4,075	$4,206	$4,327
U.S. Revenue	$1,753	$2,168	$2,677	$2,866	$2,998
Non-U.S. Revenue	$ 797	$1,056	$1,398	$1,340	$1,329
Cost of Revenue	$1,762	$2,265	$2,871	$3,060	$3,107
R&D Expense	$ 111	$ 134	$ 189	$ 219	$ 237
SG&A Expense	$ 420	$ 516	$ 637	$ 674	$ 700
Pretax Income	$ 257	$ 308	$ 379	$ 175	$ 213
Pretax Margin (%)	10.5	9.6	9.3	4.2	4.9
Effective Tax Rate (%)	45.5	43.9	44.1	37.7	32.4
Net Income	$ 140	$ 173	$ 212	$ 109	$ 144
Average Shares Outstanding (Millions)	22.79	22.80	23.02	23.48	23.61
Per Share Data					
Earnings	$ 6.15	$ 7.58	$ 9.22	$ 4.62	$ 6.10
Dividends	$ 1.76	$ 2.00	$ 2.00	$ 2.00	$ 2.00
Book Value	$ 36.03	$ 41.79	$ 50.58	$ 53.67	$ 57.65
Price Range	$61 3/8-92 1/2	$ 78-101	$ 7 5/8-150 3/4	$ 75-126 1/4	$70 1/2-152 1/2
Total Employees	78,571	85,779	89,875	83,714	80,007
Capital Expenditures	$309.6	$427.1	$542.2	$341.4	$342.0

Source: Texas Instruments, Inc.
Annual Reports
DATAQUEST

Texas Instruments, Inc.

Table 1

Texas Instruments, Inc.
ESTIMATED REVENUES BY OPERATING GROUP
(Millions of Dollars)

	1978	1979	1980	1981	1982
Semiconductor Group	$ 945	$1,242	$1,580	$1,295	$1,300
Consumer Products Group	370	365	405	405	518
Digital Systems Group	365	522	647	726	655
Government Electronics Group	473	572	771	898	1,084
Materials & Electrical Products Group	403	493	527	437	386
Services Group	223	267	432	649	629
Intracompany Sales	(229)	(237)	(287)	(204)	(245)
Total Revenues	$2,550	$3,224	$4,075	$4,206	$4,327

Source: Texas Instruments, Inc.
Annual Reports
DATAQUEST

Texas Instruments, Inc.

Table 2

Texas Instruments
ESTIMATED SEMICONDUCTOR REVENUES
(Millions of Dollars)

	1975	1976	1977	1978	1979	1980	1981	1982
Total Semiconductor	520	655	741	921	1,212	1,580	1,295	1,305
Total Integrated Circuit	300	421	514	679	952	1,305	1,075	1,155
Bipolar Digital (Technology)	145	215	242	306	422	598	510	520
TTL	120	187	223	286	400	575	495	505
DTL	15	15	10	9	7	5	2	-
ECL	10	5	5	8	10	5	-	-
Other Bipolar Digital	-	8	4	3	5	13	13	15
Bipolar Digital (Function)	145	215	242	306	422	598	510	520
Bipolar Digital Memory	-	-	-	9	14	55	50	43
Bipolar Digital Logic	-	-	-	297	408	543	460	477
MOS (Technology)	100	135	180	238	360	502	350	400
NMOS	-	-	-	-	242	374	240	300
PMOS	-	-	-	-	110	120	100	80
CMOS	-	-	-	-	8	8	10	20
MOS (Function)	100	135	180	238	360	502	350	400
MOS Memory	-	-	-	-	240	330	200	250
MOS Microprocessor	-	-	-	-	80	95	80	95
MOS Logic	-	-	-	-	40	77	70	55
Linear	55	71	92	135	170	205	215	235
Total Discrete	177	174	170	176	184	191	150	90
Transistor	136	127	124	129	134	138	115	80
Small Signal Transistor	79	65	62	63	64	65	52	30
Power Transistor	57	62	62	66	70	73	63	50
Diode	30	32	31	34	37	39	25	5
Small Signal Diode	19	20	19	20	22	22	13	-
Power Diode	7	8	8	10	11	13	10	5
Zener Diode	4	4	4	4	4	4	2	-
Thyristor	4	8	8	7	7	8	6	3
Other Discrete	7	7	7	6	6	6	4	2
Total Optoelectronic	43	60	57	66	76	84	70	60
LED Lamps	4	6	6	8	10	12	9	8
LED Displays	24	30	28	32	37	40	34	28
Optical Couplers	3	4	4	6	8	10	9	8
Other Optoelectronics	12	20	19	20	21	22	18	16

Source: Texas Instruments, Inc.
Annual Reports
DATAQUEST

Texas Instruments, Inc.

Table 3

Texas Instruments
FINANCIAL STATEMENT HISTORY 1975-1982
(Millions of Dollars)

		Fiscal Year Ending December 31									
		1975	1976	1977	1978	1979	1980	1981	1982	TREND	CMPD GR
BALANCE SHEET											
1	CASH & LIQUID SECURITIES	266.50	293.75	257.13	115.37	116.64	139.80	150.00	420.00	0.05	(2.35)
3	RECEIVABLES	245.79	282.25	334.15	443.67	547.98	629.80	590.60	641.70	63.15	15.08
4	INVENTORY	142.80	197.65	214.28	300.50	340.25	442.70	372.00	360.00	37.10	15.26
5	OTHER CURRENT ASSETS	7.32	9.52	9.34	55.95	78.27	87.00	84.30	105.20	15.65	54.59
7	EXCESS FUNDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	TOTAL CURRENT ASSETS	662.56	783.17	814.90	915.50	1083.14	1299.30	1196.90	1526.90	115.95	12.02
9	GROSS P P E	538.95	606.38	713.79	927.01	1275.61	1723.00	1939.00	2083.80	248.25	24.25
10	ACCUMULATED DEPRECIATION	285.24	303.51	319.69	354.36	463.14	625.60	833.50	987.50	102.29	21.02
11	NET P P E	253.71	302.87	394.09	572.65	812.47	1097.40	1105.50	1096.30	145.96	27.10
12	MISC ASSETS	25.20	41.66	46.05	5.93	12.57	17.00	8.10	8.20	(4.37)	(19.56)
15	*TOTAL ASSETS*	941.48	1127.70	1255.04	1494.08	1908.17	2413.70	2310.50	2631.40	257.54	16.72
16	LOANS PAYABLE OVERSEAS	37.31	46.10	36.76	45.83	179.30	170.40	32.40	48.70	6.42	7.29
17	ACCTS PYBLE & ACCRD EXPS	172.62	211.67	287.91	451.96	536.71	630.40	614.30	784.00	88.15	24.55
18	ACCRUED TAXES	58.52	113.42	85.79	49.71	100.27	92.10	67.00	68.80	(1.08)	(0.89)
19	ACCRUED RETIRE BENES	18.46	30.47	34.11	40.18	52.92	66.50	38.00	44.60	3.93	12.05
20	CURR MAT LONG TERM DEBT	9.20	9.21	10.42	12.09	1.75	0.40	1.30	0.80	(1.65)	(36.84)
21	DIVIDENDS PAYABLE	5.73	7.54	9.58	11.39	11.41	11.60	11.80	11.80	0.83	9.82
22	TOTAL CURR LIABILITIES	301.84	418.42	466.57	611.17	882.36	971.40	764.80	958.70	96.61	17.68
23	LONG TERM DEBT	47.53	38.17	29.67	19.07	17.56	211.70	211.70	214.00	30.68	34.52
24	DEFERRED TAXES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	MISC LIABILITIES	5.82	10.84	14.18	16.58	17.11	12.70	9.10	6.80	(0.15)	(1.41)
26	DEFERD CREDITS & OTH LIAB	0.00	0.00	0.00	25.99	38.26	53.40	84.80	91.10	13.50	8649.13
27	DEFICIT FUNDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	TOTAL LIABILITIES	356.19	467.42	510.43	672.81	955.29	1249.20	1050.40	1270.60	140.65	20.96
29	PREFERRED STOCK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	COMMON STOCK	23.02	23.03	23.03	23.04	23.06	23.40	23.70	23.80	0.12	0.51
31	CAPITAL SURPLUS	104.12	106.42	106.32	106.91	107.81	149.50	181.20	186.60	12.88	9.70
32	RETAINED EARNINGS	458.15	530.82	615.26	715.44	842.71	1008.80	1070.30	1167.10	108.76	14.94
33	TREASURY STOCK	0.00	0.00	0.00	(24.12)	(20.70)	(17.20)	(15.10)	(16.70)	(2.86)	**********
34	TOTAL EQUITY	585.29	660.28	744.62	821.27	952.88	1164.50	1260.10	1360.80	118.89	13.49
35	*TOTAL LIAB & EQUITY*	941.48	1127.70	1255.04	1494.08	1908.17	2413.70	2310.50	2631.40	257.54	16.72
36	NET WORKING CAPITAL	360.72	364.75	348.33	304.33	200.78	327.90	432.10	568.20	19.34	4.17
INCOME & EXPENSE											
38	SALES	1367.62	1658.61	2046.46	2549.85	3224.13	4074.70	4206.00	4326.60	478.68	19.57
40	COST OF GOODS	831.06	994.72	1216.72	1526.40	1932.64	2391.10	2595.10	2656.10	294.13	19.82
41	GROSS PROFIT	536.56	663.89	829.73	1023.45	1291.49	1683.60	1610.90	1670.50	184.55	19.18
42	S G & A EXPENSE	227.52	265.89	325.98	419.80	515.65	636.70	674.10	699.60	75.88	19.17
43	EMPLOYEE PROFIT SHAR	21.18	44.67	50.15	61.40	76.73	98.50	40.30	47.70	3.79	9.15
44	INT FNDED R&D EXPS	50.71	72.24	96.18	111.05	134.34	188.50	219.40	236.50	27.82	24.70
45	OPERATING PROFIT	237.16	281.10	357.44	431.21	564.76	751.90	677.10	686.70	77.07	18.67
46	DEPRECIATION	92.27	87.29	108.06	131.00	187.24	257.00	333.00	338.50	41.13	25.01
47	LEASE PAYMENTS	30.09	31.18	38.54	46.70	58.17	86.20	91.20	112.50	12.28	22.77
48	INTEREST EXPENSE	10.82	8.31	9.18	8.37	19.52	44.30	41.30	33.10	5.21	29.03
49	MISC EXPENSE	0.00	0.00	0.00	0.00	0.00	0.00	36.60	0.00	2.18	325.38
51	MISC INCOME	11.97	23.78	9.26	12.25	8.91	4.60	0.00	10.50	(1.74)	(76.82)
53	PRETAX PROFIT	115.94	178.10	210.92	257.39	308.73	379.00	175.00	213.10	14.53	7.55
54	INCOME TAXES	53.80	80.60	94.20	117.11	135.84	166.80	66.50	69.10	3.24	3.20
56	NET PROFIT	62.14	97.42	116.64	140.28	172.89	212.20	108.50	144.00	11.28	10.55
57	EPS AFTER PFD DIVIDENDS	2.71	4.25	5.11	6.15	7.58	9.22	4.62	6.10	0.47	10.09
58	COMMON DIV PER SHARE	1.00	1.00	1.32	1.68	2.00	2.00	2.00	2.00	0.17	12.29

Source: Texas Instruments, Inc.
Annual Reports
DATAQUEST

Texas Instruments, Inc.

Table 4

Texas Instruments
FINANCIAL STATEMENT HISTORY 1975-1982
(Percent)

		Fiscal Year Ending December 31									
		1975	1976	1977	1978	1979	1980	1981	1982	TREND	CMPD GR
BALANCE SHEET											
1	*CASH & LIQUID SECURITIES*	28.31	26.05	20.49	7.72	6.11	5.79	6.49	15.96	(2.74)	(16.34)
3	*RECEIVABLES*	26.11	25.03	26.82	29.70	28.72	26.09	25.56	24.39	(0.14)	(0.55)
4	*INVENTORY*	15.18	17.53	17.07	20.11	17.83	18.34	16.10	13.68	(0.19)	(1.25)
5	*OTHER CURRENT ASSETS*	0.78	0.84	0.74	3.74	4.10	3.60	3.85	4.00	0.54	32.44
7	*EXCESS FUNDS*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	*TOTAL CURRENT ASSETS*	70.38	69.45	64.93	61.27	56.76	53.83	51.80	58.03	(2.53)	(4.03)
9	*GROSS P P E*	57.24	53.77	56.87	62.05	66.95	71.38	83.92	79.19	4.20	6.45
10	*ACCUMULATED DEPRECIATION*	30.30	26.91	25.47	23.72	24.27	25.92	36.07	37.53	1.17	3.68
11	*NET P P E*	26.95	26.86	31.40	38.33	42.58	45.47	47.85	41.66	3.03	8.89
12	*MISC ASSETS*	2.68	3.69	3.67	0.40	0.66	0.70	0.35	0.31	(0.50)	(31.09)
15	**TOTAL ASSETS**	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	0.00
16	*LOANS PAYABLE OVERSEAS*	3.96	4.08	3.09	3.07	9.40	7.06	1.40	1.85	(0.12)	(8.08)
17	*ACCTS PYBLE & ACCRD EXPS*	18.34	18.77	22.94	30.25	28.13	26.12	26.59	29.79	1.51	6.71
18	*ACCRUED TAXES*	6.22	10.06	6.84	3.33	5.25	3.82	2.90	2.61	(0.81)	(14.92)
19	*ACCRUED RETIRE BENES*	1.96	2.70	2.72	2.69	2.77	2.76	1.64	1.69	(0.08)	(4.00)
20	*CURR MAT LONG TERM DEBT*	0.98	0.82	0.83	0.81	0.09	0.02	0.06	0.03	(0.16)	(45.89)
21	*DIVIDENDS PAYABLE*	0.81	0.67	0.76	0.76	0.60	0.48	0.51	0.45	(0.03)	(5.91)
22	*TOTAL CURR LIABILITIES*	32.06	37.10	37.18	40.91	46.24	40.25	33.10	36.43	0.30	0.82
23	*LONG TERM DEBT*	5.05	3.38	2.36	1.28	0.92	8.77	9.16	8.13	0.83	15.25
24	*DEFERRED TAXES*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	*MISC LIABILITIES*	0.72	0.96	1.13	1.11	0.90	0.53	0.39	0.26	(0.10)	(15.53)
26	*DEFERD CREDITS & OTH LIAB*	0.00	0.00	0.00	1.74	2.01	2.21	2.80	3.46	0.54	4818.09
27	*DEFICIT FUNDS*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	*TOTAL LIABILITIES*	37.83	41.45	40.67	45.03	50.06	51.75	45.46	48.29	1.57	3.63
29	*PREFERRED STOCK*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	*COMMON STOCK*	2.44	2.04	1.84	1.54	1.21	0.97	1.03	0.90	(0.22)	(13.89)
31	*CAPITAL SURPLUS*	11.06	9.44	8.47	7.16	5.65	6.19	7.84	7.09	(0.52)	(6.02)
32	*RETAINED EARNINGS*	48.66	47.07	49.02	47.84	44.16	41.79	46.32	44.35	(0.71)	(1.52)
33	*TREASURY STOCK*	0.00	0.00	0.00	(1.61)	(1.08)	(0.71)	(0.65)	(0.63)	(0.11)	*********
34	*TOTAL EQUITY*	62.17	58.55	59.33	54.97	49.94	48.25	54.54	51.71	(1.57)	(2.77)
35	**TOTAL LIAB & EQUITY**	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	0.00
36	*NET WORKING CAPITAL*	38.31	32.34	27.75	20.37	10.52	13.58	18.70	21.59	(2.83)	(10.75)
INCOME & EXPENSE											
38	*SALES*	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	0.00
40	*COST OF GOODS*	60.77	59.97	59.46	59.86	59.94	58.68	61.70	61.39	0.13	0.21
41	*GROSS PROFIT*	39.23	40.03	40.54	40.14	40.06	41.32	38.30	38.61	(0.13)	(0.33)
42	*S G & A EXPENSE*	16.64	16.03	15.93	16.46	15.99	15.63	16.03	16.17	(0.06)	(0.34)
43	*EMPLOYEE PROFIT SHAR*	1.55	2.69	2.45	2.41	2.38	2.37	0.96	1.10	(0.14)	(8.72)
44	*INT ENDED R&D EXPS*	3.71	4.36	4.70	4.36	4.17	4.63	5.22	5.47	0.19	4.29
45	*OPERATING PROFIT*	17.34	16.95	17.47	16.91	17.52	18.70	16.10	15.87	(0.12)	(0.76)
46	*DEPRECIATION*	6.75	5.26	5.28	5.14	5.81	6.31	7.92	7.82	0.29	4.55
47	*LEASE PAYMENTS*	2.20	1.88	1.88	1.83	1.80	2.12	2.17	2.80	0.06	2.67
48	*INTEREST EXPENSE*	0.79	0.50	0.45	0.33	0.61	1.09	0.98	0.77	0.05	7.91
49	*MISC EXPENSE*	0.00	0.00	0.00	0.00	0.00	0.00	0.87	0.00	0.05	240.50
51	*MISC INCOME*	0.88	1.43	0.45	0.48	0.28	0.11	0.00	0.24	(0.15)	(75.78)
53	*PRETAX PROFIT*	8.48	10.74	10.31	10.09	9.58	9.30	4.16	4.93	(0.73)	(10.06)
54	*INCOME TAXES*	3.93	4.86	4.61	4.59	4.21	4.09	1.58	1.60	(0.41)	(13.69)
56	*NET PROFIT*	4.54	5.87	5.70	5.50	5.36	5.21	2.58	3.33	(0.32)	(7.54)
57	*EPS AFTER PFD DIVIDENDS*	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	0.00
58	*COMMON DIV PER SHARE*	36.88	23.54	25.85	27.30	26.37	21.70	43.29	32.79	0.67	2.00

Source: Texas Instruments, Inc.
Annual Reports
DATAQUEST

Texas Instruments, Inc.

Table 5

Texas Instruments
FUNDS FLOW HISTORY 1976-1982
(Percent)

		Fiscal Year Ending December 31								
		1976	1977	1978	1979	1980	1981	1982	TREND	CMPD GR
SOURCES										
56	*NET PROFIT*	97.42	116.64	140.28	172.89	212.20	108.50	144.00	6.98	5.28
46	*DEPRECIATION*	87.29	108.06	131.00	187.24	257.00	333.00	338.50	47.48	28.36
61	*NEW LONG TERM DEBT*	0.00	1.92	1.49	0.25	194.54	1.30	3.10	7.18	1103.49
62	*NEW EQUITY*	0.50	(2.15)	(1.21)	0.90	41.96	31.97	5.52	4.52	*********
63	*INCR OTHER LIABILITIES*	4.02	3.35	28.38	12.80	10.73	7.80	24.00	1.83	24.25
66	*TOTAL SOURCES*	189.23	227.82	299.94	374.08	716.43	482.57	$15.12	67.99	21.17
USES										
67	*P P & EXPENDITURES*	136.45	199.28	309.56	427.06	541.93	341.10	329.30	39.09	16.51
68	*REPAYMENT LONG TERM DEBT*	9.36	9.21	10.42	12.09	1.75	0.40	1.30	(1.80)	(39.29)
69	*PREFERRED DIVIDENDS*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
70	*COMMON DIVIDENDS*	22.93	30.15	38.29	45.60	46.04	46.97	47.22	4.08	12.26
72	*INCR WORKING CAPITAL*	4.04	(15.22)	(42.33)	(113.88)	125.76	105.10	135.60	28.69	*********
71	*INCR OTHER ASSETS*	16.45	4.40	(40.12)	6.63	4.43	(8.90)	0.10	(1.11)	*********
74	*TOTAL USES*	189.23	227.82	275.82	377.50	719.92	484.67	$13.52	68.95	21.55
75	*EXCESS/DEFICIT*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
76	*CUMULATIVE SUR/DEF*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: Texas Instruments, Inc.
Annual Reports
DATAQUEST

Texas Instruments, Inc.

Table 6

Texas Instruments
FINANCIAL RATIO HISTORY 1975-1982

	Fiscal Year Ending December 31									
	1975	1976	1977	1978	1979	1980	1981	1982	ST AV	WTD AVG
LIQUIDITY										
1 *CURRENT RATIO*	2.195	1.872	1.747	1.498	1.228	1.338	1.565	1.593	1.629	1.529
2 *QUICK RATIO*	1.697	1.377	1.267	0.915	0.753	0.792	0.968	1.107	1.110	1.002
3 *CASH RATIO*	0.883	0.702	0.551	0.189	0.132	0.144	0.196	0.438	0.404	0.308
4 *WORKING CAPITAL/SALES*	0.264	0.220	0.170	0.119	0.082	0.080	0.103	0.131	0.144	0.118
6 *DAYS RECEIVABLES*	65.597	62.113	59.598	63.510	62.036	56.416	51.253	54.135	59.332	57.311
7 *DAYS INVENTORY*	82.753	72.524	64.280	71.857	64.260	67.578	52.322	49.471	63.131	60.468
LEVERAGE										
8 *LONG TERM DEBT/CAPITALIZ*	0.075	0.055	0.038	0.023	0.018	0.154	0.144	0.136	0.080	0.097
11 *LONG TERM DEBT/EQUITY*	0.081	0.058	0.040	0.023	0.018	0.182	0.168	0.157	0.091	0.112
12 *TOTAL DEBT/EQUITY*	0.161	0.142	0.106	0.094	0.208	0.328	0.195	0.194	0.178	0.196
COVERAGE										
13 *EBIT/INTEREST*	11.713	22.432	23.978	31.752	16.816	9.555	5.237	7.436	16.115	13.697
14 *FIXED CHARGE COVERAGE*	3.834	5.510	5.420	5.674	4.974	3.904	2.321	2.464	4.263	3.835
16 *REPAY LTD+FIX CHARGE COV*	*********	4.469	4.543	4.772	4.304	3.852	2.314	2.442	3.814	3.404
OPER PERFORMANCE										
17 *GROSS PROFIT/SALES*	0.392	0.400	0.405	0.401	0.401	0.413	0.383	0.386	0.398	0.396
18 *OPER PROFIT/SALES*	0.173	0.169	0.175	0.169	0.175	0.187	0.161	0.159	0.171	0.170
21 *PRETAX PROFIT/SALES*	0.085	0.107	0.103	0.101	0.096	0.093	0.042	0.049	0.084	0.076
22 *NET PROFIT/SALES*	0.045	0.059	0.057	0.055	0.054	0.052	0.026	0.033	0.048	0.044
23 *NET PROFIT/AVG EQUITY*	*********	0.156	0.166	0.179	0.195	0.200	0.089	0.110	0.157	0.147
24 *NET PROFIT/AVG CAPITALIZ*	*********	0.146	0.158	0.174	0.191	0.181	0.076	0.095	0.146	0.135
26 *NET PROFIT/AVG TOT ASSETS*	*********	0.094	0.098	0.102	0.102	0.098	0.046	0.058	0.085	0.078
27 *E P S GROWTH RATE*	*********	0.567	0.202	0.205	0.232	0.216	(0.499)	0.320	0.178	0.101
28 *SALES GROWTH RATE*	*********	0.213	0.234	0.246	0.264	0.264	0.032	0.029	0.183	0.150
TURNOVER										
31 *SALES/AVG EQUITY*	*********	2.663	2.913	3.257	3.635	3.849	3.469	3.302	3.298	3.428
32 *SALES/AVG CAPITALIZ*	*********	2.492	2.779	3.158	3.561	3.473	2.954	2.840	3.037	3.098
33 *SALES/AVG TOT DEBT + EQTY*	*********	2.315	2.595	2.962	3.146	3.020	2.756	2.765	2.794	2.856
34 *SALES/AVG TOTAL ASSETS*	*********	1.603	1.718	1.855	1.895	1.896	1.781	1.751	1.784	1.805
35 *SALES/AVG OPER ASSETS*	*********	1.657	1.783	1.891	1.906	1.899	1.790	1.757	1.812	1.823
36 *SALES/AVG GROSS P P E*	*********	2.896	3.100	3.108	2.928	2.718	2.297	2.151	2.743	2.591
BALANCE SHEET										
37 *CASH/SALES*	0.195	0.177	0.126	0.045	0.036	0.034	0.036	0.097	0.093	0.070
38 *RECEIVABLES/SALES*	0.180	0.170	0.163	0.174	0.170	0.155	0.140	0.148	0.163	0.157
41 *INVENTORY/SALES*	0.104	0.119	0.105	0.118	0.106	0.109	0.086	0.093	0.104	0.100
42 *OTH CURR ASSETS/SALES*	0.005	0.006	0.005	0.022	0.024	0.021	0.020	0.024	0.015	0.020
44 *GROSS P P E/SALES*	0.394	0.366	0.349	0.364	0.396	0.423	0.461	0.482	0.404	0.423
46 *MISC ASSETS/SALES*	0.018	0.025	0.023	0.002	0.004	0.004	0.002	0.002	0.010	0.006
47 *ACCOUNTS PAYABLE/SALES*	0.126	0.128	0.141	0.177	0.166	0.155	0.146	0.181	0.153	0.160
48 *ACCRUED TAXES/SALES*	0.043	0.068	0.042	0.019	0.031	0.023	0.016	0.016	0.032	0.025
51 *ACCRUED LIABILITY/SALES*	0.013	0.018	0.017	0.016	0.016	0.016	0.009	0.010	0.015	0.014
52 *LINE 21/SALES*	0.004	0.005	0.005	0.004	0.004	0.003	0.003	0.003	0.004	0.003
53 *DEFERRED TAXES/SALES*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
54 *MISC LIABILITIES/SALES*	0.005	0.007	0.007	0.007	0.005	0.003	0.002	0.002	0.005	0.004
56 *LINE 26/SALES*	0.000	0.000	0.000	0.010	0.012	0.013	0.015	0.021	0.009	0.013
MISCELLANEOUS										
57 *EQUITY PER COMMON SHARE*	25.536	28.791	32.599	36.030	41.795	50.584	53.660	57.639	40.829	46.507
58 *RETIRE/PREV GROSS P P E*	*********	(0.128)	(0.152)	(0.135)	(0.085)	(0.074)	(0.073)	(0.095)	(0.106)	(0.095)
61 *DEPREC/PREV GROSS P P E*	*********	0.162	0.178	0.184	0.202	0.201	0.193	0.175	0.185	0.188
62 *COM DIVS/ERN-PFD DIVS*	0.369	0.235	0.259	0.273	0.264	0.217	0.433	0.328	0.297	0.305
63 *TAX RATE*	0.464	0.453	0.447	0.455	0.440	0.440	0.380	0.324	0.425	0.406
64 *COST OF GOODS/SALES*	0.608	0.600	0.595	0.599	0.599	0.587	0.617	0.614	0.602	0.604
65 *S G & A/SALES*	0.166	0.160	0.159	0.165	0.160	0.156	0.160	0.162	0.161	0.160

Source: Texas Instruments, Inc.
Annual Reports
DATAQUEST

Texas Instruments, Inc.

Texas Instruments, Inc.
13500 N. Central Expressway
P.O. Box 225474
Dallas, Texas 75265
Telephone: (214) 995-2011
(Millions of Dollars Except per Share Data)

Balance Sheet (December 31)

	1977	1978	1979	1980	1981
Working Capital	$ 348	$ 304	$ 201	$ 328	$ 432
Long-Term Debt	$ 30	$ 19	$ 18	$ 212	$ 212
Shareholders' Equity	$ 745	$ 821	$ 953	$1,165	$1,260
After-Tax Return on Average Equity (%)	16.6	18.2	9.5	2.0	8.9

Operating Performance (Fiscal Year Ending December 31)

	1977	1978	1979	1980	1981
Revenue	$2,047	$2,450	$3,224	$4,075	$4,206
U.S. Revenue	$1,431	$1,753	$2,168	$2,677	$2,866
Non-U.S. Revenue	$ 616	$ 797	$1,056	$1,398	$1,340
Cost of Revenues	$1,413	$1,762	$2,265	$2,871	$3,060
R&D Expenditures	$ 96	$ 111	$ 134	$ 189	$ 219
Marketing, SG&A Expense	$ 326	$ 420	$ 516	$ 637	$ 674
Pretax Income	$ 211	$ 257	$ 308	$ 379	$ 175
Pretax Margin (%)	10.3	10.5	9.6	9.3	4.2
Effective Tax Rate (%)	44.5	45.5	43.9	44.1	37.7
Net Income	$ 117	$ 140	$ 173	$ 212	$ 109
Average Shares Outstanding (Millions)	22.84	22.79	22.80	23.02	23.48
Per Share Data					
Earnings	$ 5.11	$ 6.15	$ 7.58	$ 9.22	$ 4.62
Dividends	$ 1.41	$ 1.76	$ 2.00	$ 2.00	$ 2.00
Book Value	$ 32.60	$ 36.03	$ 41.79	$ 50.58	$ 53.67
Price Range	$93 1/8-129 3/4	$61 3/8-92 1/2	$ 78-101	$ 78 5/8-150 3/4	$ 75-126 1/4
Total Employees	68,521	78,571	85,779	89,875	83,714
Capital Expenditures	$199.3	$309.6	$427.1	$542.2	$341.4

Source: Texas Instruments Annual Reports
DATAQUEST, Inc.

Texas Instruments, Inc.

Table 1

Texas Instruments, Inc.
ESTIMATED REVENUES BY OPERATING GROUP
(Millions of Dollars)

	1977	1978	1979	1980	1981
Semiconductor Groups	$ 772	$ 945	$1,242	$1,580	$1,295
Consumer Products Group	340	370	365	405	405
Digital Systems Group	219	365	522	647	726
Equipment Group	393	473	572	771	898
Materials & Electrical Products Group	334	403	493	527	437
Services Group	175	223	267	432	649
Intracompany Sales	(187)	(229)	(237)	(287)	(204)
Total Revenues	$2,046	$2,550	$3,224	$4,075	$4,206

Source: Texas Instruments Annual Reports
DATAQUEST, Inc.

Texas Instruments, Inc.

Table 2

Texas Instruments Inc.
ESTIMATED SEMICONDUCTOR REVENUES
(Millions of Dollars)

	1974	1975	1976	1977	1978	1979	1980	1981
TOTAL SEMICONDUCTOR	634	520	655	741	921	1212	1580	1295
Total Integrated Circuit	374	300	421	514	679	952	1305	1075
Bipolar Digital	234	145	215	242	306	422	598	510
TTL	202	120	187	223	286	400	575	495
DTL	13	15	15	10	9	7	5	2
ECL	12	10	5	5	8	10	5	0
Other	7	0	8	4	3	5	13	13
Bipolar Digital (Recap)					306	422	598	510
Memory					9	14	55	50
Logic					297	408	543	460
MOS	88	100	135	180	238	360	502	350
NMOS						242	374	240
PMOS						110	120	100
CMOS						8	8	10
MOS (Recap)						360	502	350
Memory						240	330	195
Microprocessor						80	95	85
Logic						40	77	70
Linear	52	55	71	92	135	170	205	215
Total Discrete	218	177	174	170	176	184	191	150
Transistor	154	136	127	124	129	134	138	115
Small Signal	85	79	65	62	63	64	65	52
Power Transistor	69	57	62	62	66	70	73	63
Diode	50	30	32	31	34	37	39	25
Small Signal	37	19	20	19	20	22	22	13
Power	10	7	8	8	10	11	13	10
Zener	3	4	4	4	4	4	4	2
Thyristor	7	4	8	8	7	7	8	6
Other	7	7	7	7	6	6	6	4
Total Optoelectronic	42	43	60	57	66	76	84	70
LED Lamps	3	4	6	6	8	10	12	9
LED Displays	28	24	30	28	32	37	40	34
Optical Couplers	3	3	4	4	6	8	10	9
Other	8	12	20	19	20	21	22	18

Source: Texas Instruments, Inc., Annual Reports
DATAQUEST, Inc.

Texas Instruments, Inc.

Table 3

Texas Instruments, Inc.
FINANCIAL STATEMENT HISTORY 1974-1981
(Millions of Dollars)

		Fiscal Year Ending Dec 31									
		1974	1975	1976	1977	1978	1979	1980	1981	TREND	CMPD GR
BALANCE SHEET											
1	*CASH & LIQUID SECURITIES*	154.76	266.58	293.75	257.13	115.37	116.64	139.80	150.00	(15.96)	(0.02)
3	*RECEIVABLES*	293.91	245.79	282.25	334.15	443.67	547.98	629.80	590.60	58.38	15.17
4	*INVENTORY*	198.16	142.88	197.65	214.28	300.50	340.25	442.70	372.00	38.45	15.40
5	*OTHER CURRENT ASSETS*	9.07	7.32	9.52	9.34	55.95	78.27	87.00	84.30	14.02	53.67
7	*EXCESS FUNDS*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	*TOTAL CURRENT ASSETS*	655.95	662.56	783.17	814.90	915.50	1083.14	1299.30	1196.90	94.89	10.87
9	*GROSS P P E*	515.31	538.95	606.38	713.79	927.01	1275.61	1723.00	1939.00	215.56	23.28
10	*ACCUMULATED DEPRECIATION*	234.86	285.24	303.51	319.69	354.36	463.14	625.60	833.50	76.26	18.37
11	*NET P P E*	280.45	253.71	302.87	394.09	572.65	812.47	1097.40	1105.50	139.30	27.27
12	*MISC ASSETS*	28.86	25.20	41.66	46.05	5.93	12.57	17.00	8.10	(3.73)	(17.84)
15	*TOTAL ASSETS*	965.25	941.48	1127.70	1255.04	1494.08	1908.17	2413.70	2310.50	230.46	16.14
16	*LOANS PAYABLE OVERSEAS*	74.03	37.31	46.10	38.76	45.83	179.90	170.40	32.40	9.29	7.47
17	*ACCTS PYBLE & ACCRD EXPS*	151.66	172.62	211.67	287.91	451.96	536.71	630.40	614.30	79.36	26.15
18	*ACCRUED TAXES*	83.47	58.52	113.42	85.79	49.71	100.27	92.10	67.00	(0.27)	(0.22)
19	*ACCRUED RETIRE BENES*	25.40	18.46	30.47	34.11	40.18	52.92	66.50	38.00	4.78	14.06
20	*CURR MAT LONG TERM DEBT*	1.37	9.20	9.21	10.42	12.09	1.75	0.40	1.30	(0.78)	(21.99)
21	*DIVIDENDS PAYABLE*	5.72	5.73	7.54	8.58	11.39	11.41	11.60	11.80	1.02	12.66
22	*TOTAL CURR LIABILITIES*	341.64	301.84	418.42	466.57	611.17	882.36	971.40	764.80	93.41	18.13
23	*LONG TERM DEBT*	72.75	47.53	38.17	29.67	19.07	17.56	211.70	211.70	20.49	15.60
24	*DEFERRED TAXES*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	*MISC LIABILITIES*	9.48	6.82	10.84	14.18	16.58	17.11	12.70	9.10	0.57	5.32
26	*DEFERD CREDITS & OTH LIAB*	0.00	0.00	0.00	0.00	25.99	38.26	53.40	64.80	10.25	*********
27	*DEFICIT FUNDS*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	*TOTAL LIABILITIES*	423.88	356.19	467.42	510.43	672.81	955.29	1249.20	1050.40	124.72	19.62
29	*PREFERRED STOCK*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	*COMMON STOCK*	22.94	23.02	23.03	23.03	23.04	23.06	23.40	23.70	0.09	0.37
31	*CAPITAL SURPLUS*	99.49	104.12	106.42	106.32	106.91	107.81	149.50	181.20	9.57	7.47
32	*RETAINED EARNINGS*	418.94	458.15	530.82	615.26	715.44	842.71	1008.80	1070.90	99.39	15.42
33	*TREASURY STOCK*	0.00	0.00	0.00	0.00	(24.12)	(20.70)	(17.20)	(15.10)	(3.31)	*********
34	*TOTAL EQUITY*	541.37	585.29	660.28	744.62	821.27	952.88	1164.50	1260.10	105.73	13.39
35	*TOTAL LIAB & EQUITY*	965.25	941.48	1127.70	1255.04	1494.08	1908.17	2413.70	2310.50	230.46	16.14
36	*NET WORKING CAPITAL*	314.30	360.72	364.75	348.33	304.33	200.78	327.90	432.10	1.48	(0.21)
INCOME & EXPENSE											
38	*SALES*	1572.49	1367.62	1658.61	2046.46	2549.85	3224.13	4074.70	4206.00	442.50	18.93
40	*COST OF GOODS*	943.54	831.06	994.72	1216.72	1526.40	1932.64	2391.10	2595.10	267.67	18.96
41	*GROSS PROFIT*	628.94	536.56	663.89	829.73	1023.45	1291.49	1683.60	1610.90	174.83	16.85
42	*S G & A EXPENSE*	232.69	227.52	265.89	325.98	419.80	515.85	636.70	674.10	71.18	19.31
43	*EMPLOYEE PROFIT SHAR*	41.76	21.18	44.67	50.15	61.40	76.73	96.50	40.30	5.64	11.52
44	*INT FNDED R&D EXPS*	63.98	50.71	72.24	96.16	111.05	134.34	188.50	219.40	23.55	22.72
45	*OPERATING PROFIT*	290.52	237.16	281.10	357.44	431.21	564.76	761.90	677.10	74.46	16.19
46	*DEPRECIATION*	87.26	92.27	87.29	108.06	131.00	187.24	257.00	333.00	34.13	22.40
47	*LEASE PAYMENTS*	33.88	30.09	31.18	38.54	46.70	56.17	86.20	91.20	9.18	18.50
48	*INTEREST EXPENSE*	10.74	10.82	8.31	9.18	8.37	19.52	44.30	41.30	4.93	25.30
49	*MISC EXPENSE*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36.60	3.05	659.08
51	*MISC INCOME*	4.16	11.97	23.78	9.26	12.25	8.91	4.60	0.00	(1.28)	(85.55)
53	*PRETAX PROFIT*	162.80	115.94	178.10	210.92	257.39	308.73	379.00	175.00	21.89	10.36
54	*INCOME TAXES*	73.18	53.80	80.68	94.28	117.11	135.84	166.80	66.50	6.41	8.39
56	*NET PROFIT*	89.62	62.14	97.42	116.64	140.28	172.89	212.20	108.50	13.48	11.92
57	*EPS AFTER PFD DIVIDENDS*	3.92	2.71	4.25	5.11	6.15	7.58	9.22	4.62	0.58	11.56
58	*COMMON DIV PER SHARE*	0.92	1.00	1.00	1.32	1.68	2.00	2.00	2.00	0.19	14.29

Source: Texas Instruments Annual Reports & Form 10-K
DATAQUEST, Inc.

Texas Instruments, Inc.

Table 4

Texas Instruments, Inc.
FINANCIAL STATEMENT HISTORY 1974-1981
(Percent)

		Fiscal Year Ending Dec 31									
		1974	1975	1976	1977	1978	1979	1980	1981	TREND	CMPD GR
	BALANCE SHEET										
1	CASH & LIQUID SECURITIES	16.04	28.31	26.05	20.49	7.72	6.11	5.79	6.49	(3.00)	(20.80)
3	RECEIVABLES	30.45	26.11	25.03	26.62	29.70	28.72	26.09	25.56	(0.24)	(0.84)
4	INVENTORY	20.53	15.18	17.53	17.07	20.11	17.83	18.34	16.10	(0.13)	(0.64)
5	OTHER CURRENT ASSETS	0.94	0.78	0.84	0.74	3.74	4.10	3.60	3.65	0.55	32.32
7	EXCESS FUNDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	TOTAL CURRENT ASSETS	67.96	70.38	69.45	64.93	61.27	56.76	53.83	51.80	(2.83)	(4.54)
9	GROSS P P E	53.39	57.24	53.77	56.87	62.05	66.85	71.38	63.92	3.91	6.15
10	ACCUMULATED DEPRECIATION	24.33	30.30	26.91	25.47	23.72	24.27	25.92	36.07	0.60	1.92
11	NET P P E	29.05	26.95	26.86	31.40	38.33	42.58	45.47	47.85	3.31	9.59
12	MISC ASSETS	2.99	2.68	3.69	3.67	0.40	0.66	0.70	0.35	(0.48)	(29.26)
15	*TOTAL ASSETS*	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	0.00
16	LOANS PAYABLE OVERSEAS	7.67	3.96	4.09	3.09	3.07	9.40	7.06	1.40	(0.15)	(7.47)
17	ACCTS PYBLE & ACCRD EXPS	15.71	18.34	18.77	22.94	30.25	28.13	26.12	26.59	1.79	9.61
18	ACCRUED TAXES	8.65	6.22	10.06	6.84	3.33	5.25	3.82	2.90	(0.84)	(14.09)
19	ACCRUED RETIRE BENES	2.63	1.96	2.70	2.72	2.69	2.77	2.76	1.64	(0.03)	(1.79)
20	CURR MAT LONG TERM DEBT	0.14	0.98	0.82	0.83	0.81	0.09	0.02	0.06	(0.09)	(32.83)
21	DIVIDENDS PAYABLE	0.59	0.61	0.67	0.76	0.76	0.60	0.48	0.51	(0.02)	(3.00)
22	TOTAL CURR LIABILITIES	35.39	32.06	37.10	37.18	40.91	46.24	40.25	33.10	0.67	1.71
23	LONG TERM DEBT	7.54	5.05	3.38	2.36	1.28	0.92	8.77	9.16	0.26	(0.47)
24	DEFERRED TAXES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	MISC LIABILITIES	0.98	0.72	0.96	1.13	1.11	0.90	0.53	0.39	(0.06)	(9.32)
26	DEFERD CREDITS & OTR LIAB	0.00	0.00	0.00	0.00	1.74	2.01	2.21	2.80	0.46	6006.43
27	DEFICIT FUNDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	TOTAL LIABILITIES	43.91	37.83	41.45	40.67	45.03	50.06	51.75	45.46	1.32	2.99
29	PREFERRED STOCK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	COMMON STOCK	2.38	2.44	2.04	1.84	1.54	1.21	0.97	1.03	(0.23)	(13.58)
31	CAPITAL SURPLUS	10.31	11.06	9.44	8.47	7.16	5.65	6.19	7.84	(0.65)	(7.47)
32	RETAINED EARNINGS	43.40	48.66	47.07	49.02	47.88	44.16	41.79	46.32	(0.28)	(0.62)
33	TREASURY STOCK	0.00	0.00	0.00	0.00	(1.61)	(1.08)	(0.71)	(0.65)	(0.15)	*********
34	TOTAL EQUITY	56.09	62.17	58.55	59.33	54.97	49.94	48.25	54.54	(1.32)	(2.37)
35	*TOTAL LIAB & EQUITY*	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	0.00
36	NET WORKING CAPITAL	32.56	38.31	32.34	27.75	20.37	10.52	13.58	18.70	(3.49)	(14.08)
	INCOME & EXPENSE										
38	SALES	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	0.00
40	COST OF GOODS	60.00	60.77	59.97	59.46	59.86	59.94	58.68	61.70	0.02	0.03
41	GROSS PROFIT	40.00	39.23	40.03	40.54	40.14	40.06	41.32	38.30	(0.02)	(0.06)
42	S G & A EXPENSE	14.80	16.64	16.03	15.93	16.46	15.99	15.63	16.03	0.05	0.32
43	EMPLOYEE PROFIT SHAR	2.66	1.55	2.69	2.45	2.41	2.38	2.37	0.96	(0.10)	(6.23)
44	INT FNDED R&D EXPS	4.07	3.71	4.36	4.70	4.36	4.17	4.63	5.22	0.14	3.19
45	OPERATING PROFIT	18.48	17.34	16.95	17.47	16.91	17.52	18.70	16.10	(0.10)	(0.62)
46	DEPRECIATION	5.55	6.75	5.26	5.28	5.14	5.81	6.31	7.92	0.19	2.92
47	LEASE PAYMENTS	2.15	2.20	1.88	1.86	1.83	1.80	2.12	2.17	(0.01)	(0.36)
48	INTEREST EXPENSE	0.68	0.79	0.50	0.45	0.33	0.61	1.09	0.98	0.04	5.36
49	MISC EXPENSE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.87	0.07	455.86
51	MISC INCOME	0.26	0.88	1.43	0.45	0.48	0.28	0.11	0.00	(0.11)	(83.41)
53	PRETAX PROFIT	10.35	8.48	10.74	10.31	10.09	9.58	9.30	4.16	(0.51)	(7.21)
54	INCOME TAXES	4.65	3.93	4.86	4.61	4.59	4.21	4.09	1.58	(0.27)	(8.86)
56	NET PROFIT	5.70	4.54	5.87	5.70	5.50	5.36	5.21	2.58	(0.24)	(5.98)
57	EPS AFTER PFD DIVIDENDS	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	0.00
58	COMMON DIV PER SHARE	23.46	36.88	23.54	25.85	27.30	26.37	21.70	43.29	0.87	2.45

Source: Texas Instruments Annual Reports & Form 10-K
DATAQUEST, Inc.

Texas Instruments, Inc.

Table 5

Texas Instruments, Inc.
FUNDS FLOW HISTORY 1975-1981
(Millions of Dollars)

		Fiscal Year Ending Dec 31								
		1975	1976	1977	1978	1979	1980	1981	TREND	CMPD GR
SOURCES										
56	*NET PROFIT*	62.14	97.42	116.64	140.20	172.89	212.20	108.50	15.17	13.81
46	*DEPRECIATION*	92.27	87.29	108.06	131.00	167.24	257.00	333.00	40.74	26.40
61	*NEW LONG TERM DEBT*	0.00	0.00	1.92	1.49	0.25	194.54	1.30	13.98	5537.97
62	*NEW EQUITY*	4.69	0.50	(2.15)	(1.21)	0.90	41.96	31.97	5.99	*********
63	*INCR OTHER LIABILITIES*	(2.67)	4.02	3.35	28.38	12.80	10.73	7.80	1.94	*********
66	*TOTAL SOURCES*	156.45	189.23	227.82	299.94	374.08	716.43	482.57	77.82	26.30
USES										
67	*P P E EXPENDITURES*	65.54	136.45	199.28	309.56	427.06	541.93	341.10	66.62	35.32
68	*REPAYMENT LONG TERM DEBT*	17.39	9.36	9.21	10.42	12.09	1.75	0.40	(2.26)	(40.19)
69	*PREFERRED DIVIDENDS*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
70	*COMMON DIVIDENDS*	22.92	22.93	30.15	38.29	45.60	46.04	46.97	4.78	15.19
72	*INCR WORKING CAPITAL*	54.25	4.04	(15.22)	(42.33)	(113.88)	125.76	105.10	10.62	*********
71	*INCR OTHER ASSETS*	(3.65)	16.45	4.40	(40.12)	6.63	4.43	(8.90)	(1.34)	*********
74	*TOTAL USES*	156.45	189.23	227.82	275.82	377.50	719.92	484.67	78.42	26.44
75	*EXCESS/DEFICIT*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
76	*CUMULATIVE SUR/DEF*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: Texas Instruments Annual Reports & Form 10-K
DATAQUEST, Inc.

Texas Instruments, Inc.

Table 6

Texas Instruments, Inc.
FINANCIAL RATIO HISTORY 1974-1981

		Fiscal Year Ending Dec 31									
		1974	1975	1976	1977	1978	1979	1980	1981	ST AV	WTD AVG
	LIQUIDITY										
1	CURRENT RATIO	1.920	2.195	1.872	1.747	1.498	1.228	1.338	1.565	1.670	1.546
2	QUICK RATIO	1.313	1.697	1.377	1.267	0.915	0.753	0.792	0.968	1.135	1.008
3	CASH RATIO	0.453	0.883	0.702	0.551	0.189	0.132	0.144	0.196	0.406	0.301
4	WORKING CAPITAL/SALES	0.200	0.264	0.220	0.170	0.119	0.062	0.080	0.103	0.152	0.123
6	DAYS RECEIVABLES	58.222	65.597	62.113	59.598	63.510	62.036	56.416	51.253	61.093	58.857
7	DAYS INVENTORY	76.665	62.753	72.524	64.280	71.857	64.260	67.578	52.922	66.530	64.259
	LEVERAGE										
8	LONG TERM DEBT/CAPITALIZ	0.118	0.075	0.055	0.038	0.023	0.018	0.154	0.144	0.078	0.084
11	LONG TERM DEBT/EQUITY	0.134	0.081	0.058	0.040	0.023	0.018	0.182	0.168	0.088	0.096
12	TOTAL DEBT/EQUITY	0.274	0.161	0.142	0.106	0.094	0.208	0.328	0.195	0.188	0.195
	COVERAGE										
13	EBIT/INTEREST	16.157	11.713	22.432	23.978	31.752	16.816	9.555	5.237	17.205	15.868
14	FIXED CHARGE COVERAGE	4.649	3.834	5.510	5.420	5.674	4.974	3.904	2.321	4.536	4.295
16	REPAY LTD+FIX CHARGE COV	*********	3.710	4.469	4.543	4.772	4.304	3.852	2.314	3.995	3.793
	OPER PERFORMANCE										
17	GROSS PROFIT/SALES	0.400	0.392	0.400	0.405	0.401	0.401	0.413	0.383	0.400	0.399
18	OPER PROFIT/SALES	0.185	0.173	0.169	0.175	0.169	0.175	0.187	0.161	0.174	0.173
21	PRETAX PROFIT/SALES	0.104	0.085	0.107	0.103	0.101	0.096	0.093	0.042	0.091	0.085
22	NET PROFIT/SALES	0.057	0.045	0.059	0.057	0.055	0.054	0.052	0.026	0.051	0.048
23	NET PROFIT/AVG EQUITY	*********	0.110	0.156	0.166	0.179	0.195	0.200	0.089	0.157	0.159
24	NET PROFIT/AVG CAPITALIZ	*********	0.100	0.146	0.158	0.174	0.191	0.181	0.076	0.147	0.148
26	NET PROFIT/AVG TOT ASSETS	*********	0.065	0.094	0.098	0.102	0.102	0.098	0.046	0.086	0.085
27	E P S GROWTH RATE	*********	(0.309)	0.567	0.202	0.205	0.232	0.216	(0.499)	0.088	0.043
28	SALES GROWTH RATE	*********	(0.130)	0.213	0.234	0.246	0.264	0.264	0.032	0.160	0.183
	TURNOVER										
31	SALES/AVG EQUITY	*********	2.428	2.663	2.913	3.257	3.535	3.849	3.469	3.173	3.395
32	SALES/AVG CAPITALIZ	*********	2.194	2.492	2.779	3.158	3.561	3.473	2.954	2.944	3.124
33	SALES/AVG TOT DEBT + EQTY	*********	1.998	2.315	2.595	2.962	3.146	3.020	2.756	2.683	2.836
34	SALES/AVG TOTAL ASSETS	*********	1.435	1.603	1.718	1.855	1.895	1.886	1.781	1.739	1.802
35	SALES/AVG OPER ASSETS	*********	1.476	1.657	1.783	1.891	1.906	1.899	1.790	1.772	1.827
36	SALES/AVG GROSS P P E	*********	2.594	2.896	3.100	3.108	2.928	2.718	2.297	2.806	2.755
	BALANCE SHEET										
37	CASH/SALES	0.098	0.195	0.177	0.126	0.045	0.036	0.034	0.036	0.093	0.069
38	RECEIVABLES/SALES	0.167	0.180	0.170	0.163	0.174	0.170	0.155	0.140	0.167	0.161
41	INVENTORY/SALES	0.126	0.104	0.119	0.105	0.116	0.106	0.109	0.088	0.109	0.106
42	OTH CURR ASSETS/SALES	0.006	0.005	0.006	0.005	0.022	0.024	0.021	0.020	0.014	0.017
44	GROSS P P E/SALES	0.328	0.394	0.366	0.349	0.364	0.396	0.423	0.461	0.385	0.401
46	MISC ASSETS/SALES	0.018	0.018	0.025	0.023	0.002	0.004	0.004	0.002	0.012	0.008
47	ACCOUNTS PAYABLE/SALES	0.096	0.126	0.128	0.141	0.177	0.166	0.155	0.146	0.142	0.151
48	ACCRUED TAXES/SALES	0.053	0.043	0.068	0.042	0.019	0.031	0.023	0.016	0.037	0.030
51	ACCRUED LIABILITY/SALES	0.016	0.013	0.018	0.017	0.016	0.016	0.016	0.009	0.015	0.015
52	LINE 21/SALES	0.004	0.004	0.005	0.005	0.004	0.004	0.003	0.003	0.004	0.004
53	DEFERRED TAXES/SALES	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
54	MISC LIABILITIES/SALES	0.006	0.005	0.007	0.007	0.007	0.005	0.003	0.002	0.005	0.005
56	LINE 26/SALES	0.000	0.000	0.000	0.000	0.010	0.012	0.013	0.015	0.006	0.009
	MISCELLANEOUS										
57	EQUITY PER COMMON SHARE	23.688	25.536	28.791	32.599	36.030	41.795	50.584	53.660	36.585	41.828
58	RETIRE/PREV GROSS P P E	*********	(0.081)	(0.128)	(0.152)	(0.135)	(0.085)	(0.074)	(0.073)	(0.104)	(0.097)
61	DEPREC/PREV GROSS P P E	*********	0.179	0.162	0.178	0.184	0.202	0.201	0.193	0.186	0.191
62	CON DIVS/ERN-PFD DIVS	0.235	0.369	0.235	0.259	0.273	0.264	0.217	0.433	0.285	0.296
63	TAX RATE	0.450	0.464	0.453	0.447	0.455	0.440	0.440	0.380	0.441	0.432
64	COST OF GOODS/SALES	0.600	0.608	0.600	0.595	0.599	0.599	0.587	0.617	0.600	0.601
65	S G & A/SALES	0.148	0.166	0.160	0.159	0.165	0.160	0.156	0.160	0.159	0.160

Source: Texas Instruments Annual Reports & Form 10-K
DATAQUEST, Inc.

Texas Instruments, Inc.

Texas Instruments, Inc.
13500 North Central Expressway
P.O. Box 225474
Dallas, Texas 75265
(214) 995-2011
(Millions of Dollars Except Per Share Data)

Balance Sheet (December 31)

	1977	1978	1979	1980
Working Capital	$ 348.3	$ 304.3	$ 200.8	$ 327.9
Long-Term Debt	$ 29.7	$ 19.1	$ 17.6	$ 211.7
Shareholders' Equity	$ 744.6	$ 821.3	$ 952.9	$1,164.5
After-Tax Return on Average Equity (%)	16.6	18.2	19.5	20.0

Operating Performance (Fiscal Year Ending December 31)

	1977	1978	1979	1980
Revenue	$2,046.5	$2,549.9	$3,224.1	$4,074.7
U.S. Revenue*	$1,460.0	$1,800.0	$2,240.0	$2,780.0
Non-U.S. Revenue*	$ 586.5	$ 749.9	$ 986.1	$1,294.7
Cost of Revenues	$1,413.4	$1,761.6	$2,265.4	$2,870.5
R&D Expenditures	$ 96.2	$ 111.1	$ 134.3	$ 188.5
General Administrative & Marketing	$ 326.0	$ 419.8	$ 515.7	$ 636.7
Pretax Income	$ 210.9	$ 257.4	$ 308.7	$ 379.0
Pretax Margin (%)	10.3	10.1	9.6	9.3
Effective Tax Rate (%)	44.7	45.5	44.0	44.0
Net Income	$ 116.6	$ 140.3	$ 172.9	$ 212.2
Average Shares Outstanding (Millions)	22.84	22.79	22.80	23.02
Per Share Data				
Earnings	$ 5.11	$ 6.15	$ 7.58	$ 9.22
Dividends	$ 1.32	$ 1.68	$ 2.00	$ 2.00
Book Value	$ 32.60	$ 36.03	$ 41.79	$ 50.58
Price Range	$ 93 1/8-129 3/4	$ 61 3/8-92 1/2	$ 78 - 101	$ 78 5/8-150 3/4
Total Employees	68,521	78,571	85,779	89,875
Capital Expenditures	$ 199.3	$ 309.6	$ 427.1	$ 541.9

*DATAQUEST estimates

Source: Texas Instruments, Inc., Annual Reports
DATAQUEST, Inc.

Texas Instruments, Inc.

Table 1

Texas Instruments, Inc.
ESTIMATED REVENUES BY OPERATING GROUP
(Millions of Dollars)

	1976	1977	1978	1979	1980
Semiconductor Group	$ 679	$ 772	$ 945	$1,242	$1,580
Consumer Products Group	252	340	370	365	405
Digital Systems Group	144	219	365	522	647
Equipment Group	331	393	473	572	771
Materials & Electrical Products Group	284	334	403	493	527
Services Group	138	175	223	267	432
Intracompany Sales	(169)	(187)	(229)	(237)	(287)
Total Revenues	$1,659	$2,046	$2,550	$3,224	$4,075

Source: Texas Instruments, Inc., Annual Reports
DATAQUEST, Inc.

Texas Instruments, Inc.

Table 2

Texas Instruments, Inc.
ESTIMATED SEMICONDUCTOR REVENUES
(Millions of Dollars)

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
TOTAL SEMICONDUCTOR	313	414	604	634	520	655	741	921	1212	1585
Total Integrated Circuit	153	219	363	374	300	421	514	679	952	1305
Bipolar Digital	114	161	255	234	145	215	242	306	430	610
TTL	77	125	220	204	120	187	228	286	413	593
DTL	15	14	9	11	15	15	10	9	8	8
ECL	14	15	17	12	10	5	0	8	5	5
Other	8	7	9	7	0	8	4	3	4	4
Bipolar Digital										610
Memory										36
Logic										574
MOS	14	25	65	88	100	135	180	238	352	490
NMOS										362
PMOS										120
CMOS										8
MOS										490
Memory										305
Microprocessor										110
Logic										75
Linear	25	33	43	52	55	71	92	135	170	205
Total Discrete	152	183	213	218	177	174	170	176	184	190
Transistor			154	154	136	127	124	129	134	137
Small Signal			92	85	79	65	62	63	64	65
Power Transistor			62	69	57	62	62	66	70	72
Diode			47	50	30	32	31	34	37	40
Small Signal			36	37	19	20	19	20	22	24
Power			8	10	7	8	8	10	11	12
Zener			3	3	4	4	4	4	4	4
Thyristor			6	7	4	8	8	7	7	7
Other			6	7	7	7	7	6	6	6
Total Optoelectronic	8	12	28	42	43	60	57	66	76	90
LED Lamps	1	2	3	3	4	6	6	8	10	12
LED Displays	3	5	18	28	24	30	28	32	37	44
Optical Couplers	0	1	2	3	3	4	4	6	8	10
Other	4	4	5	8	12	20	19	20	21	24

Source: Texas Instruments, Inc., Annual Reports
DATAQUEST, Inc.

Texas Instruments, Inc.

Table 3

Texas Instruments, Inc.
FINANCIAL STATEMENT HISTORY 1973-1980
(Millions of Dollars)

		Fiscal Year Ending December 31									
		1973	1974	1975	1976	1977	1978	1979	1980	TREND	CMPD GR
BALANCE SHEET											
1	*CASH & LIQUID SECURITIES*	179.19	154.78	266.58	293.75	257.13	115.37	116.64	139.80	(11.39)	(6.67)
3	*RECEIVABLES*	228.58	293.91	245.79	282.25	334.15	443.67	547.98	629.80	56.24	15.56
4	*INVENTORY*	174.07	198.18	142.88	197.65	214.28	300.50	340.25	442.70	36.67	14.74
5	*OTHER CURRENT ASSETS*	8.25	9.07	7.32	9.52	9.34	55.95	78.27	87.00	12.42	48.74
7	*EXCESS FUNDS*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	*TOTAL CURRENT ASSETS*	590.09	655.95	662.56	783.17	814.90	915.50	1083.14	1299.30	93.94	11.37
9	*GROSS P P E*	403.48	515.31	538.95	606.38	713.79	827.01	1275.61	1723.00	170.35	21.68
10	*ACCUMULATED DEPRECIATION*	183.54	234.86	285.24	303.51	319.69	354.36	463.14	625.60	53.09	16.30
11	*NET P P E*	219.94	280.45	253.71	302.87	394.09	572.65	812.47	1097.40	117.27	25.79
12	*MISC ASSETS*	18.02	28.86	25.20	41.66	46.05	5.93	12.57	17.00	(1.69)	(9.95)
15	**TOTAL ASSETS**	828.05	965.25	941.48	1127.70	1255.04	1494.08	1908.17	2413.70	209.52	15.89
16	*LOANS PAYABLE OVERSEAS*	17.58	74.03	37.31	46.10	38.76	45.83	179.30	170.40	19.22	28.04
17	*ACCTS PYBLE & ACCRD EXPS*	165.44	151.66	172.62	211.67	287.91	451.96	536.71	630.40	72.55	25.20
18	*ACCRUED TAXES*	42.75	83.47	58.52	113.42	85.79	49.71	100.27	92.10	4.47	6.79
19	*ACCRUED RETIRE BENES*	36.16	25.40	18.46	30.47	34.11	40.18	52.92	66.50	4.99	13.16
20	*CURR MAT LONG TERM DEBT*	17.32	1.37	9.20	8.21	10.42	12.09	1.75	0.40	(1.27)	(25.03)
21	*DIVIDENDS PAYABLE*	3.87	5.72	5.73	7.54	9.58	11.39	11.41	11.60	1.21	17.35
22	*TOTAL CURR LIABILITIES*	283.12	341.64	301.84	418.42	466.57	611.17	882.36	971.40	101.16	20.41
23	*LONG TERM DEBT*	67.69	72.75	47.53	38.17	29.67	19.07	17.56	211.70	7.60	(2.49)
24	*DEFERRED TAXES*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	*MISC LIABILITIES*	7.90	9.48	6.82	10.84	14.18	18.58	17.11	12.70	1.24	11.59
26	*DEFERD CREDITS & OTH LIAB*	0.00	0.00	0.00	0.00	0.00	25.99	38.26	53.40	7.66	7767.63
27	*DEFICIT FUNDS*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	*TOTAL LIABILITIES*	358.71	423.86	356.19	467.42	510.43	672.81	955.29	1249.20	117.66	19.26
29	*PREFERRED STOCK*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	*COMMON STOCK*	22.85	22.94	23.02	23.03	23.03	23.04	23.06	23.40	0.05	0.23
31	*CAPITAL SURPLUS*	94.30	99.49	104.12	106.42	106.32	106.91	107.81	149.50	5.19	4.51
32	*RETAINED EARNINGS*	352.18	418.94	458.15	530.82	615.26	715.44	842.71	1008.80	90.14	15.83
33	*TREASURY STOCK*	0.00	0.00	0.00	0.00	0.00	(24.12)	(20.70)	(17.20)	(3.53)	*********
34	*TOTAL EQUITY*	469.34	541.37	585.29	660.28	744.62	821.27	952.88	1164.50	91.86	13.08
35	**TOTAL LIAB & EQUITY**	828.05	965.25	941.48	1127.70	1255.04	1494.08	1908.17	2413.70	209.52	15.89
36	*NET WORKING CAPITAL*	306.97	314.30	360.72	364.75	348.33	304.33	200.78	327.90	(7.22)	(2.74)
INCOME & EXPENSE											
38	*SALES*	1287.28	1572.48	1367.62	1658.61	2046.46	2549.85	3224.13	4074.70	377.44	17.76
40	*COST OF GOODS*	763.81	948.54	831.06	994.72	1216.72	1526.40	1932.64	2391.10	221.96	17.57
41	*GROSS PROFIT*	523.47	628.94	536.56	663.89	829.73	1023.45	1291.49	1683.60	155.48	18.05
42	*S G & A EXPENSE*	196.12	232.69	227.52	265.89	325.98	419.80	515.85	636.70	61.14	18.51
43	*EMPLOYEE PROFIT SHAR*	35.58	41.76	21.18	44.67	50.15	61.40	76.73	96.50	8.66	17.20
44	*INT FNDED R&D EXPS*	55.00	63.98	50.71	72.24	96.16	111.05	134.34	188.50	17.75	19.51
45	*OPERATING PROFIT*	236.76	290.52	237.16	281.10	357.44	431.21	564.76	761.90	67.92	17.49
46	*DEPRECIATION*	58.76	87.26	92.27	87.29	108.06	131.00	187.24	257.00	24.02	19.97
47	*LEASE PAYMENTS*	31.55	33.88	30.09	31.18	38.54	46.70	58.17	86.20	6.68	14.36
48	*INTEREST EXPENSE*	6.65	10.74	10.82	8.31	9.18	8.37	19.52	44.30	3.58	20.39
49	*MISC EXPENSE*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
51	*MISC INCOME*	6.75	4.16	11.97	23.78	9.26	12.25	8.91	4.60	(0.06)	0.30
53	*PRETAX PROFIT*	145.54	162.80	115.94	178.18	210.92	257.39	308.73	378.00	33.58	15.99
54	*INCOME TAXES*	62.31	73.18	53.80	80.68	94.28	117.11	135.84	166.80	14.86	16.01
56	*NET PROFIT*	83.24	89.62	62.14	97.42	116.64	140.28	172.89	212.20	18.72	15.99
57	*EPS AFTER PFD DIVIDENDS*	3.67	3.92	2.71	4.25	5.11	6.15	7.58	9.22	0.81	15.89
58	*COMMON DIV PER SHARE*	0.55	0.92	1.00	1.00	1.32	1.60	2.00	2.00	0.21	19.11

Note: R&D expenditures listed here are for internally funded R&D only. Texas Instruments also performs a considerable amount of R&D funded by government and other outside agencies.

Source: Texas Instruments Annual Reports & Form 10-K
DATAQUEST, Inc.

Table 4

Texas Instruments, Inc.
FINANCIAL STATEMENT HISTORY 1973-1980
(Percent)

		Fiscal Year Ending December 31									
		1973	1974	1975	1976	1977	1978	1979	1980	TREND	CMPD GR
BALANCE SHEET											
1	CASH & LIQUID SECURITIES	21.64	16.04	28.31	26.05	20.49	7.72	6.11	5.79	(2.71)	(19.47)
3	RECEIVABLES	27.61	30.45	26.11	25.03	26.62	29.70	28.72	26.09	(0.08)	(0.28)
4	INVENTORY	21.02	20.53	15.18	17.53	17.07	20.11	17.83	18.34	(0.21)	(1.00)
5	OTHER CURRENT ASSETS	1.00	0.94	0.78	0.84	0.74	3.74	4.10	3.60	0.51	28.34
7	EXCESS FUNDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	TOTAL CURRENT ASSETS	71.26	67.96	70.38	69.45	64.93	61.27	56.76	53.83	(2.50)	(3.91)
9	GROSS P P E	48.73	53.39	57.24	53.77	56.87	62.05	66.85	71.36	2.90	5.00
10	ACCUMULATED DEPRECIATION	22.16	24.33	30.30	26.91	25.47	23.72	24.27	25.92	0.06	0.35
11	NET P P E	26.56	29.05	26.95	26.86	31.40	38.33	42.58	45.47	2.84	8.54
12	MISC ASSETS	2.18	2.99	2.68	3.69	3.67	0.40	0.66	0.70	(0.34)	(22.30)
15	*TOTAL ASSETS*	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	0.00
16	LOANS PAYABLE OVERSEAS	2.12	7.67	3.96	4.09	3.09	3.07	9.40	7.06	0.47	10.48
17	ACCTS PYBLE & ACCRD EXPS	19.98	15.71	18.34	18.77	22.94	30.25	28.13	26.12	1.73	9.03
18	ACCRUED TAXES	5.16	8.65	6.22	10.06	6.84	3.33	5.25	3.82	(0.46)	(7.85)
19	ACCRUED RETIRE BENES	4.37	2.63	1.96	2.70	2.72	2.69	2.77	2.76	(0.10)	(2.36)
20	CURR MAT LONG TERM DEBT	2.09	0.14	0.98	0.62	0.83	0.81	0.09	0.02	(0.18)	(35.31)
21	DIVIDENDS PAYABLE	0.47	0.59	0.61	0.67	0.76	0.76	0.60	0.48	0.01	1.26
22	TOTAL CURR LIABILITIES	34.19	35.39	32.06	37.10	37.18	40.91	46.24	40.25	1.47	3.90
23	LONG TERM DEBT	8.17	7.54	5.05	3.38	2.36	1.28	0.92	0.77	(0.49)	(15.86)
24	DEFERRED TAXES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	MISC LIABILITIES	0.95	0.98	0.72	0.96	1.13	1.11	0.90	0.83	(0.02)	(3.71)
26	DEFERD CREDITS & OTH LIAB	0.00	0.00	0.00	0.00	0.00	1.74	2.01	2.21	0.37	4496.75
27	DEFICIT FUNDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	TOTAL LIABILITIES	43.32	43.91	37.83	41.45	40.67	45.03	50.06	51.75	1.32	2.90
29	PREFERRED STOCK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	COMMON STOCK	2.76	2.38	2.44	2.04	1.84	1.54	1.21	0.97	(0.25)	(13.51)
31	CAPITAL SURPLUS	11.39	10.31	11.06	9.44	8.47	7.16	5.65	6.19	(0.86)	(9.82)
32	RETAINED EARNINGS	42.53	43.40	48.66	47.07	49.02	47.88	44.16	41.79	(0.02)	(0.05)
33	TREASURY STOCK	0.00	0.00	0.00	0.00	0.00	(1.61)	(1.08)	(0.71)	(0.18)	**********
34	TOTAL EQUITY	56.68	56.09	62.17	58.55	59.33	54.97	49.94	48.25	(1.32)	(2.43)
35	*TOTAL LIAB & EQUITY*	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	0.00
36	NET WORKING CAPITAL	37.07	32.56	38.31	32.34	27.75	20.37	10.52	13.58	(3.96)	(16.08)
INCOME & EXPENSE											
38	SALES	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	0.00
40	COST OF GOODS	59.34	60.00	60.77	59.97	59.46	59.86	59.94	58.68	(0.10)	(0.16)
41	GROSS PROFIT	40.66	40.00	39.23	40.03	40.54	40.14	40.06	41.32	0.10	0.24
42	S G & A EXPENSE	15.24	14.80	16.64	16.03	15.93	16.46	15.99	15.63	0.10	0.63
43	EMPLOYEE PROFIT SHAR	2.76	2.66	1.55	2.69	2.45	2.41	2.38	2.37	(0.02)	(0.48)
44	INT FNDED R&D EXPS	4.27	4.07	3.71	4.36	4.70	4.36	4.17	4.63	0.06	1.48
45	OPERATING PROFIT	18.38	18.48	17.34	16.95	17.47	16.91	17.52	18.70	(0.04)	(0.23)
46	DEPRECIATION	4.64	5.85	6.75	5.26	5.28	5.14	5.81	6.91	0.10	1.87
47	LEASE PAYMENTS	2.45	2.15	2.20	1.88	1.88	1.83	1.80	2.12	(0.06)	(2.89)
48	INTEREST EXPENSE	0.52	0.68	0.79	0.50	0.45	0.33	0.61	1.09	0.03	2.23
49	MISC EXPENSE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
51	MISC INCOME	0.52	0.26	0.88	1.43	0.45	0.48	0.28	0.11	(0.06)	(14.83)
53	PRETAX PROFIT	11.31	10.35	8.48	10.74	10.31	10.09	9.58	9.30	(0.16)	(1.51)
54	INCOME TAXES	4.84	4.65	3.93	4.86	4.61	4.59	4.21	4.09	(0.07)	(1.49)
56	NET PROFIT	6.47	5.70	4.54	5.87	5.70	5.50	5.36	5.21	(0.09)	(1.51)
57	EPS AFTER PFD DIVIDENDS	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	0.00
58	COMMON DIV PER SHARE	15.13	23.46	36.88	23.54	25.85	27.30	26.37	21.70	0.41	2.78

Note: R&D expenditures listed here are for internally funded R&D only. Texas Instruments also performs a considerable amount of R&D funded by government and other outside agencies.

Source: Texas Instruments Annual Reports & Form 10-K
DATAQUEST, Inc.

Texas Instruments, Inc.

Table 5

Texas Instruments, Inc.
FUNDS FLOW HISTORY 1974-1980
(Millions of Dollars)

		Fiscal Year Ending December 31								
		1974	1975	1976	1977	1978	1979	1980	TREND	CMPD GR
SOURCES										
58	NET PROFIT	69.62	62.14	97.42	116.64	140.28	172.89	212.20	22.57	19.54
46	DEPRECIATION	87.26	82.27	87.29	108.06	131.00	167.24	257.00	26.53	19.82
61	NEW LONG TERM DEBT	6.43	0.00	0.00	1.92	1.49	0.25	194.54	20.22	1118.54
62	NEW EQUITY	3.44	4.69	0.50	(2.15)	(1.21)	0.90	41.96	3.78	*********
63	INCR OTHER LIABILITIES	1.58	(2.67)	4.02	3.35	28.38	12.80	10.73	2.95	*********
66	TOTAL SOURCES	188.33	156.45	189.23	227.82	299.94	374.08	716.43	76.08	24.84
USES										
67	P P E EXPENDITURES	147.77	65.54	136.45	199.28	309.56	427.06	541.93	74.24	35.31
60	REPAYMENT LONG TERM DEBT	17.32	17.39	9.36	9.21	10.42	12.09	1.75	(2.01)	(23.47)
69	PREFERRED DIVIDENDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
70	COMMON DIVIDENDS	21.03	22.92	22.93	30.15	38.29	45.60	46.04	4.85	16.35
72	INCR WORKING CAPITAL	(8.61)	54.25	4.04	(15.22)	(42.33)	(118.88)	125.76	0.73	*********
71	INCR OTHER ASSETS	10.84	(3.65)	16.45	4.40	(40.12)	6.63	4.43	(1.97)	*********
74	TOTAL USES	188.33	156.45	189.23	227.82	275.82	377.50	719.92	75.84	24.61
75	EXCESS/DEFICIT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
76	CUMULATIVE SUR/DEF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: Texas Instruments Annual Reports & Form 10-K
DATAQUEST, Inc.

Texas Instruments, Inc.

Table 6

Texas Instruments, Inc.
FINANCIAL RATIO HISTORY 1973-1980

		Fiscal Year Ending December 31									
		1973	1974	1975	1976	1977	1978	1979	1980	ST AV	WTD AVG
LIQUIDITY											
1	*CURRENT RATIO*	2.084	1.920	2.195	1.672	1.747	1.498	1.228	1.338	1.735	1.584
2	*QUICK RATIO*	1.440	1.313	1.697	1.377	1.267	0.915	0.753	0.792	1.194	1.058
3	*CASH RATIO*	0.533	0.453	0.883	0.702	0.551	0.189	0.132	0.144	0.461	0.360
4	*WORKING CAPITAL/SALES*	0.238	0.200	0.264	0.220	0.170	0.119	0.062	0.080	0.169	0.138
6	*DAYS RECEIVABLES*	64.814	68.222	65.597	62.113	58.598	63.510	62.036	56.416	62.788	61.420
7	*DAYS INVENTORY*	83.182	76.665	62.753	72.524	64.280	71.857	64.260	67.578	70.387	68.274
LEVERAGE											
8	*LONG TERM DEBT/CAPITALIZ*	0.126	0.118	0.075	0.055	0.038	0.023	0.018	0.154	0.076	0.069
11	*LONG TERM DEBT/EQUITY*	0.144	0.134	0.081	0.058	0.040	0.023	0.018	0.182	0.085	0.078
12	*TOTAL DEBT/EQUITY*	0.219	0.274	0.161	0.142	0.106	0.084	0.208	0.328	0.191	0.194
COVERAGE											
13	*EBIT/INTEREST*	22.873	16.157	11.713	22.432	23.978	31.752	16.816	9.555	19.410	19.017
14	*FIXED CHARGE COVERAGE*	4.810	4.648	3.834	5.510	5.420	5.674	4.874	3.904	4.847	4.857
16	*REPAY LTD+FIX CHARGE COV*	*********	3.349	3.710	4.469	4.543	4.772	4.304	3.852	4.143	4.250
OPER PERFORMANCE											
17	*GROSS PROFIT/SALES*	0.407	0.400	0.392	0.400	0.405	0.401	0.401	0.413	0.402	0.404
18	*OPER PROFIT/SALES*	0.184	0.185	0.173	0.169	0.175	0.169	0.175	0.187	0.177	0.177
21	*PRETAX PROFIT/SALES*	0.113	0.104	0.085	0.107	0.103	0.101	0.096	0.093	0.100	0.098
22	*NET PROFIT/SALES*	0.065	0.057	0.045	0.059	0.057	0.055	0.054	0.052	0.055	0.054
23	*NET PROFIT/AVG EQUITY*	*********	0.177	0.110	0.156	0.166	0.178	0.195	0.200	0.169	0.179
24	*NET PROFIT/AVG CAPITALIZ*	*********	0.156	0.100	0.146	0.156	0.174	0.191	0.181	0.158	0.168
26	*NET PROFIT/AVG TOT ASSETS*	*********	0.100	0.065	0.094	0.098	0.102	0.102	0.098	0.094	0.097
27	*E P S GROWTH RATE*	*********	0.069	(0.309)	0.567	0.202	0.205	0.232	0.216	0.169	0.210
28	*SALES GROWTH RATE*	*********	0.222	(0.130)	0.213	0.234	0.246	0.264	0.264	0.187	0.221
TURNOVER											
31	*SALES/AVG EQUITY*	*********	3.112	2.428	2.663	2.913	3.257	3.535	3.849	3.122	3.309
32	*SALES/AVG CAPITALIZ*	*********	2.732	2.194	2.492	2.779	3.158	3.561	3.473	2.913	3.114
33	*SALES/AVG TOT DEBT + EQTY*	*********	2.493	1.998	2.315	2.595	2.962	3.146	3.020	2.647	2.809
34	*SALES/AVG TOTAL ASSETS*	*********	1.754	1.435	1.603	1.718	1.855	1.895	1.866	1.735	1.791
35	*SALES/AVG OPER ASSETS*	*********	1.801	1.476	1.657	1.783	1.891	1.906	1.898	1.773	1.823
36	*SALES/AVG GROSS P P E*	*********	3.423	2.594	2.896	3.100	3.108	2.928	2.718	2.967	2.923
BALANCE SHEET											
37	*CASH/SALES*	0.139	0.098	0.195	0.177	0.126	0.045	0.036	0.034	0.106	0.085
38	*RECEIVABLES/SALES*	0.178	0.187	0.180	0.170	0.163	0.174	0.170	0.155	0.172	0.168
41	*INVENTORY/SALES*	0.135	0.126	0.104	0.119	0.105	0.118	0.106	0.109	0.115	0.112
42	*OTH CURR ASSETS/SALES*	0.006	0.006	0.005	0.006	0.005	0.022	0.024	0.021	0.012	0.015
44	*GROSS P P E/SALES*	0.313	0.328	0.394	0.366	0.349	0.364	0.396	0.423	0.366	0.380
46	*MISC ASSETS/SALES*	0.014	0.018	0.018	0.025	0.023	0.002	0.004	0.004	0.014	0.011
47	*ACCOUNTS PAYABLE/SALES*	0.129	0.096	0.126	0.128	0.141	0.177	0.166	0.155	0.140	0.149
48	*ACCRUED TAXES/SALES*	0.033	0.053	0.043	0.069	0.042	0.019	0.031	0.023	0.039	0.035
51	*ACCRUED LIABILITY/SALES*	0.028	0.016	0.013	0.018	0.017	0.016	0.016	0.016	0.018	0.017
52	*LINE 21/SALES*	0.003	0.004	0.004	0.005	0.005	0.004	0.004	0.003	0.004	0.004
53	*DEFERRED TAXES/SALES*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
54	*MISC LIABILITIES/SALES*	0.006	0.006	0.005	0.007	0.007	0.007	0.005	0.003	0.006	0.005
56	*LINE 26/SALES*	0.000	0.000	0.000	0.000	0.000	0.010	0.012	0.013	0.004	0.007
MISCELLANEOUS											
57	*EQUITY PER COMMON SHARE*	20.684	23.688	25.536	28.791	32.599	36.030	41.795	50.584	32.463	37.118
58	*RETIRE/PREV GROSS P P E*	*********	(0.089)	(0.081)	(0.128)	(0.152)	(0.135)	(0.085)	(0.074)	(0.106)	(0.105)
61	*DEPREC/PREV GROSS P P E*	*********	0.216	0.179	0.162	0.178	0.184	0.202	0.201	0.189	0.190
62	*CON DIVS/ERN-PFD DIVS*	0.151	0.235	0.369	0.235	0.259	0.273	0.264	0.217	0.250	0.255
63	*TAX RATE*	0.428	0.450	0.464	0.453	0.447	0.455	0.440	0.440	0.447	0.447
64	*COST OF GOODS/SALES*	0.593	0.600	0.608	0.600	0.595	0.599	0.599	0.587	0.598	0.596
65	*S G & A/SALES*	0.152	0.148	0.166	0.160	0.159	0.165	0.160	0.156	0.158	0.160

Source: Texas Instruments Annual Reports & Form 10-K
DATAQUEST, Inc.

8.12 Texas Instruments

Texas Instruments, Inc.
13500 N. Central Expressway
P.O. Box 225474
Dallas, Texas 75265

Balance Sheet (December 31)

	1978	1979	Percent Change 1978-79
Working Capital ($ Millions)	$ 304.3	$ 200.8	(34.0%)
Long Term Debt ($ Millions)	$ 19.1	$ 17.6	7.9%
Shareholders' Equity ($ Millions)	$ 821.3	$ 952.9	16.0%
After-Tax Return on Average Equity (%)	18.2%	19.5%	

Operating Performance (Fiscal Year Ending December 31)

	1978	1979	Percent Change 1978-79
Revenue ($ Millions)	$2,549.9	$3,224.1	26.4%
Cost of Revenues ($ Millions)	$1,526.4	$1,932.6	26.6%
R&D Expense ($ Millions)	$ 111.1	$ 134.3	20.9%
Marketing, SG&A Expense ($ Millions)	$ 419.8	$ 515.7	22.8%
Pretax Income ($ Millions)	$ 257.4	$ 308.7	19.9%
Pretax Margin (%)	10.1%	9.6%	
Net Income ($ Millions)	$ 140.3	$ 172.9	23.2%
Per Share Data			
Earnings ($)*	$ 6.15	$ 7.58	23.2%
Dividend ($)	$ 1.68	$ 2.00	19.0%
Book Value ($)	$ 36.03	$ 41.79	16.0%
Average Shares Outstanding (Millions)	22.79	22.80	0.0%
Capital Expenditures ($ Millions)	$ 309.6	$ 427.1	38.0%
Total Employees	78,571	85,779	9.2%

*Fully diluted

Source: Texas Instruments Annual Reports
DATAQUEST, Inc.

8.12 Texas Instruments

Table 8.12-1

Texas Instruments
ESTIMATED REVENUES BY OPERATING GROUP
(Millions of Dollars)

	1973	1974	1975	1976	1977	1978	1979
Semiconductor Group	$ 622	$ 652	$ 537	$ 679	$ 772	$ 945	$1,242
Consumer Products Group	99	245	215	252	340	370	365
Digital Group	63	75	90	144	219	365	522
Equipment Group	265	312	276	331	393	473	572
Materials & Electrical Products Group	228	285	255	284	334	403	493
Service Group	118	148	133	138	175	223	267
Intracompany Sales	(108)	(145)	(138)	(169)	(187)	(229)	(237)
Total Revenues	$1,287	$1,572	$1,368	$1,659	$2,046	$2,550	$3,224

Source: Texas Instruments Annual Reports
DATAQUEST, Inc.

8.12 Texas Instruments

Table 8.12-2

Texas Instruments
ESTIMATED SEMICONDUCTOR REVENUES
(Millions of Dollars)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
TOTAL SEMICONDUCTOR	336	313	414	604	634	520	655	741	921	1212
TOTAL I C	141	153	219	363	374	300	421	514	679	952
BIPOLAR DIGITAL	115	114	161	255	234	145	215	242	306	430
TTL	71	77	125	220	204	120	187	228	296	411
DTL	24	15	14	9	11	15	15	10	9	10
ECL	10	14	15	17	12	10	5	0	8	5
OTHER	10	8	7	9	7	0	8	4	3	4
MOS	6	14	25	65	88	100	135	180	238	352
PMOS										
NMOS										
CMOS										
LINEAR	20	25	33	43	52	55	71	92	135	170
INTERFACE										
CONTROL										
ENTERTAINMENT										
OTHER										
TOTAL DISCRETE	188	152	183	213	218	177	174	170	176	184
TRANSISTOR				154	154	136	127	124	129	134
SMALL SIGNAL				92	85	79	65	62	63	64
POWER				62	69	57	62	62	66	70
DIODE				47	50	30	32	31	34	37
SMALL SIGNAL				36	37	19	20	19	20	22
POWER				8	10	7	8	8	10	11
ZENER				3	3	4	4	4	4	4
THYRISTOR				6	7	4	8	8	7	7
OTHER				6	7	7	7	7	6	6
OPTOELECTRONIC	7	8	12	28	42	43	60	57	66	76
LED LAMPS	1	1	2	3	3	4	6	6	8	10
LED DISPLAYS	2	3	5	18	28	24	30	28	32	37
COUPLERS	0	0	1	2	3	3	4	4	6	8
OTHER	4	4	4	5	8	12	20	19	20	21

Source: Texas Instruments Annual Reports and Form 10-K

8.12 Texas Instruments

Table 8.12-3

Texas Instruments
FINANCIAL STATEMENT HISTORY 1972-1979
(Millions of Dollars)

		Fiscal Year Ending December 31									
		1972	1973	1974	1975	1976	1977	1978	1979	TREND	CMPD GR
BALANCE SHEET											
1	*CASH & LIQUID SECURITIES*	196.09	179.19	154.78	266.58	293.75	257.13	115.37	116.64	(6.44)	(4.90)
3	*RECEIVABLES*	156.98	228.58	293.91	245.79	282.25	334.15	443.67	547.98	47.26	16.17
4	*INVENTORY*	102.65	174.07	198.18	142.88	197.65	214.28	300.50	340.25	28.55	14.91
5	*OTHER CURRENT ASSETS*	14.51	8.25	9.07	7.32	9.52	9.34	55.95	78.27	8.19	29.51
7	*EXCESS FUNDS*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	*TOTAL CURRENT ASSETS*	470.24	590.09	655.95	662.56	783.17	814.90	915.50	1083.14	77.56	11.12
9	*GROSS P P E*	334.51	403.48	515.31	538.95	606.38	713.79	927.01	1275.61	117.48	19.02
10	*ACCUMULATED DEPRECIATION*	179.51	183.54	234.86	285.24	303.51	319.69	354.36	463.14	37.05	13.87
11	*NET P P E*	154.99	219.94	280.45	253.71	302.87	394.09	572.65	812.47	80.43	23.28
12	*MISC ASSETS*	9.19	18.02	28.86	25.20	41.66	46.05	5.93	12.57	0.37	(1.72)
15	**TOTAL ASSETS**	634.42	828.05	965.25	941.48	1127.70	1255.04	1494.08	1908.17	158.36	14.85
16	*LOANS PAYABLE OVERSEAS **	12.07	17.59	74.03	37.31	46.10	38.76	45.83	179.30	14.46	29.86
17	*ACCTS PYBLE & ACCD EXPNS*	118.64	165.44	151.66	172.62	211.67	287.91	451.96	536.71	57.22	23.48
18	*ACCRUED TAXES*	35.16	42.75	83.47	58.52	113.42	85.79	49.71	100.27	6.58	11.09
19	*ACCRUED RETIREMENT BENES*	19.69	36.16	25.40	18.46	30.47	34.11	40.18	52.92	3.46	11.09
20	*CURR MAT LONG-TERM DEBT*	0.30	17.32	1.37	9.20	9.21	10.42	12.09	1.75	0.13	22.03
21	*DIVIDENDS PAYABLE*	2.33	3.87	5.72	5.73	7.54	9.58	11.39	11.41	1.36	24.41
22	*TOTAL CURR LIABILITIES*	188.19	283.12	341.64	301.84	418.42	466.57	611.17	882.36	83.22	20.87
23	*LONG-TERM DEBT*	71.37	67.69	72.75	47.53	38.17	29.67	19.07	17.56	(9.03)	(20.30)
24	*DEFERRED TAXES*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	*MISC LIABILITIES*	5.23	7.90	9.48	6.82	10.84	14.18	16.58	17.11	1.72	17.69
26	*DEFERRED CREDITS & OTH LI*	0.00	0.00	0.00	0.00	0.00	0.00	25.99	38.26	4.74	3075.58
27	*DEFICIT FUNDS*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	*TOTAL LIABILITIES*	264.79	358.71	423.88	356.19	467.42	510.43	672.81	955.29	80.65	16.68
29	*PREFERRED STOCK*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	*COMMON STOCK*	11.11	22.85	22.94	23.02	23.03	23.03	23.04	23.06	1.01	6.34
31	*CAPITAL SURPLUS*	75.48	94.30	99.49	104.12	106.42	106.32	106.91	107.81	3.72	4.06
32	*RETAINED EARNINGS*	283.04	352.18	418.94	458.15	530.82	615.26	715.44	842.71	76.14	16.02
33	*TREASURY STOCK*	0.00	0.00	0.00	0.00	0.00	0.00	(24.12)	(20.70)	(3.16)	*********
34	*TOTAL EQUITY*	369.63	469.34	541.37	585.29	660.28	744.62	821.27	952.88	77.70	13.32
35	**TOTAL LIAB & EQUITY**	634.42	828.05	965.25	941.48	1127.70	1255.04	1494.08	1908.17	158.36	14.85
36	*NET WORKING CAPITAL*	282.05	306.97	314.30	360.72	364.75	348.33	304.33	200.78	(5.67)	(2.47)
INCOME & EXPENSE											
38	*SALES*	943.69	1287.28	1572.49	1367.62	1658.61	2046.46	2549.85	3224.13	285.58	16.74
40	*COST OF GOODS*	575.81	763.81	943.54	831.06	994.72	1216.72	1526.40	1932.64	170.17	16.57
41	*GROSS PROFIT*	367.89	523.47	628.94	536.56	663.89	829.73	1023.45	1291.49	115.41	17.00
42	*S G & A EXPENSE*	153.47	196.12	232.69	227.52	265.89	325.98	419.80	515.65	47.26	17.37
43	*EMPLOYEE PROFIT SHARING*	19.44	35.58	41.76	21.18	44.67	50.15	61.40	76.73	6.89	17.62
44	*INT. FUNDED R & D EXPS.*	38.00	55.00	63.98	50.71	72.24	96.16	111.05	134.34	12.77	18.04
45	*OPERATING PROFIT*	156.97	236.76	290.52	237.16	281.10	357.44	431.21	564.76	48.47	16.39
46	*DEPRECIATION*	47.70	59.76	87.26	92.27	87.29	108.06	131.00	187.24	16.55	18.25
47	*LEASE PAYMENTS*	26.20	31.55	33.88	30.09	31.18	38.54	46.70	58.17	3.75	9.95
48	*INTEREST EXPENSE*	5.68	6.65	10.74	10.82	8.31	9.18	8.37	19.52	1.17	11.39
49	*MISC EXPENSE*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
51	*MISC INCOME*	7.18	6.75	4.16	11.97	23.78	9.26	12.25	8.91	0.79	9.45
53	*PRETAX PROFIT*	84.57	145.54	162.80	115.94	178.10	210.92	257.39	308.73	27.80	16.91
54	*INCOME TAXES*	36.54	62.31	73.18	53.80	80.68	94.28	117.11	135.84	12.61	17.45
56	*NET PROFIT*	48.03	83.24	89.62	62.14	97.42	116.64	140.28	172.89	15.19	16.48
57	*EPS AFTER PFD DIVIDENDS*	2.17	3.67	3.92	2.71	4.25	5.11	6.15	7.58	0.66	16.17
58	*COMMON DIV PER SHARE*	0.41	0.55	0.92	1.00	1.00	1.32	1.68	2.00	0.21	23.35

Source: Texas Instruments Annual Reports & Form 10-K
DATAQUEST, Inc.

8.12 Texas Instruments

Table 8.12-4

Texas Instruments
FINANCIAL STATEMENT HISTORY 1972-1979
(Percent)

		Fiscal Year Ending December 31									
		1972	1973	1974	1975	1976	1977	1978	1979	TREND	CMPD GR
BALANCE SHEET											
1	*CASH & LIQUID SECURITIES*	30.91	21.64	16.04	28.31	26.05	20.49	7.72	6.11	(2.76)	(17.19)
3	*RECEIVABLES*	24.74	27.61	30.45	26.11	25.03	26.62	29.70	28.72	0.31	1.15
4	*INVENTORY*	16.18	21.02	20.53	15.18	17.53	17.07	20.11	17.83	(0.01)	0.06
5	*OTHER CURRENT ASSETS*	2.29	1.00	0.94	0.78	0.84	0.74	3.74	4.10	0.31	12.76
7	*EXCESS FUNDS*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	*TOTAL CURRENT ASSETS*	74.12	71.26	67.96	70.38	69.45	64.93	61.27	56.76	(2.16)	(3.25)
9	*GROSS P P E*	52.73	48.73	53.39	57.24	53.77	56.87	62.05	66.85	2.05	3.63
10	*ACCUMULATED DEPRECIATION*	28.30	22.16	24.33	30.30	26.91	25.47	23.72	24.27	(0.24)	(0.85)
11	*NET P P E*	24.43	26.56	29.05	26.95	26.86	31.40	38.33	42.58	2.30	7.34
12	*MISC ASSETS*	1.45	2.18	2.99	2.68	3.69	3.67	0.40	0.66	(0.14)	(14.42)
15	*TOTAL ASSETS*	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	0.00
16	*LOANS PAYABLE OVERSEAS*	1.90	2.12	7.67	3.96	4.09	3.09	3.07	9.40	0.52	13.07
17	*ACCTS PYBLE & ACCD EXPNS*	18.70	19.98	15.71	18.34	18.77	22.94	30.25	28.13	1.66	7.52
18	*ACCRUED TAXES*	5.54	5.16	8.65	6.22	10.06	6.84	3.33	5.25	(0.15)	(3.27)
19	*ACCRUED RETIREMENT BENES*	3.10	4.37	2.63	1.96	2.70	2.72	2.69	2.77	(0.12)	(3.27)
20	*CURR MAT LONG-TERM DEBT*	0.05	2.09	0.14	0.98	0.82	0.83	0.81	0.09	(0.05)	6.25
21	*DIVIDENDS PAYABLE*	0.37	0.47	0.59	0.61	0.67	0.76	0.76	0.60	0.04	8.32
22	*TOTAL CURR LIABILITIES*	29.66	34.19	35.39	32.06	37.10	37.18	40.91	46.24	1.90	5.25
23	*LONG-TERM DEBT*	11.25	8.17	7.54	5.05	3.38	2.36	1.28	0.92	(1.48)	(30.60)
24	*DEFERRED TAXES*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	*MISC LIABILITIES*	0.82	0.95	0.98	0.72	0.96	1.13	1.11	0.90	0.02	2.48
26	*DEFERRED CREDITS & OTH LI*	0.00	0.00	0.00	0.00	0.00	0.00	1.74	2.01	0.27	2014.47
27	*DEFICIT FUNDS*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	*TOTAL LIABILITIES*	41.74	43.32	43.91	37.83	41.45	40.67	45.03	50.06	0.72	1.59
29	*PREFERRED STOCK*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	*COMMON STOCK*	1.75	2.76	2.38	2.44	2.04	1.84	1.54	1.21	(0.14)	(7.41)
31	*CAPITAL SURPLUS*	11.90	11.39	10.31	11.08	9.44	8.47	7.16	5.65	(0.86)	(9.39)
32	*RETAINED EARNINGS*	44.61	42.53	43.40	48.66	47.07	49.02	47.88	44.16	0.46	1.02
33	*TREASURY STOCK*	0.00	0.00	0.00	0.00	0.00	0.00	(1.61)	(1.08)	(0.19)	**********
34	*TOTAL EQUITY*	58.26	56.68	56.09	62.17	58.55	59.33	54.97	49.94	(0.72)	(1.33)
35	*TOTAL LIAB & EQUITY*	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	0.00
36	*NET WORKING CAPITAL*	44.46	37.07	32.56	38.31	32.34	27.75	20.37	10.52	(4.06)	(15.08)
INCOME & EXPENSE											
38	*SALES*	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	0.00
40	*COST OF GOODS*	61.02	59.34	60.00	60.77	59.97	59.46	59.86	59.94	(0.09)	(0.14)
41	*GROSS PROFIT*	38.98	40.66	40.00	39.23	40.03	40.54	40.14	40.06	0.09	0.22
42	*S G & A EXPENSE*	16.26	15.24	14.80	16.64	16.03	15.93	16.46	15.99	0.08	0.54
43	*EMPLOYEE PROFIT SHARING*	2.06	2.76	2.66	1.55	2.69	2.45	2.41	2.38	0.01	0.75
44	*INT. FUNDED R & D EXPS.*	4.03	4.27	4.07	3.71	4.36	4.70	4.36	4.17	0.05	1.11
45	*OPERATING PROFIT*	16.63	18.39	18.48	17.34	16.95	17.47	16.91	17.52	(0.06)	(0.30)
46	*DEPRECIATION*	5.05	4.64	5.55	6.75	5.26	5.28	5.14	5.81	0.06	1.29
47	*LEASE PAYMENTS*	2.78	2.45	2.15	2.20	1.88	1.88	1.83	1.80	(0.13)	(5.82)
48	*INTEREST EXPENSE*	0.60	0.52	0.68	0.79	0.50	0.45	0.33	0.61	(0.02)	(4.59)
49	*MISC EXPENSE*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
51	*MISC INCOME*	0.76	0.52	0.26	0.88	1.43	0.45	0.48	0.28	(0.03)	(5.25)
53	*PRETAX PROFIT*	8.96	11.31	10.35	8.48	10.74	10.31	10.09	9.58	0.00	0.14
54	*INCOME TAXES*	3.87	4.84	4.65	3.93	4.86	4.61	4.59	4.21	0.02	0.61
56	*NET PROFIT*	5.09	6.47	5.70	4.54	5.87	5.70	5.50	5.36	(0.02)	(0.22)
57	*EPS AFTER PFD DIVIDENDS*	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	0.00
58	*COMMON DIV PER SHARE*	19.13	15.13	23.46	36.88	23.54	25.85	27.30	26.37	1.25	6.18

Source: Texas Instruments Annual Reports & Form 10-K
DATAQUEST, Inc.

8.12 Texas Instruments

Table 8.12-5

Texas Instruments
FUNDS FLOW HISTORY 1973-1979
(Millions of Dollars)

		Fiscal Year Ending December 31								
		1973	1974	1975	1976	1977	1978	1979	TREND	CMPD GR
SOURCES										
56	*NET PROFIT*	83.24	89.62	62.14	97.42	116.64	140.28	172.89	15.17	14.20
46	*DEPRECIATION*	59.76	87.26	92.27	87.29	108.06	131.00	187.24	17.35	17.00
61	*NEW LONG-TERM DEBT*	13.63	6.43	0.00	0.00	1.92	1.49	0.25	(1.72)	25.80
62	*NEW EQUITY*	29.07	3.44	4.69	0.50	(2.15)	(1.21)	0.90	(3.60)	*********
63	*INCR OTHER LIABILITIES*	2.67	1.58	(2.67)	4.02	3.35	28.38	12.80	3.21	*********
66	*TOTAL SOURCES*	186.37	188.33	156.45	189.23	227.82	299.94	374.08	30.42	12.77
USES										
67	*P P E EXPENDITURES*	124.71	147.77	65.54	136.45	199.28	309.56	427.06	48.73	25.16
68	*REPAYMENT LONG-TERM DEBT*	0.30	17.32	17.39	9.36	9.21	10.42	12.09	0.48	40.23
69	*PREFERRED DIVIDENDS*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
70	*COMMON DIVIDENDS*	12.59	21.03	22.92	22.93	30.15	38.29	45.60	5.03	20.98
72	*INCR WORKING CAPITAL*	41.94	(8.61)	54.25	4.04	(15.22)	(42.33)	(113.88)	(21.58)	*********
71	*INCR OTHER ASSETS*	8.83	10.84	(3.65)	16.45	4.40	(40.12)	6.63	(3.59)	*********
74	*TOTAL USES*	188.37	188.33	156.45	189.23	227.82	275.82	377.50	29.06	12.20
75	*EXCESS/DEFICIT*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
76	*CUMULATIVE SUR/DEF*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: Texas Instruments Annual Reports & Form 10-K
DATAQUEST, Inc.

8.12 Texas Instruments

Table 8.12-6

Texas Instruments
FINANCIAL RATIO HISTORY 1972-79

		Fiscal Year Ending December 31									
		1972	1973	1974	1975	1976	1977	1978	1979	ST AV	WTD AVG
LIQUIDITY											
1	*CURRENT RATIO*	2.499	2.084	1.920	2.195	1.872	1.747	1.498	1.228	1.880	1.704
2	*QUICK RATIO*	1.876	1.440	1.313	1.697	1.377	1.267	0.915	0.753	1.330	1.178
3	*CASH RATIO*	1.042	0.633	0.453	0.883	0.702	0.551	0.189	0.132	0.573	0.455
4	*WORKING CAPITAL/SALES*	0.299	0.238	0.200	0.264	0.220	0.170	0.119	0.062	0.197	0.163
6	*DAYS RECEIVABLES*	60.718	64.814	68.222	65.597	62.113	59.598	63.510	62.036	63.326	62.956
7	*DAYS INVENTORY*	65.070	83.182	76.665	62.753	72.524	64.280	71.857	64.260	70.074	68.828
LEVERAGE											
8	*LONG-TERM DEBT/CAPITALIZ*	0.162	0.126	0.118	0.075	0.055	0.038	0.023	0.018	0.077	0.052
11	*LONG-TERM DEBT/EQUITY*	0.193	0.144	0.134	0.081	0.058	0.040	0.023	0.018	0.087	0.057
12	*TOTAL DEBT/EQUITY*	0.227	0.219	0.274	0.161	0.142	0.106	0.094	0.208	0.179	0.161
COVERAGE											
13	*EBIT/INTEREST*	15.900	22.873	16.157	11.713	22.432	23.978	31.752	16.816	20.203	21.383
14	*FIXED CHARGE COVERAGE*	3.653	4.810	4.649	3.834	5.510	5.420	5.674	4.974	4.815	5.059
16	*REPAY LTD+FIX CHARGE COV*	*********	4.773	3.349	3.710	4.469	4.543	4.772	4.304	4.274	4.355
OPER PERFORMANCE											
17	*GROSS PROFIT/SALES*	0.390	0.407	0.400	0.392	0.400	0.405	0.401	0.401	0.400	0.401
18	*OPER PROFIT/SALES*	0.166	0.184	0.185	0.173	0.169	0.175	0.169	0.175	0.175	0.174
21	*PRETAX PROFIT/SALES*	0.090	0.113	0.104	0.085	0.107	0.103	0.101	0.096	0.100	0.100
22	*NET PROFIT/SALES*	0.051	0.065	0.057	0.045	0.059	0.057	0.055	0.054	0.055	0.055
23	*NET PROFIT/AVG EQUITY*	*********	0.198	0.177	0.110	0.156	0.166	0.179	0.195	0.169	0.171
24	*NET PROFIT/AVG CAPITALIZ*	*********	0.170	0.156	0.100	0.146	0.158	0.174	0.191	0.156	0.162
26	*NET PROFIT/AVG TOT ASSETS*	*********	0.114	0.100	0.065	0.094	0.098	0.102	0.102	0.096	0.096
27	*E P S GROWTH RATE*	*********	0.691	0.069	(0.309)	0.567	0.202	0.205	0.232	0.237	0.216
28	*SALES GROWTH RATE*	*********	0.364	0.222	(0.130)	0.213	0.234	0.246	0.264	0.202	0.206
TURNOVER											
31	*SALES/AVG EQUITY*	*********	3.069	3.112	2.428	2.663	2.913	3.257	3.635	3.011	3.099
32	*SALES/AVG CAPITALIZ*	*********	2.632	2.732	2.194	2.492	2.779	3.158	3.561	2.793	2.943
33	*SALES/AVG TOT DEBT + EQTY*	*********	2.511	2.493	1.998	2.315	2.595	2.962	3.146	2.574	2.697
34	*SALES/AVG TOTAL ASSETS*	*********	1.760	1.754	1.435	1.603	1.718	1.855	1.895	1.717	1.749
35	*SALES/AVG OPER ASSETS*	*********	1.794	1.801	1.476	1.657	1.783	1.891	1.906	1.758	1.788
36	*SALES/AVG GROSS P P E*	*********	3.489	3.423	2.594	2.896	3.100	3.108	2.928	3.077	3.012
BALANCE SHEET											
37	*CASH/SALES*	0.208	0.139	0.098	0.195	0.177	0.126	0.045	0.036	0.128	0.106
38	*RECEIVABLES/SALES*	0.166	0.178	0.187	0.180	0.170	0.163	0.174	0.170	0.173	0.172
41	*INVENTORY/SALES*	0.109	0.135	0.126	0.104	0.119	0.105	0.118	0.106	0.115	0.113
42	*OTH CURR ASSETS/SALES*	0.015	0.006	0.006	0.005	0.008	0.005	0.022	0.024	0.011	0.013
44	*GROSS P P E/SALES*	0.354	0.313	0.328	0.394	0.366	0.349	0.364	0.396	0.358	0.366
46	*MISC ASSETS/SALES*	0.010	0.014	0.018	0.018	0.025	0.023	0.002	0.004	0.014	0.013
47	*ACCOUNTS PAYABLE/SALES*	0.126	0.129	0.096	0.126	0.128	0.141	0.177	0.166	0.136	0.145
48	*ACCRUED TAXES/SALES*	0.037	0.033	0.053	0.043	0.068	0.042	0.019	0.031	0.041	0.039
51	*ACCRUED LIABILITY/SALES*	0.021	0.028	0.016	0.013	0.018	0.017	0.016	0.016	0.018	0.017
52	*LINE 21/SALES*	0.002	0.003	0.004	0.004	0.005	0.005	0.004	0.004	0.004	0.004
53	*DEFERRED TAXES/SALES*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
54	*MISC LIABILITIES/SALES*	0.006	0.006	0.006	0.005	0.007	0.007	0.007	0.005	0.006	0.006
56	*LINE 26/SALES*	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.012	0.003	0.005
MISCELLANEOUS											
57	*EQUITY PER COMMON SHARE*	16.696	20.684	23.688	25.536	28.791	32.599	36.030	41.795	28.227	32.150
58	*RETIRE/PREV GROSS P P E*	*********	(0.167)	(0.089)	(0.081)	(0.128)	(0.152)	(0.135)	(0.085)	(0.119)	(0.116)
61	*DEPREC/PREV GROSS P P E*	*********	0.179	0.216	0.179	0.162	0.178	0.184	0.202	0.186	0.186
62	*COM DIVS/EXM-PFD DIVS*	0.191	0.151	0.235	0.369	0.235	0.259	0.273	0.264	0.247	0.262
63	*TAX RATE*	0.432	0.428	0.450	0.464	0.453	0.447	0.455	0.440	0.446	0.448
64	*COST OF GOODS/SALES*	0.610	0.593	0.600	0.608	0.600	0.595	0.599	0.599	0.600	0.599
65	*S G & A/SALES*	0.163	0.152	0.148	0.166	0.180	0.159	0.165	0.160	0.159	0.160

Source: Texas Instruments Annual Reports & Form 10-K
DATAQUEST, Inc.

DATAQUEST INCORPORATED RESEARCH NEWSLETTER

SIS Code: 8.12 Texas Instruments December 18, 1978

UPDATE ON TEXAS INSTRUMENTS

Summary

DATAQUEST estimates that Texas Instruments (TI) will report fiscal 1978 revenues of about $2,520 million, a 23 percent increase over 1977, with earnings of about $140 million, or $6.15 per share, an 18 percent increase over the previous year. We expect TI's 1979 revenues to be about $2,870 million, with after-tax earnings of about $160 million, or $7.00 per share.

Significant items discussed in this update are:

- Semiconductor revenues are expected to grow to an estimated $1,030 million in 1979, up about 12 percent over an estimated $920 million in 1978.
- Management changes in the Semiconductor Group this year appear to have substantially improved its ability to react to the marketplace.
- TI's progress in MOS memory during 1978 has been substantial, but its product line is still limited and it is not the acknowledged leader in memory technology.
- Progress in MOS microprocessors has been mixed. TI's 4 bit product family is doing very well but its 16 bit product family is facing tough competition from new 16 bit-products on the market.
- Fairchild's recently announced FAST (Fairchild Advanced Schottky TTL) product line poses a substantial threat to a significant portion of TI's TTL business.
- Texas Instruments is adding significant new capacity. Capacity expansion in 1979 is expected to be greater than 1978's $300 million and could force TI to borrow money.
- Consumer Products Group revenues in 1979 will likely be impacted by the economy. We forecast a growth of 5 percent to about $410 million in 1979. Speak & Spell and other learning aids are becoming a significant part of the business.

- The Digital Systems Group revenues are expected to be about $320 million, which is up about 46 percent over 1977 and represents a growth rate greater than that of the overall terminal and minicomputer market. In 1979, the group's revenues are expected to grow to about $430 million.

- Equipment Group revenues are expected to grow about 17 percent in 1979 to $555 million. A large production program for laser guided bombs is providing a significant portion of 1979 billing.

Estimated Revenues and Profits

DATAQUEST's revenue estimates for 1977 through 1979 for each of Texas Instruments' operating groups are presented in Table 1. We estimate that 1978 revenues will grow to about $2,520 million, an increase of 23 percent over 1977. We expect after-tax profit margins to be down to about 5.5 percent from a level of 5.7 percent in 1977. The lower margins are a result of costs encountered in bringing on new semiconductor capacity and the build-up of engineering and marketing support for new products in several groups.

We expect TI's 1979 revenues to grow about 14 percent to $2,870 million with margins essentially flat. Recent tax law changes will help TI's margins, but we expect operating expenses to remain high.

Corporate Overview

Texas Instruments is diligently striving to foster innovation and increase productivity. By purposefully planning its corporate strategies around high technology with a careful sprinkling of innovation, it is confidently marching forward toward its long stated goals of $3 billion in revenues by the late 1970s and $10 billion by the late 1980s. Although we understand that TI's internal goal for 1979 is $3 billion, we perceive it as an extremely aggresive goal for 1979 (up about 19 percent) that leaves no room for slippage of any programs.

When Texas Instruments successfully devotes its corporate efforts to a major project, the results are truly impressive. Despite some setbacks, TI has built a successful consumer electronics business that no other U.S. company has been able to duplicate. While its other U.S. competitors were dropping out, TI has succeeded in doing what the Japanese do so well—completely focusing its efforts on a major market and capturing a major share of that market.

TI's success is largely attributable to its sophisticated OST (objectives, strategies, and tactics) planning system and the tight management controls that it has developed over the years. TI's management style has been well known as a tough environment. The management changes that occurred in February 1978 brought in some new managers whose style is much more people oriented. We believe that

Table 1

Texas Instruments

ESTIMATED REVENUES
(Dollars in Millions)

	1977	Percent Change 1977-78	1978E	Percent Change 1978-79	1979E
Semiconductor	$ 772	22.4%	$ 945	12.2%	$ 1,060
Consumer Products	340	14.7%	390	(5.1%)	410
Digital Systems	219	46.1%	320	34.4%	430
Equipment	393	20.9%	475	16.8%	555
Material and Electrical Products	334	18.3%	395	11.4%	440
Services	175	22.9%	215	11.6%	240
Intracompany Sales	(187)	17.6%	(220)	20.5%	(265)
Total Revenues	$ 2,046	23.2%	$ 2,520	13.7%	$ 2,870
After-Tax Profit Margin	5.70%		5.53%		5.66%
After-Tax Profits	$116.64	20.0%	$140.00	14.3%	$160.00
Earnings Per Share	$ 5.11	20.4%	$ 6.15	13.8%	$ 7.00

Source: Texas Instruments, Inc. Annual Report
DATAQUEST, Inc. estimates
December 1978

the reorganization has had a positive effect, with increased human orientation of TI's highly organized management process. We believe that TI is now a stronger company as a result of these changes.

TI's attention to increased productivity is visible in all operating groups. Its employees' profit-sharing plan is directly related to employee productivity through the People Effectiveness Index (PEI), defined as a ratio of total revenues to total employee wages, salaries, and benefits. This ratio increased to 2.3 in 1977, up from 2.2 several years ago. TI is spending heavily on automation and productivity enhancement; robot arms on the assembly lines and robot mail carts are now becoming commonplace at TI.

TI's commitment to growth is not inexpensive, as its capital spending plan demonstrates. TI has been able to self-fund its growth in the last few years from retained earnings while diminishing its debt. However, we believe that it must now go to external financing to fund its growth in the coming years. TI's capital spending program is discussed in more detail at the end of this newsletter.

We understand that negotiations are proceeding between TI and the Securities and Exchange Commission regarding a more complete breakout of TI's lines of business in its annual report. Currently TI lumps semiconductors and electrical controls into a category called "Components" and digital systems and consumer products into a category called "Digital Products."

TI has solved many previous problems but it faces several major challenges in 1979. These include:

- Firmly establishing the mid and upper range of its microprocessor line in the market
- Successfully merchandising new computer products from the Consumer Products Group
- Improving corporate profitability

Each of the Company's groups is analyzed in the following sections.

Semiconductor Group

Estimated Semiconductor Group revenues are presented in Table 2 by major product type. We expect TI's semiconductor revenues to increase about 24 percent to $920 million in 1978 and to increase about 12 percent to $1,030 million in 1979. The real growth areas for TI are MOS and linear with bipolar digital not far behind. We estimate that TI continues to lose market share in discrete and optoelectronics.

Memory

TI's MOS memory operation, headquartered in Houston, Texas, had a good year in 1978. After spending a large sum of money in 1977 to

Table 2

Texas Instruments

ESTIMATED SEMICONDUCTOR GROUP REVENUES
(Dollars in Millions)

	1977	Percent Change 1977-78	1978	Percent Change 1978-79	1979
Bipolar Digital	$246	25.5%	$308	8.8%	$ 335
MOS	180	33.3%	240	25.0%	300
Linear	92	28.3%	118	14.4%	135
Total I.C.	$518	28.6%	$666	15.6%	$ 770
Transistors	$125	8.0%	$135	0.8%	136
Diodes	32	15.6%	37	2.7%	38
Thyristors	6	16.7%	7	0%	7
Other	7	0.0%	7	(14.3%)	6
Total Discrete	$170	9.4%	$186	0.5%	$ 187
Total Optoelectronics	57	19.3%	68	7.4%	73
Total Semiconductors	$745	23.5%	$920	12.0%	$1,030
Non Semiconductor Products	64	25.0%	80	12.5%	90
(Intragroup Use)	(37)	48.6%	(55)	9.1%	(60)
Semiconductor Group Total	$772	22.4%	$945	12.2%	$1,060

Source: DATAQUEST, Inc.
December 1978

redesign its 16K dynamic RAM, TI now has a successful product and should ship about 3 million 16K dynamic RAMs in 1978 versus only about 43,000 in 1977. The heavy losses sustained in 1977 were finally reversed in the second half of 1978. Although the division is now profitable there is still room for improvement.

The new management has certainly had a positive impact in the division, with a large number of new product announcements and a greatly improved position in 16K dynamic RAMs. We believe that the new management has as one of its primary goals the re-establishment of TI as an acknowledged leader in semiconductor technology. TI's 64K dynamic MOS RAM, announced in September 1978, is an important step in that direction.

TI's announcement of its 64K dynamic RAM makes it the first U.S. company to unveil such a product. This 5-volt only, 33,000 square mil device will consume about one-tenth the power of the 16K dynamic RAM on a per-bit basis. TI is sampling small quantities of the part to a select set of large volume users. On December 7, Motorola announced its 64K dynamic RAM with availability of parts in the first quarter. While a substantial market advantage will accrue to TI with prompt delivery of samples and evaluation quantities, a delay could diminish its advantage.

During 1978, TI also announced several other new MOS memory products, including a 32K EPROM and a 16K static MOS RAM. TI has increased its MOS memory products from four products in 1976 to about two dozen products in 1978. Despite this impressive array, TI's MOS memory line is limited without a fast 4K static MOS RAM like the 2147. Furthermore, TI is still not recognized as the technology leader in MOS memory. Its reputation is based on its ability to manufacture in high volume and to rapidly reduce prices.

TI is currently shipping 64K CCD memory devices in limited quantities (about 10,000 units per month) to a large number of customers that are developing disc memory or buffer memory systems using CCDs. We understand that the 64K CCD has been difficult to fabricate because of alpha radiation, yield, and other problems. Although several competitors have dropped out, TI appears, at least for the present, to be committed to establish the CCD market. We estimate that it will be 1980 before 256K bit CCD devices are available in reasonable quantities from TI and other suppliers.

TI announced its 256K bit magnetic bubble module in 1978, but the full line of peripherals needed to control, drive, and interface magnetic bubble modules to TTL logic will not be ready until late 1979. Therefore, we expect TI to continue to emphasize its 92K bit magnetic bubble module, which is fully supported with a line of peripheral and interface devices. Although TI announced its 92K bit product in early 1977, it is still not shipping large quantities to the merchant market. The delay resulted from TI's redesigning the product to include the chevron bubble propagation pattern, being slow

to fully support the module with peripheral circuits, and using large quantities for its own product requirements.

TI's lapse has given the competition time to catch up; Hitachi, Fujitsu, and Rockwell are now shipping magnetic bubble modules, and Intel, National Semiconductor, and Nippon Electric are in development. However, TI has improved its product during this period, and we expect it to continue using significant quantities in TI products like the Model 765 portable terminal to achieve product advantages that are not easily duplicated.

Microprocessors

TI's microprocessor programs have had varying degrees of success. The TMS-1000 4-bit single chip microcomputer has been extremely well received by a wide range of users. We estimate that TI will ship about 9 million units this year, up from about 3 million units in 1977. This low-priced controller is designed to serve a broad range of controller applications in the industrial, consumer, and computer market segments. Initially, this product was offered in PMOS only. Some members of the family are now available in CMOS, and NMOS versions are available in the European market.

TI's 16-bit TMS 9900 microprocessor was not a fully supported chip with a full line of peripheral and interface chips until this year. It is this insufficient design, development, software, and marketing that, in our opinion, has prevented the 9900 from being more widely accepted. These deficiencies are the type that can exclude TI from large package orders that include much memory and I/O besides the CPU.

Despite these weaknesses, TI is committed to the 9900 microprocessor family, which is used in the TM 990 board products as well as in the 990 minicomputers and its intelligent terminals. TI is shipping the 9980 microprocessor, which uses an 8-bit I/O channel but internally is 16 bits wide. It is planning to sample the 9940 single-chip microcomputer with an 8-bit wide data and I/O bus in the near future. It is also working on a number of new products in this family. We believe that TI is developing additional strategies to enable it to compete effectively against single chip 8-bit products such as the 8048 and the 3870.

The Semiconductor Group produces a line of board products called the TM 990 family that includes CPU, memory, I/O, and peripheral boards. These are sold to OEMs (original equipment manufacturers) and have been well received. A large user of the TM 990 boards is General Electric Data Services Network. We also understand that TI has penetrated the PABX market with this unit. However, in the 16-bit board business, DATAQUEST perceives TI as greatly lagging Digital Equipment in market penetration at this time.

Linear, Bipolar, and Discrete Devices

The demand for TI's linear products has been exceeding supply by far; lead times are currently in the 14-20 week range and slowly

increasing. A/D and D/A converters are in very strong demand, as are a number of other linear devices.

Bipolar digital circuits are experiencing lead times of from 20 to 28 weeks. TI's major product emphasis here is low-power Schottky (LS) and the new super-Schottky devices. Demand for these devices has been particularly strong. TI now has a very broad line of LS devices—about 175 at mid-year. Many are expecially designed to interface with mciroprocessors. DATAQUEST estimates TI's LS market share to be greater than 50 percent of the market.

TI went into the recent upturn well positioned in the bipolar digital market, but it is vulnerable in a downturn. It is too early to tell about the future of super-Schottky. Demand has been strong, but there has been no volume production as yet. Since super-Schottky must compete with ECL, the future is uncertain. Fairchild's recently introduced FAST (Fairchild Advanced Schottky TTL) product line has met with great market acceptance. This very fast product (under 4 nanosecond gate delay) is a frontal attach on a substantial part of TI's business.

TI continues to lose market share in discrete devices as it focuses its attention on ICs. Its strength in discretes is small signal devices, where it makes MOSFET transistors used in TV tuners, audio tuners, and other small signal applications. It also makes a very competitive line of power transistors. TI is a relatively small producer of diodes and thyristors, and we do not expect that it will significantly change these positions.

Consumer Products Group

DATAQUEST estimates that Consumer Products Group revenues will be up about 15 percent to $390 million in 1978, compared to about $340 million in 1977. However, we expect 1979 to be a difficult year for this group with projected revenues up only 5 percent to $410 million. We believe that general softness in consumer demand will affect both TI's calculator and watch businesses.

Our projections for 1979 show TI's calculator unit shipments as remaining essentially flat in 1979. Although 1978 calculator revenues are estimated to be about $280 million, up from $240 in 1977, we expect only about $280 million in revenues in 1979. Furthermore, revenues from digital watches are also expected to be nearly flat in 1979, at about $110 million.

There are two reasons for projecting relatively flat 1979 calculator and watch sales. Consumer spending is expected to be down somewhat in 1979; the consumer is currently overextended in private debt. Furthermore, the digital watch market is not growing as fast as expected. There still appears to be much consumer hesitance toward using digital timepieces.

TI has made significant improvements in its calculator product line in 1978. All but a few of the low-cost calculators and some of the scientific and business calculators have been converted over to liquid crystal displays (LCD). The conversion to LCD has put a tremendous demand on TI's Semiconductor Group to manufacture the displays. Although, TI established an LCD manufacturing facility in Dallas in 1977, it is still unable to meet its own internal requirements. TI can now meet most, but not all, of its calculator requirements, and is still short of meeting its watch display requirements. Some of the thin-line LCD calculators that TI sells are produced for it by Sharp of Japan.

Now that TI's watches are more than 50 percent LCD, TI finds itself in a bind with respect to displays and CMOS watch chips. It is buying nearly all of its LCD watch displays and CMOS watch chips from external suppliers while it continues to build its internal capacity. It is even buying some finished watches from some Far East assemblers to enable it to penetrate the chronograph/alarm watch market. We expect that TI will continue using outside sources for finished watches and calculators in 1979 while it builds its own manufacturing capacity.

TI stresses its "design to cost" strategy in the manufacture of its calculators and watches, which are produced entirely domestically. The chips are made at one of TI's wafer fab facilities in Texas, the plastic cases are stamped in Lubbock, Texas, and final assembly takes place in Lubbock, Midland, Odessa, or Abilene, Texas. TI has invested heavily in the automation of these assembly facilities to make domestically assembled consumer products cost effective. It has recently introduced robot arms into the calculator assembly operations in Lubbock.

Learning aids have become an important new growth market for this group. The earlier "Little Professor" and "Dataman" calculator-like learning aids have been well accepted by the public. In the third quarter, TI introduced its "Speak & Spell" product, which uses a TI-developed voice synthesizer chip, together with two 128K bit ROMs. Two ROM chips give the product a 200-word vocabulary and a very intelligible speech output.

We estimate that TI should ship about 100,000 units of the Speak & Spell in 1978 at $30 per unit, for $3 million in revenue. In 1979, TI is expected to ship about 800,000 units at $20 each for $16 million in revenue. TI could sell more but production is currently limited by the I^2L speech synthesizer chip needed to drive the speaker and yet consume low power.

DATAQUEST expects TI's Consumer Products Group to announce two computer products in 1979. TI will probably not announce its home computer at the January Consumer Electronics Show (CES) in Las Vegas. However, we do expect its unveiling at the June CES in Chicago. We understand that this product uses RAM memory for temporary storage,

ROM memory for program storage, has a standard full typewriter keyboard on a well-designed console with a dust cover, connection to a color or monochrome TV set, and is capable of generating 16 colors as well as tones. It also has I/O ports for digital cassette or floppy disc storage and an RS-232 interface for communications. We expect the retail price to be in the $400 to $450 range. We estimate that TI could still produce 5,000 to 10,000 units of its home computer units in the second half of 1979, thereby generating up to $3 million revenues.

The Consumer Group is also likely to announce a small business computer priced under $10,000 for a fully equipped computer with keyboard, CRT, printer, floppy disc, and memory. We estimate that TI might ship 2,500 units, generating revenues of $10 million.

The success of its home computer and small business computer will depend largely on TI's developing a creative merchandising program. Marketing a $400 home computer or a $10,000 small business computer is far different from marketing a $25 calculator or watch for which TI has developed some 75,000 consumer outlets in the United States. Since the concept of the TI-owned store has not advanced sufficiently to carry distribution of these products in 1979, TI must find another approach from among its present retailers as well as others.

Digital Systems Group

TI's Digital Systems Group is growing rapidly as TI puts corporate emphasis on its Distributed Computing Thrust. We estimate that its revenues will grow about 46 percent this year to an estimated $320 million, up from $219 million last year. Furthermore, we estimate continued growth of about 34 percent to approximately $430 million. These estimated growth rates are in excess of the industry growth rates, consistent with our belief that TI is picking up some market share in terminals and minicomputers.

In the last 12 to 18 months, TI has added about 15 new terminal products—intelligent and dumb terminals as well as several models of dot matrix impact printers. The intelligent terminals have the ability to do extensive data manipulation and processing in a stand-alone manner as well as communicate with one or more computers. One of TI's lightweight portable terminals (Model 765) includes a bubble memory and acoustic coupler for communications. This feature enables a traveling sales person to record orders during the day and then communicate them back to a central computer.

TI's minicomputer efforts have also been strongly focused toward distributed processing, with particular emphasis on hierarchy and networking. The software compatibility among the different models of its 990 family, as well as their communications capability, is very important to this distributed processing thrust. TI is also incorporating its 9900 microprocessors into its intelligent

terminals. The software compatibility between the 9900 microprocessor and the 990 minicomputers is an obvious advantage in the network applications that TI is stressing.

TI's minicomputer business previously emphasized large turnkey systems business, including large clients such as Montgomery Ward, Pacific Telephone, Sears Roebuck, and Ramada Inn. Four years ago, these systems represented about 25 percent of TI's minicomputer business; they are now less than 10 percent as TI puts more emphasis on standard systems sales, as well as on sales to OEM customers. We believe that this is in the best interest of the division as it forces TI to standardize its hardware, software, service, and marketing, and to develop volume sales.

The growth of the Digital Systems Group is exemplified by its recent move into manufacturing facilities in Temple, Texas, and a recent commitment by TI to construct a major new facility in northwest Houston on a new 250 acre site. Nearly 500,000 square feet of space is being added for the use of this group in 1978.

Equipment Group

The Equipment Group, with its three major divisions—Radar, Missiles and Ordance, and Electro-optical—is experiencing very good growth this year. The group has a good balance of production and development contracts to assure continued good growth into 1979, but there is some doubt about 1980's production program. We estimate that the group will grow about 21 percent to about $475 million in 1978, and about 14 percent in 1979 to $540 million.

The Electro-optical Division has developed a unique modular approach to forward looking infra-red (FLIR) systems that has enabled it to considerably reduce the price for military FLIR systems. At this time, TI has major production programs for the night sight on the M60 tank and the TOW and Dragon night sights as well.

In the Missiles and Ordance Division, TI has major production on the SHRIKE and Pave-way guidance systems. TI was producing guidance systems for the SHRIKE missile more than 10 years ago and now finds that production levels on this unit are as high as ever. TI's production program for the LAGAP (Laser Guided Artillery Piece) is multiyear program with billings in 1979 that could approach 20 percent of the group's revenues. TI also has a major development contract on the Harpoon missile on which it is the major systems contractor. This is a first for TI as it had primarily been a subcontractor for guidance electronics.

In the Radar Division, air traffic control continues to be a major part of the business. The ASR-8, airport surveillance radar, has been widely used and continues to be a good source of business. The Discrete Address Beacon System (DABS) is in the development phase and major production is expected in the future.

In addition to the three operating divisions, there is a new business and marketing operation that contains a number of development groups that work on advanced technology of interest to the entire group.

Materials and Electrical Products

This group contains both the Electrical Controls Division and the Metallurgical Materials Division and has major locations in Attleboro, Massachusetts, and Johnson City, Tennessee. We estimate that the group's revenues grew about 15 percent in 1978 to an estimated $385 million and will grow another 12 percent next year to about $430 million.

In 1978, TI completed a major new clad-metal facility in Attleboro that greatly expanded its capacity and enabled it to increase its penetration of the automotive market; TI's clad-metal products are permitting automotive producers both to reduce weight and to reduce corrosion in trim materials. TI's clad-metal materials are also extensively used as connectors and lead frames for many of TI's semiconductor products, as well as for sale to the merchant market in applications such as the barrel for Cross pens.

The Electrical Controls Division introduced a new product called the Program Master 550, which is an upgrade of its earlier 5TI family of programmable industrial controllers. This new product uses semiconductor technology in an easy-to-use programming keyboard that enables electricians and other tradesmen to program as though they were thinking in terms of relay logic. The new Program Master-550 series is gaining wide acceptance.

Services Group

This group provides exploration and computation services to the petroleum industry. TI uses special purpose digital field systems to collect the seismic data and then processes the collected data in its computational centers around the world. TI's three-dimensional (3-D) seismic data processing continues to make penetration in the worldwide seismic business. Increased resolution and capability gained from the 3-D processing enables TI to provide more significant information about sub-surface structures than conventional technology. This has enabled TI's seismic processing activities to grow faster than the total market and improve its position as the largest independent geophysical contractor.

Capital Spending and R&D Trends

Texas Instruments' commitment to growth is demonstrated by its capital expenditures over the last three years; it has spent $136 million, $199 million, and about $300 million in 1976, 1977, and 1978 respectively. We estimate that TI's 1979 capital expenditures will increase again to about $350 million.

In 1978, capital expenditures for the Semiconductor group include the completion of the new 4-inch wafer facility in Lubbock, Texas, as well as a front-end facility in Freising, Germany. The Digital Systems Group has been the beneficiary of much of the capital spending. The group's facilities are expanding by about 500,000 square feet in 1978 and 1979 through capital additions in Austin, Temple, and Abilene, Texas, and a major new facility in Houston, Texas. The Equipment Group moved into its new Lewisville, Texas, facilities early this year and additional space is already being added at the site.

An important part of capital spending for the Semiconductor Group has been the three new E-beam machines that were acquired in the last three years. TI recently announced its new corporate front-end facility at the expressway site in Dallas. This new facility is TI's primary laboratory for developing advanced processing techniques for VLSI.

In addition to capital spending, TI has spent heavily on its own research and development, referred to as its OST programs (objectives, strategies, and tactics). These expenditures were $96 million in 1977 and are expected to be about $113 million in 1978. TI's thorough planning and attention to details and execution make these OST dollars very effective investments in the future.

TI remains very strongly committed to its $3 billion goal by the end of the 1970s and $10 billion goal by the late 1980s. We believe that the level of capital spending and OST funding, combined with TI's careful planning and attention to details and execution, will enable them to reach these goals.

Daniel L. Klesken
James F. Riley
Frederick L. Zieber

DATAQUEST INCORPORATED RESEARCH NEWSLETTER

SIS Code: 8.12 Texas Instruments March 15, 1978

UPDATE ON TEXAS INSTRUMENTS

Summary

Texas Instruments reported 1977 revenues of $2,046 million, a 23 percent increase over 1976, and earnings of $116.6 million, a 20 percent increase. We estimate that the Company's lower after tax margin was a result of problems in the Semiconductor Group which incurred large development expenses for memories and microprocessors, and large start up costs for bubble memories and new semiconductor fabrication facilities.

Other significant items discussed in this update:

- DATAQUEST believes that a major reason for the reorganization of February 1978 was TI's lack of progress in the MOS market.
- The Consumer Products Group had revenue growth of approximately 38 percent in 1977, with good profits. This group is expected to introduce a product into the hobby/home computer market by mid-year.
- Digital Systems had revenue growth of about 50 percent in 1977. Terminals were very profitable, but computer systems were only marginally profitable.
- The Equipment Group has a good mix between production and development programs and is expected to have revenue growth of about 16 percent in 1978.
- During 1977, Texas Instruments made major investments in semiconductor fabrication and clad metal manufacturing capacity and acquired several Texas sites for future expansion.

DATAQUEST estimates that Texas Instruments' revenues will grow about 17 percent in 1978 to about $2.4 billion. Good revenue growth is expected in each of TI's major groups with corporate profit margins of about 5.75 percent for a net profit of about $138 million or $6.05 a share.

Estimated Revenues

DATAQUEST's revenue estimates for each of Texas Instruments' major groups or divisions for 1976 through 1978 are presented in

Table 1. Note that our estimates for 1976 and 1977 have been adjusted from earlier newsletters and notebook sections to correspond with TI's 1977 Annual Report, in which the Company reported its net sales billed and profit by line of business in accordance with Financial Accounting Standards No. 14. While the numbers reported by TI combine the results of several TI groups, DATAQUEST has estimated the revenues to correspond with the Company's operating groups.

While 1977 was a good year for TI in terms of revenue growth, profit margins declined from 1976. The Semiconductor Group was a factor in this decline because of large development expenditures made for MOS memories and microprocessors with comparatively small revenues to offset the development costs. Estimated revenues for TI's Semiconductor Group are presented in Table 2. Total semiconductor revenues in 1977 increased about 14 percent over 1976 to an estimated $745 million. Integrated circuit revenues increased about 23 percent to approximately $518 million while discrete devices and optoelectronics declined by about 2 percent and 5 percent respectively. The largest estimated revenue gain was achieved by MOS. Estimated earnings did not keep pace with these revenue gains. In 1978 we expect that integrated circuits will again show the largest percent growth, and that discretes and optoelectronics will be up after declines in 1977.

Margin Analysis

Our estimates of Texas Instruments' pretax earnings and margins for each of the major operating groups are presented in Table 3. Pretax margins for the Semiconductor Group declined to an estimated 12.4 percent, while Consumer Products and Digital Systems had gains. Consumer Products Group margins grew from about 7.7 to an estimated 9.9 percent in a year when large investments were being made in the watch program. Digital Systems' gain from from 7.7 to an estimated 9.9 percent came despite marginal profits from computer systems.

Company-reported margins for the Services Group increased in 1977 over a poor year in 1976 while Company-reported margins for the Equipment Group remained essentially flat. Our estimated lower margin for the Materials and Electrical Products Group resulted from both Company-reported lower margins for Metals and our estimated lower margins for Electrical Controls.

Company Reorganization

A major reorganization in February 1978 split the Semiconductor Group into two segments. Jim Fischer (formerly responsible for Corporate Development) now has responsibility for all semiconductor operations in the U.S., Japan, and the Far East; Stewart Carrell is responsible for TI's European Semiconductor Group. DATAQUEST understands that Mr. Carrell was sent to Europe to solve a number of problems that existed there as well as to place top management in Europe where TI is seeking a greater presence.

Table 1

Texas Instruments

ESTIMATED REVENUES 1976-78

(Dollars in Millions)

Group	1976	Percent Change 1976-77	1977	Percent Change 1977-78	1978
Semiconductor	$ 679	13.7%	$ 772	13.3%	$ 875
Consumer Products	286	37.8%	394	24.4%	490
Digital Systems	110	50.0%	165	36.4%	225
Equipment	331	18.7%	393	15.8%	455
Materials and Electrical Products	284	17.6%	334	12.3%	375
Services	138	26.8%	175	11.4%	195
Intracompany Sales	(169)	10.6%	(187)	15.0%	(215)
Total Revenues	$1,659	23.3%	$ 2,046	17.3%	$ 2,400
After-Tax Profit Margin	5.87%		5.70%		5.75%
After-Tax Profits	$97.42	19.73%	$116.64	18.3%	$138.00
Earnings Per Share	$ 4.25	20.2%	$ 5.11	18.4%	$ 6.05

Source: Texas Instruments, Inc. Annual Report
DATAQUEST, Inc. estimates
March 1978

Table 2

Texas Instruments

ESTIMATED SEMICONDUCTOR GROUP REVENUES

(Dollars in Millions)

	1976	Percent Change 1976-77	1977
Bipolar Digital	$215	14.4%	$246
MOS	135	33.3%	180
Linear	71	29.6%	92
Total IC	$421	23.0%	$518
Transistors	$127	(2.4%)	$124
Diodes	32	(3.1%)	31
Thyristors	8	0.0%	8
Other	7	0.0%	7
Total Discrete	$174	(2.3%)	$170
Total Optoelectronics	$ 60	(5.0%)	57
Total Semiconductors	$655	13.7%	$745
Non Semiconductor Products	55	16.4%	64
(Intragroup Use)	(31)	19.4%	(37)
Semiconductor Group Total	$679	13.7%	$772

Source: DATAQUEST, Inc.
March 1978

Mr. Fischer has Bernard List reporting to him for all U.S. MOS operations; Charles Clough reports for all U.S. bipolar and discrete semiconductor operations. DATAQUEST believes that TI's MOS product offerings, revenues, and profitability were not keeping pace as the markets were rapidly changing from TTL to MOS, thereby necessitating a change in top level management. The MOS Division had earlier been split into MOS memory (Don Brooks), MOS Consumer and Automotive (Gene McFarland), and MOS Microcomputers (Jim Van Tassel).

Dr. Morris Chang, formerly responsible for TI's worldwide semiconductor operation, now is responsible for the Consumer Products Group. No other changes within the Consumer Group were made at that time. However, we understand that Dr. Chang has made some changes in the organization since taking over.

DATAQUEST is currently preparing a more extensive organization chart of Texas Instruments for SIS subscribers.

Corporate Analysis

Texas Instruments has a corporate commitment to growth in order to meet a stated goal of $10 billion revenues in the late 1980s. To attain this goal, the Company has identified three major growth areas—semiconductors, consumer products, and distributed computing. The consumer and distributed computing areas both had excellent growth in 1977 and are expected to have well above average growth in 1978. The Semiconductor Group, the Company's largest, is not growing that fast. Its growth in 1977 was about 14 percent compared to 23 percent for the total Company, and its pretax margin declined to about 12 percent.

The Semiconductor Group includes major segments with limited growth—discrete devices, small scale integration digital circuits, optoelectronics, portions of linear circuits (core interface), and portions of MOS (calculator chips). With a large proportion of slowly increasing businesses, the Semiconductor Group must find significant new growth markets and invest heavily in new product development in order to attain the high growth goals set for semiconductors. DATAQUEST perceives that TI has been hurt by its inability to develop large high technology chips and bring them to market quickly. We also believe that the discrete components business has been highly profitable and has been paying for development elsewhere in the Semiconductor Group.

Texas Instruments faces the difficult task of establishing its position in the MOS marketplace. Although it shipped an estimated 12.4 million 4K dynamic MOS RAMs in 1977, it shipped only about 40,000 16K dynamic MOS RAMs after a year-long redesign effort. Despite the success of the TMS 1000 microcomputer family, the 9900 microprocessor family has not yet really established itself. DATAQUEST believes that TI must profitably establish its complete MOS memory and microprocessor lines in order for the Semiconductor Group to have a good year in 1978.

Consumer Products now has a well established position in calculators and is working toward a similar status in digital watches. We expect that new watch product introductions and a hobby/home computer introduction in 1978 will even more firmly establish this group as a major growth segment of TI's business.

The Company has reorganized to solve problems of the past. The major items it faces in 1978 are:

- Returning the Semiconductor Group to a more profitable status with higher year to year growth
- Establishing its complete microprocessor line in the market
- Adding capacity at a rate to meet the worldwide market demand for its products

Each group of the Company is analyzed in greater detail in the following paragraphs.

Semiconductor Group

DATAQUEST estimates that TI is still the number one worldwide and domestic supplier of semiconductors. We estimate that TI's domestic bookings for 1975, 1976, and 1977 were $355, $386, and $432 million dollars respectively. The year to year growth for domestic bookings was about 9 percent from 1975 to 1976 and 12 percent from 1976 to 1977. We believe that domestic billings followed a similar growth experience thereby underperforming the estimated growth of the Company's worldwide billings. In an earlier newsletter on Motorola (February 23, 1978) we incorrectly stated that Motorola was number one domestically. TI retains its number one position, although we believe that its once dominant position is eroding.

The MOS operation was a major disappointment to TI in 1977. Therefore, we expect major emphasis to be placed on all aspects of this operation. TI's shipments of the 16K dynamic RAM are expected to exceed 1 million units in 1978, up from 40,000 units in 1977. We understand the Company is also increasing its rate of shipments on the 4K dynamic and the 4K static RAMs. TI began shipping the 16-pin 4027 device in about the third quarter of 1977 and we expect this product to represent an increasing percentage of TI's 4K dynamic RAM shipments. The company did ship 8K and 16K EPROMs in 1977 and plans to begin shipping 32K EPROMS very soon.

MOS Microprocessors had a mixed year in 1977. TI shipped an estimated 2.8 million units of its TMS 1000 microcomputer family during the year. These shipments increased rapidly in the third quarter as a lead item to high volume production runs by users of the TMS 1000. Although TI has offered the 8080A in both ceramic and plastic packages, it has not supported this microprocessor with a broad range of peripheral circuits. It has offered this product primarily as a stopgap until the 9900 family was better developed. We estimate that approximately 95,000 units of the 9900 were shipped in

Table 3

Texas Instruments

ESTIMATED PRETAX EARNINGS

(Dollars in Millions)

Group	1976 Revenues	1976 Pretax Earnings	1976 Pretax Margin	1977 Revenues	1977 Pretax Earnings	1977 Pretax Margin
Semiconductor	$679	$ 90.0	13.3%	$772	$ 96.0	12.4%
Consumer Products	286	22.0	7.7%	394	39.0	9.9%
Digital Systems	110	8.0	7.3%	165	15.0	9.1%
Equipment	331	33.0	10.0%	393	39.0	9.9%
Materials & Electrical Products	284	42.0	14.8%	334	47.0	14.1%
Services	138	2.0	1.4%	175	14.0	8.0%
Subtotal		$197.0			$250.0	
Operating Eliminations		(34.5)			(39.1)	
Corporate Earnings		15.5			0.1	
Net Eliminations		(19.0)			(39.0)	
Net Earnings		$178.0			$211.0	

Source: Texas Instruments, Inc. Annual Report
DATAQUEST, Inc. estimates
March 1978

1977. This volume is expected to increase in 1978; the 9980 began shipments in January, and the 9940 is expected to begin shipments in mid-1978.

TI has not had a strong CMOS capability in the past. However, as a result of CMOS capability requirements for LCD watches, TI has renewed its efforts in this area. During the second half of 1977, TI purchased most of its CMOS watch chips from RCA and other suppliers. However, the Company is in the process of redesigning new CMOS chips for advanced watch products. Eventually, we expect TI to make all of these CMOS chips internally. DATAQUEST understands that TI is also attempting a more aggressive posture in other segments of the CMOS market.

TI added a new 4-inch MOS wafer fabrication facility in Lubbock, Texas, during 1977. The installation of equipment was completed in the second half of the year and the facility is expected to gradually process more wafers each month. The facility will process MOS products for use by the Consumer Products Group in Lubbock, as well as memory, microprocessor, and other MOS products.

TI introduced its 92K bit magnetic bubble module in the first half of 1977 and sampled it to a limited set of customers. DATAQUEST understands that TI had production problems throughout most of 1977 with the magnetic bubble modules. TI supported the module with a printed circuit board containing discrete and integrated circuits to interface TTL signals with the bubble memory. It was not until late 1977 that TI completed the development of all the integrated circuits to do the interfacing in a more compact area.

In 1977, TI introduced a portable terminal using the 92K bit bubble module, and we believe the Company is developing other products using bubble memories. We believe that the production problems in 1977 plus TI's desire to achieve unique product advantages using bubbles led to TI's limited presence in the magnetic bubble marketplace later in 1977. We understand that TI is completing development of a 256K bit bubble module and related interface circuits. We expect that after TI has resolved its production problems, developed the new interface circuits, and adequately supported its internal programs, it will become a very aggressive supplier of magnetic bubbles.

TI introduced its 64K CCD in late 1977 and shipped about 5,000 units to interested users. DATAQUEST believes that the program was delayed beyond its original date because of product development priorities diverted to the 16K dynamic MOS RAM program. We believe that TI will aggresively market the CCD in 1978.

In 1977 TI had a strong effort in control and interface linear circuits and bipolar digital circuits especially low power Schottky. New products were introduced and a high level of marketing attention was focused on these product areas. Both linear and bipolar digital enjoyed above industry average growth in 1977.

The Company continued its active role in Electron-Beam (E-Beam) by adding its sixth E-Beam machine in 1977. Two E-Beam machines are in the Central Research Laboratory for R&D, two are in the Semiconductor Electronics Research Laboratory for process development, and two are in the mask shop. In the mask shop, the E-Beam machines generate a single chip pattern which is then stepped and repeated by a special camera to generate the mask. Some direct slice writing is also done in the mask shop. The Company anticipates direct slice writing for some commerical semiconductor products within three years.

Consumer Products Group

DATAQUEST estimates that 1978 Consumer Products Group revenues will increase to about $490 million, up about 24 percent over estimated 1977 revenues. We estimate that the $490 million will be comprised of about $340 million of calculators, $140 million of watches, and $10 million of other products such as hobby/home computers. We estimate that the $394 million of estimated revenues in 1977 was comprised of about $100 million of watches (about 8 million units) and $294 million of calculators.

In 1977, TI introduced both its low-priced LED watch at $9.95 and its LCD watch for men. They also marketed a Star Wars LED watch that came out in September and sold an estimated one million units by Christmas. We understand that TI will be adding more LCD watches to the line, and we are expecting higher priced fashion models as well as chronograph models. A more complete line of ladies watches is also expected in 1978.

TI's SR-58 and SR-59 programmable calculators have been a great success. TI distributed about 10,000 of the SR-59s to its engineering and professional staff. Using ROMs for calculator software, TI has greatly added to the capability of hand-held calculators. In 1977, the Company added a thin-line calculator using LCD displays. This was made for TI by Sharp of Japan, but it is expected that TI will eventually make the product internally.

We understand that TI is actively pursuing the hobby/home computer market with a product expected to be announced at the June Consumer Electronics Show. We expect that TI will unveil a product that is very competitive both functionally and in terms of price.

Morris Chang, the new Director of the Consumer Products Group, brings with him much engineering and technical knowhow. However, he will probably rely heavily on the existing marketing organization which has developed a very effective marketing and sales organization across the United States and worldwide, with some 75,000 outlets now offering TI Consumer Products. TI uses direct sales into the major retailers and catalog stores, and we expect that they will continue to increase this penetration.

Digital Systems

We estimate that the $165 million of Digital Systems sales were comprised of about $80 million in terminals, $60 million in computer systems, and $25 million in digital field systems. The digital field systems are digital recording instruments for use in the oil exploration industry.

TI has a well established product line in its Silent 700 printing terminals. In 1977 it introduced the Model 765 with bubble memory, and we expect to see additional terminal and computer products with bubble memories in the future. This terminal division has been very profitable with pretax margins of about 12 percent.

The Computer Systems Division in Austin, Texas had good revenue growth in 1977 with marginal profitability. High marketing and tooling costs associated with the turnkey computer systems business are problems, and the Company is actively working to reduce turnkey business to about 10 percent of Digital Systems revenues in 1978. The other 90 percent of revenues will be standard computer and terminal systems to end-users or OEMs. We understand that turnkey systems represented about 25 percent of the division's business about four years ago.

Digital Systems is believed to be developing word processing systems and we expect that one or more new systems will be introduced in 1978.

TI announced its thrust in distributed computing in April 1976. After two years of planning and development, we believe that TI is well positioned with microcomputer, terminal, and computer products to become an aggressive supplier of distributed systems. However, TI has suffered from inadequate software systems and support in the past and we believe this problem must be resolved in order for TI's distributed processing thrust to be fully effective. The Company's emphasis on distributed computing is led by Group Vice President Sam K. Smith and is largely centered in two areas—Digital Systems Group and TI's Semiconductor Group where microprocessor activities now include microcomputers-on-a-board.

Equipment Group

This group which serves the government electronics market currently has a very good match between production and development programs. In 1977 its revenues were up about 19 percent over 1976, and we are expecting about 16 percent revenue growth in 1978. Pre-tax margins have been running a consistent 10 percent for this group.

The Equipment Group is organized into three major product divisions, each representing about one-third of the group business—Radar, Missile and Ordnance, and Electro-Optical. The Radar Division develops and produces ground-based and airborne radars

for the Department of Defense and the FAA. Production of the Airport Surveillance Radar-8 (ASR-8) for the FAA is a major program in this division. Over 175 airports worldwide use the ASR-5,-6,-7, and -8 equipment produced by TI over the last decade.

The Missile and Ordnance Division has a number of major production programs. The Shrike missile has been in production since the mid-1960s and is currently at its highest production rate in history. TI recently received a $72 million contract for production of guidance kits for the Laser Guided Bomb. This production program is expected to run for several years.

The Electro-Optical Division is highly competent in FLIR (Forward Looking Infra-Red) Systems. It has been developing and perfecting this product technology for over ten years and has now a series of modular FLIR systems that can be used as building blocks to meet the various military requirements.

Materials and Electrical Products Group

This group contains both the Electrical Controls Division and the Metallurgical Materials Division. We estimate that the Electrical Controls Division represents $186 million dollars of the group total while the Metallurgical Materials Division represents $148 million of the total.

The construction of TI's new clad metals facility in Attleboro, Massachusetts, was slowed somewhat by the severe weather in the Northeast, but completion is still expected in the first half of 1978. TI will remain somewhat capacity limited until this new plant is on stream. General Motors used TI's clad metals in some 105 applications in model year 1978 and it expected to increase its use to about 150 applications in model year 1979. The Electrical Controls division makes a variety of electrical chokes, control valves, thermostats, appliance controls, motor protectors, circuit breakers, pressure switches, and keyboards that are widely used by industrial manufacturers.

Services Group

This group, which provides exploration and computation services to the petroleum industry, had good revenue growth in 1977 as the cash flow of the oil companies improved. Marine exploration is growing modestly but land exploration is growing strongly, particularly in the United States. The Company continued to make progress with its 3D exploration techniques and now has about 70 projects worldwide using this approach. 3D is a three dimensional seismic data gathering and processing technique to delineate petroleum bearing formations that greatly improves upon older two dimensional techniques. Two Advanced Scientific Computers (ASCs) in Austin, Texas are devoted to billable activity for this group.

Capacity and Land Acquisition

TI added semiconductor fabrication capacity at two sites in 1977. In Lubbock, Texas it added a highly automated 4-inch MOS wafer fabrication facility and in Freisig, Germany it added a new wafer fabrication facility. The new clad metals plant for Attleboro was begun in 1977 and is expected to be making product in the first half of 1978. Construction of a new Digital Systems plant was started recently in Temple, Texas with completion expected in late 1978 or early 1979.

TI also made several important site acquisitions in the last 12 to 14 months. It acquired a modern Timex plant in Abilene, Texas and is using it for consumer product manufacturing. The Company also acquired about 500 acres of land northwest of Houston for a new Digital Systems plant expected about 1980 and about 200 acres of land near Louisville, Texas for future expansion. These plus a number of other capital programs were part of TI's $199 million capital expenditure in 1977.

Daniel L. Klesken
James F. Riley
Frederick L. Zieber

DATAQUEST INCORPORATED RESEARCH NEWSLETTER

SIS Code: 8.12 Texas Instruments July 7, 1977

UPDATE ON TEXAS INSTRUMENTS

Summary

Texas Instruments' semiconductor shipments are forecast by DATAQUEST to be up 20 percent in 1977 (which matches our forecast of 20 percent growth in total U.S. factory shipments). We expect good revenue growth from all major groups and divisions within Texas Instruments. The Consumer Products Group is expected to be up 21 percent, the Digital Systems Division up 27 percent, the Equipment Group up 17 percent, the Materials and Electrical Products Group up 12 percent, and the Services Group up 7 percent. DATAQUEST expects TI's margins to improve slightly over the 5.9 percent of 1976 to approximately 6.1 percent in 1977.

DATAQUEST's major conclusions on Texas Instruments are:

- Texas Instruments' corporate sales are expected to increase 17 percent to $1,945 million, up from $1,659 million in 1976.
- All major divisions and groups are expected to be profitable in 1977.
- Texas Instruments is very well positioned in the consumer electronics market with its calculator and digital watch products.
- Texas Instruments' major investments and growth are expected to be centered in its three major corporate thrusts—semiconductors, consumer products, and distributed computing.

Corporate Analysis

DATAQUEST's estimates of revenues for each of Texas Instruments' major groups or divisions for 1975, 1976, and 1977 are presented in Table 1.

The company has reported that it expects capital expenditures to increase 52 percent to $210 million, up from $138 million in 1976. This large capital expenditure equals 67 percent of TI's net plant, property, and equipment as of December 31, 1976 and indicates a substantial investment in new plant and equipment. We estimate that the Semiconductor Group and Consumer Products Group are recipients of major portions of this $210 million.

Texas Instruments has also reported that its R&D spending in 1977 will increase 31 percent to $94 million from $72 million in 1976; this represents an R&D expenditure of 4.8 percent of estimated total revenues. We believe that TI's three major thrusts—semiconductors, consumer products, and distributed computing—will be major recipients of these R&D dollars. TI's R&D spending has generally been in the range of 4 to 5 percent of sales, whereas most other companies in the semiconductor industry spend 7 to 10 percent of sales on research and development. We believe that TI obtains extremely good value for its R&D expenditures, so that it need invest fewer R&D dollars as a percent of sales. TI probably does not define its R&D expenditures as broadly as other companies do, which could account for a few percentage points difference and thus raise TI's figure on a consistently comparable basis.

Semiconductor Group

DATAQUEST expects the Semiconductor Group's revenues to grow from $669 million to $800 million, a 20 percent increase. Bookings were believed to have been rather weak in January and February. Although they strengthened somewhat in March and April the book-to-bill ratio for the second quarter is estimated to be 1.05 to 1. We believe that this booking weakness is due to TI's losing discrete market share to Motorola and to a sluggish TTL business.

In linear integrated circuits, TI has been very aggressive. TI, National, and Motorola are the leaders in the linear integrated circuits market and TI has been very aggressive in picking up additional new business. The company has added a number of field application engineers during the last six months to enhance its linear sales. Furthermore, TI is double-labeling its products which it had been very hesitant to do in the past; in other words, TI labels its parts with the National or Motorola part number if that happens to be a more popular part number.

The company has recently become very aggressive in the pricing and marketing of its optoelectronics products. DATAQUEST understands that TI has a goal to double or triple its optoelectronics business in the next six months. The company currently has three optoelectronic field applications engineers in the United States and expects to have ten by the end of the year.

In MOS memory, TI shipped 5.7 million 4K RAMs in 1976. We expect that TI will ship in excess of 9 million units in 1977. It is introducing 4K by 1 and 1K by 4 static MOS RAMs during the second and third quarters of 1977. TI does have a 16K dynamic MOS RAM; however, the company is experiencing production problems with it and very limited samples are available in the marketplace. DATAQUEST understands that TI is going back for additional redesign on the 16K devices. The company has not yet become a force in the bipolar memory marketplace although it has been very aggressive in the bipolar PROM market.

TI's microprocessor strategy is beginning to make inroads in the marketplace. TI covers the low-cost, high-volume consumer and control applications with its 4-bit TMS 1000 family of microprocessors. It has a series of more powerful 16-bit microprocessors in its TMS 9900 family for a wide range of applications requiring more computational or control capability than the TMS 1000 family offers. The 9900 family is also software compatible with TI's 990 minicomputer. TI also second sources the Intel 8080, but has not established itself in the large 8-bit marketplace.

The TMS 1000 is beginning to appear in some rather large volume applications. We understand at least two toy manufacturers will be using them in large quantity for this Christmas season. DATAQUEST estimates that TI shipped 140,000 TMS 1000 units in the first quarter, which is up 40 percent over the fourth quarter. We estimate that the company shipped 15,000 TMS 9900 units in the first quarter, up 50 percent over the fourth quarter, as more users are beginning to recognize and appreciate the power of the 9900 family.

Texas Instruments has introduced its 64K CCD and is currently sampling it in small quantities. The company expects to be shipping units in the third quarter. TI began sampling its 92-kilobit magnetic bubble device (MBD) early in 1977. The 92K bit MBD is currently priced at $200; for $250 the MBD is available with a PC board and instructions for building a controller and interface. We expect that TI will be marketing MBDs very aggressively in the coming months. Presently, potential users are evaluating MBDs in their product development labs. However, TI's Digital Systems Division has already introduced two terminals using MBDs for of non-volatile memory. We expect additional commercial and consumer products to be introduced in the coming months using magnetic bubble memories.

Consumer Products Group

DATAQUEST expects TI's Consumer Product Group revenues to increase 21 percent to $315 million, up from $260 million in 1976. The $315 million revenues should be split into $220 million of calculators, $90 million of watches, and $5 million of others (mainly the new CB radios).

Texas Instruments' position in calculators is now secure. It has a broad and solid product line ranging from the low-end consumer models through the scientific hand-held models, to the desk-top scientific and business calculators. At the June Consumer Electronics Show in Chicago, TI showed SR-57, SR-58, and SR-59 models; they are all programmable and have considerable calculating power. The SR-57 is a key programmable calculator with 50 program steps retailing at $79.95. The SR-58 is a key programmable calculator retailing at $124.95, and is substantially more powerful. The SR-59 retails at $299.95 and has both solid state software ROMs and magnetic cards. This machine offers up to 960 program steps with no data locations or the flexibility to trade off program and data storage locations and have 160 program steps and 100 data locations or combinations in between.

We believe that these new calculator introductions by TI will significantly impact the market presently served by competing hand-held programmable calculator models. TI's introductions also have the potential to eventually penetrate the large desktop programmable calculator market.

The SR-59 incorporates a new concept that TI calls "Solid State Software." TI uses plug-in read only memory (ROM) modules to store up to 5,000 preprogrammed steps of software libraries. Previously, the magnetic card stored 224 steps. Going from 224 program steps to 5,000 steps is a 22-fold improvement in program density.

The concept of solid state software was discussed by Mark Shepherd, Jr., Chairman of the Board of TI, at the June NCC Conference held in Dallas. At that time, Mr. Shepherd indicated that solid state software with significant programs stored in ROMs would become increasingly important in the future because it offers the potential for labor-saving in software production. DATAQUEST believes this recent development from TI is quite significant because it makes possible the sale of patented software.

Texas Instruments introduced a broad line of LCD watches at the Chicago show. They are tritium backlighted and retail in the $20 to $35 range. TI's LCD watch unit currently uses the RCA CMOS chip, the Beckman LCD display, and the Motorola crystal. DATAQUEST believes that outside sources for parts were used to bring the product to market sooner, but expects that TI will eventually supply its own CMOS chip and LCD display.

The company's line of LED watches retails in the range of $9.95 to $35.00. TI introduced the $9.95 watch in the second quarter of 1977, upsetting the digital watch market. The $9.95 entry is priced below any of the Timex mechanical watches, so that we believe TI is already picking up market share from Timex. We estimate that the manufacturing cost of the $9.95 LED plastic watch is in the $4.25 to $4.50 range and that TI ships it to the retailer at $7.50, thereby making at least 40 percent gross margin. However, we believe that the low end watch market is still only marginally profitable for TI.

Because until recently TI has apparently not been changing its production schedule to meet fluctuating demand in the consumer market we understand that TI currently has approximately 2.5 million digital watches in inventory. Some 1976 model year watches are believed to be still on retail inventory. We have seen data indicating that in the March time frame 43 percent of the watches selling over $50 were digital whereas 32 percent of the watches selling between $25 and $50 were digital and only 10 percent of the watches under $25 were digital. We believe that as the Christmas season approaches the market will change and and a much larger percentage of the under $25 watches will be digitals. This will benefit both Texas Instruments and Fairchild.

The announcement of TI's CB radio is a very significant event because it marks TI's entry into the personal communications business.

TI has for some time been interested in the personal communications market which it currently estimates at $1 billion. It expects this market to grow to $3 billion by the mid-1980s, and the company intends to be a serious contender.

Although TI has not announced any future products, these products could certainly include items such as cordless telephones, pagers, and eventually private mobile communications. It the company enters the private mobile communications business, it will certainly be competing directly with Motorola. DATAQUEST expects that by approximately 1980 TI will be confronting Motorola in the communications business.

This summer TI is completing the move to Lubbock, Texas of all of the remaining engineering, administration, and marketing functions of its Consumer Products Group. We understand that a number of key people have decided not to make the move and have remained in Dallas; most have found other positions within TI, but a few individuals have left the company.

Digital Systems Division

DATAQUEST estimates that TI's DSD sales will be $140 million in 1977, up 27 percent from $110 million in 1976. This division has two major profit and loss centers—terminals and minicomputers. TI's terminals have been in the marketplace since approximately 1970 and are gaining market share. They are respected for price, technology, and meeting market needs. TI showed two terminals at the recent National Computer Conference using magnetic bubble memories. Additional products such as add-on memory using magnetic bubbles are expected from DSD in the coming months.

TI's minicomputers have been competitive in price and technology, but its software has been substandard compared to the competition. We understand that this situation is improving. TI's 990 minicomputer family is fully software compatible with its 9900 microprocessor. We believe that this is a very important strategy and that it will pay off in the long term. However, in the short term, the 9900 and 990 have experienced limited success.

We understand that this division is actively working on word processing equipment.

Equipment Group

DATAQUEST expects the Equipment Group's revenues to grow to $385 million, up 17 percent from $330 million in 1976. This group has been, and continues to be, solidly profitable. It has a good mix of production and R&D contracts, as well as a good backlog for the future. DATAQUEST expects continued revenue growth and good profits from this group. The four major divisions are the Electro-Optical Division, which manufactures such military products as the FLIR; the Missile and

Ordnance Division, which manufactures missiles such as Paveway, Harpoon, and Harm; the Tactical Weapons Division, which conducts advanced weapons work; and the Radar Division, which manufactures ground and airborne radars. Another major segment is New Business Development, which handles TI's development of the Global Positioning Satellite (GPS).

Materials and Electrical Products

DATAQUEST estimates that this group's revenues will increase 12 percent to $240 million, up from $215 million in 1976. A major product of this group is stainless-steel-clad aluminum used in automotive trim. TI has a patented process which enables it to clad aluminum with a stainless steel finish; this makes it less expensive but attractive and corrosion resistant for automotive trim. We understand that TI is currently production-limited for this product. TI will most likely be allocating capital expenditures to increase its clad metal production capacity.

Services Group

DATAQUEST estimates that the Services Group revenues will increase 7 percent to $160 million, up from $150 million in 1976. Current exploration for oil is still somewhat limited; therefore, DATAQUEST does not expect a particularly large growth from this group.

Daniel L. Klesken
James F. Riley
Frederick L. Zieber

Table 1

Texas Instruments Incorporated
ESTIMATED REVENUES
(Dollars in Millions)

Group/Division	1975	Percent Change 1975-1976	1976	Percent Change 1976-1977	1977
Semiconductor Group	$ 537	24.6%	$ 669	19.6%	$ 800
Consumer Products Group	210	23.8%	260	21.1%	315
Digital Systems Division	71	54.9%	110	27.3%	140
Equipment Group	270	22.2%	330	16.6%	385
Materials and Electrical Products Group	195	10.3%	215	11.6%	240
Services Group	145	3.4%	150	6.6%	160
Intracompany Sales	(60)		(75)		(95)
Total Revenues	$1,368	21.3%	$1,659	17.2%	$ 1,945
Total Earnings	$62.14	56.8%	$97.42	21.8%	$118.65
Earnings as a Percent of Sales	4.54%		5.87%		6.10%

Source: DATAQUEST, Inc.
July 1977

DATAQUEST INCORPORATED RESEARCH NEWSLETTER

SIS Code: 8.12 Texas Instruments December 30, 1976

TEXAS INSTRUMENTS SEMICONDUCTOR SHIPMENTS

Estimated 1976 semiconductor shipments for Texas Instruments are shown in Table 1. Table 2 compares the percent increase in shipments, 1976 over 1975, for both Texas Instruments and all U.S. semiconductor companies combined. TI's sales are estimated to have increased essentially at the same rate as our estimate for all U.S. semiconductor companies.

The product segment comparisons with U.S. industry can be misleading and should not be considered a measure of the relative strength or weakness of Texas Instruments versus the rest of the industry. At TI, bipolar digital has performed well in 1976 primarily because of a strong rebound from a poor 1975, although shipments are still below 1974 levels. However, the high sensitivity of TTL shipments to the economy give a greater cyclicality to this product area.

Although TI linear shipments have grown slower, it is an area of intense new product development and competitiveness by TI. The slow growth is partly due to the company's high penetration in core interface, which has not grown since there has been a decline in the usage of core memories.

In MOS, TI has been hurt by the decline in calculator chip prices and 4K RAM prices. Along with Intel, however, TI remains one of the top two MOS manufacturers. Companies with rapid growth in MOS from a small base—such as AMD, Fairchild, Motorola, or Synertek—have caused a loss of market share by both TI and Intel.

TI has a major market position in small signal discrete devices—about $100 million. Furthermore, its power transistor markets are somewhat diversified. We believe TI has been keeping prices up in some discrete areas and using the profits from these areas to finance development in other fast-growing semiconductor markets.

The high growth rate in the optoelectronic market represents both an increase in the general market and larger in-house usage for TI calculators for watches. Texas Instruments and Hewlett-Packard are emerging as the major market leaders in optoelectronics.

James F. Riley
Frederick L. Zieber
Daniel L. Klesken

Table 1

Texas Instruments

ESTIMATED 1976 SEMICONDUCTOR DIVISION SHIPMENTS

(Dollars in Millions)

	North America	Europe	Japan	Rest of World	Total
Total Semiconductors	$ 377	$ 173	$ 63	$ 42	$ 655
Total IC	250	106	41	16	413
Bipolar Digital	123	61	24	7	215
MOS	99	21	12	3	135
Linear	28	24	5	6	63
Total Discrete	75	62	15	21	174
Transistors	58	45	12	12	127
Small Signal	34	27	4	5	70
Power	24	18	8	7	57
Diodes	12	10	2	8	32
Small Signal	10	7	1	5	23
Power	2	3	1	3	9
Thyristors	3	2	1	2	8
Others	2	5	0	0	7
Optoelectronics	52	5	7	4	68

Source: DATAQUEST, Inc.

Table 2

ESTIMATED GROWTH OF SEMICONDUCTOR SHIPMENTS—1975 TO 1976

(Percent)

Product	U.S. Industry	TI
Total Semiconductor	26%	26%
Bipolar Digital	25%	34%
Linear IC	28%	15%
MOS	42%	35%
Discrete	18%	12%
Optoelectronics	29%	36%

Source: DATAQUEST, Inc.

Texas Instruments, Inc.

Texas Instruments, Inc.
13500 N. Central Expressway
Dallas, Texas 75265
Telephone: (214) 995-2011
(Millions of Dollars Except Per Share Data)

Balance Sheet (December 31)

	1982	1983	1984	1985	1986
Working Capital	$ 568	$ 221	$ 446	$ 402	$ 668
Long-Term Debt	$ 214	$ 225	$ 381	$ 382	$ 191
Shareholders' Equity	$ 1,361	$1,203	$ 1,541	$ 1,428	$ 1,727
After-Tax Return on Average Equity (%)	11.0	(11.3)	23.0	(8.0)	1.8

Operating Performance (Fiscal Year Ending December 31)

	1982	1983	1984	1985	1986
Revenue	$ 4,327	$4,580	$ 5,742	$ 4,925	$ 4,974
U.S. Revenue	$ 2,998	$3,295	$ 4,087	$ 3,506	$ 3,488
Non-U.S. Revenue	$ 1,329	$1,285	$ 1,655	$ 1,419	$ 1,486
Cost of Revenue	$ 3,108	$3,607	$ 3,823	$ 3,669	$ 3,629
R&D Expense	$ 236	$ 301	$ 367	$ 402	$ 406
SG&A Expense	$ 700	$ 901	$ 858	$ 817	$ 827
Pretax Income	$ 213	($ 323)	$ 487	($ 115)	$ 987
Pretax Margin (%)	4.9	N/A	8.5	N/A	19.8
Effective Tax Rate (%)	32.4	N/A	35.1	N/A	59.6
Net Income	$ 144	($ 145)	$ 316	($ 119)	$ 29
Average Shares Outstanding (Millions)	23.61	23.86	24.21	24.95	25.31
Per Share					
Earnings	$ 6.10	($ 6.09)	$ 13.05	($ 4.76)	$ 1.14
Dividends	$ 2.00	$ 2.00	$ 2.00	$ 2.00	2.00
Book Value	$ 57.65	$50.42	$ 63.65	$ 57.23	$ 68.23
Price Range	$ 70 1/2-152 1/2	$ 101-176	$111 3/4-149 1/2	$ 86.25-131.75	$102.75-148.25
Total Employees	80,007	80,696	86,563	77,872	77,270
Capital Expenditures	$ 342.0	$478.0	$ 722.0	$ 515.0	$ 447.0

N/A = Not Applicable

Source: Texas Instruments, Inc.
Annual Reports
Dataquest
May 1987

Texas Instruments, Inc.

Table 1

Texas Instruments, Inc.
ESTIMATED REVENUE BY OPERATING GROUP
(Millions of Dollars)

	Fiscal Year Ending December 31				
	1982	1983	1984	1985	1986
Semiconductor Group	$1,305	$1,638	$2,484	$1,742	$1,820
Digital Products Group	1,173	1,109	1,147	1,000	931
Government Electronics Group	1,084	1,236	1,417	1,480	1,717
Materials and Electrical Products Group	381	460	483	486	425
Services Group	629	440	431	407	259
Intracompany Sales	(245)	(303)	(220)	(191)	(178)
Total Revenue	$4,327	$4,580	$5,742	$4,924	$4,974

Source: Texas Instruments, Inc.
Annual Reports
Dataquest
May 1987

Texas Instruments, Inc.

Table 2

Texas Instruments, Inc.
ESTIMATED SEMICONDUCTOR REVENUE
(Millions of Dollars)

	1982	1983	1984	1985	1986
Total Semiconductor	1,305	1,638	2,484	1,742	1,820
Total Integrated Circuit	1,155	1,535	2,375	1,653	1,728
Bipolar Digital (Technology)	520	667	1,077	796	875
TTL	505	650	1,056	786	863
ECL					
Other Bipolar Digital	15	17	21	10	12
Bipolar Digital (Function)	520	667	1,077	796	875
Bipolar Digital Memory	43	50	70	44	48
Bipolar Digital Logic	477	617	1,007	752	827
MOS (Technology)	400	572	889	522	501
NMOS	300	461	752	428	416
PMOS	80	91	97	46	24
CMOS	20	20	40	48	61
MOS (Function)	400	572	889	522	501
MOS Memory	250	371	670	349	299
MOS Micro Devices	95	135	117	88	94
MOS Logic	55	66	102	85	108
Linear	235	296	409	335	352
Total Discrete	90	48	59	56	58
Transistor	80	45	57	54	58
Small Signal Transistor	30	12	15	12	13
Power Transistor	50	33	42	42	45
Diode	5	0	0	0	0
Small Signal Diode					
Power Diode	5	0	0	0	0
Zener Diode	0	0	0	0	0
Thyristor	3	2	1	1	0
Other Discrete	2	1	1	1	0
Total Optoelectronic	60	55	50	33	34
LED Lamps	8	7	6	4	5
LED Displays	28	26	28	17	17
Optical Couplers	8	7	6	3	3
Other Optoelectronics	16	15	12	9	9

Source: Dataquest
May 1987

Texas Instruments, Inc.

Table 3

Texas Instruments, Inc.
FINANCIAL STATEMENT HISTORY 1979-1986
(Millions of Dollars)

		Fiscal Year Ending December 31									
		1979	1980	1981	1982	1983	1984	1985	1986	CAGR	LSQR
BALANCE SHEET											
1	CASH & LIQUID SECURITIES	116.64	139.80	150.00	420.00	184.90	274.40	158.80	214.40	9.09	7.26
3	RECEIVABLES	547.98	629.80	590.60	641.70	664.60	793.70	620.10	669.70	2 91	2.71
4	INVENTORY	340.25	442.70	372.00	360.00	335.60	489.20	447.70	609.50	8.68	5.99
5	PREPAID EXPENSES	78.27	87.00	84.30	105.20	266.60	301.10	304.10	287.80	20.44	27.07
7	EXCESS FUNDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	TOTAL CURRENT ASSETS	1083.14	1299.30	1196.90	1526.90	1451.70	1858.40	1530.70	1781.40	7.37	6.86
9	GROSS P P E	1275.61	1723.00	1939.00	2083.80	2266.30	2577.10	2775.60	2889.70	12.39	11.37
10	ACCUMULATED DEPRECIATION	463.14	625.60	833.50	987.50	1067.30	1096.00	1325.60	1452.70	17 74	16.26
11	NET P P E	812.47	1097.40	1105.50	1096 30	1199.00	1481.10	1450.00	1437.00	8.49	7.85
12	MISC ASSETS	12.57	17.00	8.10	8.20	62.60	83.90	95.40	118.30	37.74	48.76
15	*TOTAL ASSETS*	1908.18	2413.70	2310.50	2631.40	2713.30	3423.40	3076.10	3336.70	8.31	7.83
16	DEFERRED INC DISTRIB	179.30	170.40	32.40	49.50	37.30	46.30	29.60	79 40	(10 98)	(15.01)
17	ACCOUNTS PAYABLE	536.71	630.40	614.30	784.00	1050.80	1122.60	1024.70	989.20	9 13	11 06
18	ACCRUED TAXES	100.27	92.10	67.00	68.80	77.20	135.00	56.70	25.60	(17 72)	(10.97)
19	ACCRUED LIABILITIES	52.92	66.50	38.00	44.60	53.20	96.00	5.30	4.70	(29 24)	(27 18)
20	CURR MAT LONG TERM DEBT	1.75	0.40	1.30	0.00	0.00	0.00	0.00	0.00	0 00	0 00
21	OTHER CURRENT LIABILITIES	11.41	11.60	11.80	11.80	12.00	12.30	12.60	14.20	3 17	2 51
22	TOTAL CURRENT LIABILITIES	882.36	971.40	764.80	958.70	1230.50	1412.20	1128.90	1113.10	3.37	5 46
23	LONG TERM DEBT	17.56	211.70	211.70	214.00	225.10	380.70	381.90	191.40	40 67	29 14
24	DEFERRED CREDITS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0 00	0 00
25	MISC LIABILITIES	17.11	12.70	9.10	6.80	3.80	7.20	0.00	0.00	0 00	0 00
26	MINORITY INTEREST	38.26	53.40	64.80	91.10	51.20	82.80	137.60	305.10	34 53	26 02
27	DEFICIT FUNDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0 00	0 00
28	TOTAL LIABILITIES	955.29	1249.20	1050.40	1270.60	1510.60	1882.90	1648.40	1609 60	7 74	8 64
29	PREFERRED STOCK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0 00	0.00	0 00
30	COMMON STOCK	23.06	23.40	23.70	23.80	24.10	24.70	25.30	25 70	1 56	1 54
31	CAPITAL SURPLUS	107.81	149.50	181.20	186.60	218.00	287.10	342.50	674 80	29.95	24 66
32	RETAINED EARNINGS	842.71	1008.80	1070.30	1167.10	973.90	1241.30	1072.50	1039.30	3.04	2.46
33	CUM TRANSL ADJ	(20.70)	(17.20)	(15.10)	(16.78)	(13.30)	(12.60)	(12.60)	(12.50)	(6 95)	6.73
34	TOTAL EQUITY	952.88	1164 50	1260.10	1360.80	1202.70	1540.50	1427.70	1727.10	8 87	6.97
35	*TOTAL LIAB & EQUITY*	1908.18	2413.70	2310.50	2631.40	2713.30	3423.40	3076.10	3336.70	8 31	7.83
36	NET WORKING CAPITAL	200.78	327.90	432.10	568.20	221.20	446.20	401.80	668.30	16.74	10.76
INCOME & EXPENSES											
38	SALES	3224.13	4074.70	4206.00	4326.60	4579.80	5741.60	4924.50	4974.00	6 39	6.10
40	COST OF GOODS	1932.64	2391.10	2595.10	2656.10	3150.90	3274.30	3012.80	3066.10	6.82	6 46
41	GROSS PROFITS	1291.49	1683.60	1610.90	1670.50	1428.90	2467.30	1911.70	1907.90	5.73	5.49
42	S G & A EXPENSE	515.65	636.70	674.10	699.60	901.00	856.10	816.90	827.00	6.98	6.80
43	R&D EXPENSE	134.34	188.50	219.40	236.50	301.00	367.00	402.00	406.00	17 12	17.17
44	OTHER OPER EXPENSES	76.73	96.50	40.30	47.70	58.50	168.10	64.20	9 70	(25 58)	(13.34)
45	OPERATING PROFIT	564.76	761.90	677.10	686.70	168.40	1074.10	628.60	665.20	2.37	0.19
46	DEPRECIATION	187.24	257.00	333.30	338.50	351.40	422.60	515.90	426.20	12.47	12.63
47	LEASE PAYMENTS	58.17	86.20	91.20	112.50	105.10	125.70	140.50	137.10	13.03	11.76
48	INTEREST EXPENSE	19.52	44.30	41.30	33.10	36.00	48.90	40.40	24.10	3.06	1.93
49	MISC EXPENSE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
51	DISCONT OPNS	8.91	4.60	(36.60)	10.50	0.90	9.60	(46.80)	20.90	12.95	0.00
53	PRETAX PROFIT	308.73	379.00	174.70	213.10	(323.20)	486 50	(115.00)	98.70	(15.03)	0.00
54	INCOME TAXES	135.84	166.80	66.50	69.10	(177.80)	170.50	3.70	58.80	(11.27)	0.00
55	LOSS (GAIN) DISC OPNS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00
56	NET PROFIT	172.89	212.20	108.20	144.00	(145.40)	316.00	(118.70)	29.10	(22.47)	0.00
57	EPS AFTER PFD DIVIDENDS	7.58	9.22	4.61	6.10	(6.09)	13.05	(4.76)	1.14	0.00	0.00
58	COMMON DIV PER SHARE	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	0.00	0.00

Source: Texas Instruments, Inc.
Annual Reports
Dataquest
May 1987

Texas Instruments, Inc.

Table 4

Texas Instruments, Inc.
FINANCIAL STATEMENT HISTORY 1979-1986
(Percent)

		Fiscal Year Ending December 31									
		1979	1980	1981	1982	1983	1984	1985	1986	CAGR	LSQR
BALANCE SHEET											
1	CASH & LIQUID SECURITIES	6.11	5.79	6.49	15.96	6.81	8.02	5.16	6.43	0 72	(0 53)
3	RECEIVABLES	28.72	26.09	25.56	24.39	24.49	23.18	20 16	20 07	(4 99)	(4.75)
4	INVENTORY	17.83	18.34	16.10	13.68	12.37	14 29	14.55	18 27	0.35	(1 71)
5	OTHER CURRENT ASSETS	4.10	3.60	3.65	4.00	9.83	8 80	9 89	8 63	11 20	17.84
7	EXCESS FUNDS	0 00	0.00	0.00	0.00	0.00	0.00	0 00	0.00	0.00	0.00
8	TOTAL CURRENT ASSETS	56.76	53.83	51.80	58.03	53.50	54.29	49.76	53.39	(0.87)	(0.90)
9	GROSS P P E	66.85	71.38	83.92	79.19	83.53	75.28	90.23	86.60	3.77	3.28
10	ACCUMULATED DEPRECIATION	24.27	25.92	36.07	37.53	39.34	32.01	43.09	43.54	8.71	7.82
11	NET P P E	42.58	45.47	47.85	41.66	44.19	43.26	47.14	43.07	0.16	0.02
12	MISC ASSETS	0.66	0.70	0.35	0.31	2.31	2.45	3.10	3.55	27.18	37.98
15	*TOTAL ASSETS*	100 00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	(0.00)
16	NOTES PYBLE & CURR LTD	9.40	7.06	1.40	1.88	1.37	1.35	0.96	2.38	(17 81)	(21 19)
17	ACCOUNTS PAYABLE	28.13	26.12	26.59	29.79	36.73	32.79	33.31	29.65	0.75	2 99
18	ACCRUED TAXES	5.25	3.82	2.90	2.61	2.85	3.94	1.84	0.77	(24 03)	(17.44)
19	ACCRUED LIABILITIES	2.77	2.76	1.64	1.69	1.96	2.80	0.17	0.14	(34 67)	(32.47)
20	CURR OBL CAP LEASE	0.09	0 02	0.06	0 00	0.00	0.00	0.00	0 00	0.00	0.00
21	OTHER CURRENT LIABILITIES	0.60	0 48	0.51	0 45	0 44	0 36	0.41	0.43	(4.75)	(4 93)
22	TOTAL CURRENT LIABILITIES	46.24	40.25	33.10	36 43	45.35	41.25	36.70	33.36	(4.56)	(2.20)
23	LTD & NONCURR CAP LSES	0.92	8.77	9.16	8.13	8.30	11 12	12.42	5.74	29.87	19 76
24	DEFERRED TAXES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	MISC LIABILITIES	0.98	0.53	0.39	0.26	0.14	0.21	0.00	0.00	0 00	0.00
26	MINORITY INTEREST	2.00	2.21	2.80	3.46	1.89	2.42	4.47	9.14	24.21	16.86
27	DEFICIT FUNDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	TOTAL LIABILITIES	50.06	51 75	45.46	48.29	55.67	55.00	53.59	48.24	(0.53)	0.75
29	PREFERRED STOCK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	COMMON STOCK	1.21	0.97	1.03	0.90	0.89	0.72	0.82	0.77	(6.23)	(5.83)
31	CAPITAL SURPLUS	5.65	6.19	7.84	7.09	8.03	8.39	11.13	20 22	19.98	15.61
32	RETAINED EARNINGS	44.16	41.79	46.32	44.35	35.89	36.26	34.87	31.15	(4.87)	(4.99)
33	TREASURY STOCK	(1.08)	(0.71)	(0.65)	(0.63)	(0.49)	(0.37)	(0.41)	(0.37)	(14.09)	13.51
34	TOTAL EQUITY	49.94	48.25	54.54	51.71	44.33	45.00	46.41	51.76	0.51	(0.80)
35	*TOTAL LIAB & EQUITY*	100.00	100 00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	(0.00)
36	NET WORKING CAPITAL	10.52	13.58	18.70	21.59	8.15	13.03	13.06	20.03	9.63	2.72
INCOME & EXPENSES											
38	SALES	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100 00	0.00	(0.00)
40	COST OF GOODS	59.94	58.68	61.70	61 39	68.80	57 03	61 18	61.64	0.40	0.34
41	GROSS PROFITS	40.06	41.32	38.30	38.61	31.20	42.97	38.82	38.36	(0.62)	(0.57)
42	S G & A EXPENSE	15.99	15 63	16.03	16 17	19.67	14 95	16.59	16.63	0.56	0.67
43	R&D EXPENSE	4.17	4.63	5.22	5 47	6.57	6 39	8.16	8 16	10 08	10.44
44	OTHER OPER EXPENSES	2.38	2.37	0.96	1 10	1.28	2 93	1 30	0.20	(30 05)	(18.32)
45	OPERATING PROFIT	17.52	18 70	16.10	15.87	3.68	18 71	12 76	13.37	(3 78)	(5.57)
46	DEPRECIATION	5.81	6.31	7.92	7 82	7 67	7 36	10 48	8 57	5 71	6.16
47	LEASE PAYMENTS	1.80	2.12	2.17	2 60	2.29	2.19	2.85	2.76	6 24	5 33
48	INTEREST EXPENSE	0.61	1 09	0.98	0 77	0.79	0 85	0 82	0 48	(3.13)	(3.93)
49	MISC EXPENSE	0.00	0.00	0.00	0.00	0.00	0.00	0 00	0 00	0 00	0.00
51	MINRTY INT IN ADJ SUBS	0.28	0 11	(0.67)	0.24	0 02	0 17	(0.95)	0 42	6 17	0.00
53	PRETAX PROFIT	9.58	9.30	4.15	4 93	(7.06)	8 47	(2.34)	1.98	(20.14)	0.00
54	INCOME TAXES	4.21	4 09	1.58	1 60	(3.88)	2.97	0 06	1 18	(16.60)	0.00
55	EXTRAORDINARY ITEMS	0.00	0.00	0.00	0.00	0.00	0 00	0 00	0.22	0.00	0.00
56	NET PROFIT	5.36	5.21	2.57	3.33	(3.17)	5.50	(2 41)	0 59	(27 13)	0.00
57	EPS AFTER PFD DIVIDENDS	100.00	100.00	100.00	100.00	100.00	100 00	100 00	100.00	0 00	(0 00)
58	COMMON DIV PER SHARE	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	(0.00)

Source: Texas Instruments, Inc.
Annual Reports
Dataquest
May 1987

Texas Instruments, Inc.

Table 5

Texas Instruments, Inc.
FUNDS FLOW HISTORY 1979-1986
(Percent)

		Fiscal Year Ending December 31									
		1979	1980	1981	1982	1983	1984	1985	1986	CAGR	LSQR
SOURCES											
56	NET PROFIT	172.89	212.20	108.20	144 00	(145 40)	316.00	(118.70)	29.10	(22 47)	0 00
46	DEPRECIATION	187 24	257 00	333.30	338.50	351.40	422.60	515.90	426.20	12 47	12.63
61	NEW LONG TERM DEBT	0.25	194 54	1.30	2.30	11 10	155 60	1.20	0.00	0 00	0 00
62	NEW EQUITY	4.32	45.46	34.37	3.92	35.02	70.22	55.80	270 30	80 57	50 46
63	INCR OTHER LIABILITIES	12.80	10.73	7.80	24.00	(42.90)	35.00	47.60	167.50	44.39	0.00
66	TOTAL SOURCES	377.50	719.92	484.97	512.72	209.22	999.42	501.80	893.10	13.09	6 76
USES											
67	P P E EXPENDITURES	427.06	541.93	341.40	329.30	454 10	784.70	484.80	413.20	(0.47)	2.05
68	REPAYMENT LONG TERM DEBT	12.09	1.75	0.40	1.30	0.00	0.00	0.00	190.50	48.27	0.00
69	PREFERRED DIVIDENDS	0.00	0 00	0.00	0.00	0.00	0.00	0.00	0 00	0.00	0 00
70	COMMON DIVIDENDS	45.60	46 04	46.97	47 22	47 72	48 42	49 90	0 00	0 00	0 00
71	INCR OTHER ASSETS	(19.35)	4 43	(8.90)	0.10	54.40	21.30	11 50	22.90	0.00	0.00
72	INCR WORKING CAPITAL	(87.89)	125 76	105.10	134.80	(347.00)	225 00	(44 40)	266.50	0.00	0 00
74	TOTAL USES	377.51	719.92	484.97	512.72	209.22	999.42	501.80	893.10	13.09	6.76
75	EXCESS/DEFICIT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0 00	0.00
76	CUMULATIVE SUR/DEF	0.00	0.00	0.00	0.00	0.00	0.00	0 00	0.00	0 00	0.00

Source: Texas Instruments, Inc.
Annual Reports
Dataquest
May 1987

Texas Instruments, Inc.

Table 6

Texas Instruments, Inc.
FINANCIAL RATIO HISTORY 1979-1986

	Fiscal Year Ending December 31									
	1979	1980	1981	1982	1983	1984	1985	1986	ST AVG	WT AVG
LIQUIDITY										
1 CURRENT RATIO	1.228	1.338	1.565	1.593	1.180	1 316	1.356	1.600	1.397	1 418
2 QUICK RATIO	0 753	0.792	0.968	1.107	0 690	0 756	0.690	0 794	0.819	0.801
3 CASH RATIO	0 132	0.144	0.196	0.438	0 150	0.194	0.141	0.193	0.199	0 200
4 WORKING CAPITAL/SALES	0.062	0.080	0.103	0.131	0.048	0 078	0.082	0.134	0.090	0.095
6 DAYS RECEIVABLES	62.036	56.416	51.253	54.135	52.967	50 456	45.961	49.144	52.796	50.767
7 DAYS INVENTORY	64 260	67.578	52.322	49.471	38.876	54 533	54.239	72.557	56.729	56.555
LEVERAGE										
8 LONG TERM DEBT/CAPITALIZ	0.018	0.154	0.144	0.136	0.158	0.198	0.211	0.100	0.140	0.154
11 LONG TERM DEBT/EQUITY	0.018	0.182	0.168	0.157	0.187	0.247	0.267	0.111	0.167	0.186
12 TOTAL DEBT/EQUITY	0.208	0.326	0.195	0.194	0.218	0.277	0.288	0.157	0.233	0.229
COVERAGE										
13 EBIT/INTEREST	16.816	9.555	5.230	7.438	(7.978)	10.949	(1.847)	5.095	5.657	3.750
14 FIXED CHARGE COVERAGE	4.974	3.904	2.318	2.464	(1.291)	3.786	0.364	1.612	2.267	1.703
16 REPAY LTD+FIX CHARGE COV	4.304	3.652	2.312	2.442	(1.291)	3.786	0.364	0.739	2.064	1.484
OPER PERFORMANCE										
17 GROSS PROFIT/SALES	0.401	0.413	0.383	0.386	0.312	0.430	0.388	0.384	0.387	0.385
18 OPER PROFIT/SALES	0.175	0.187	0.161	0 159	0.037	0.187	0.128	0.134	0.146	0.137
21 PRETAX PROFIT/SALES	0.096	0.093	0 042	0 049	(0.071)	0.085	(0.023)	0 029	0.036	0.021
22 NET PROFIT/SALES	0.054	0.052	0.026	0 033	(0.032)	0.055	(0.024)	0.006	0.021	0.012
23 NET PROFIT/AVG EQUITY	0.195	0.200	0.089	0 110	(0.113)	0.230	(0.080)	0.018	0.081	0.047
24 NET PROFIT/AVG CAPITALIZ	0.191	0.181	0.076	0.095	(0.097)	0.189	(0.064)	0 016	0.073	0.041
26 NET PROFIT/AVG TOT ASSETS	0.101	0.098	0.046	0.058	(0.054)	0.103	(0.037)	0.009	0.041	0.023
27 E P S GROWTH RATE	0.232	0.216	(0.500)	0.324	(1.999)	(3.142)	(1.365)	(1.000)	(0.904)	(1.276)
28 SALES GROWTH RATE	0.264	0.264	0.032	0.029	0.059	0.254	(0.142)	0.010	0.096	0.053
TURNOVER										
31 SALES/AVG EQUITY	3.635	3.849	3.469	3.302	3.573	4.186	3.318	3.153	3.561	3.511
32 SALES/AVG CAPITALIZ	3.561	3.473	2.954	2.840	3.051	3.429	2.640	2 668	3.077	2.955
33 SALES/AVG TOT DEBT + EQTY	3.146	3.020	2.756	2.765	2.965	3.345	2.587	2.593	2.897	2.841
34 SALES/AVG TOTAL ASSETS	1.881	1.886	1.781	1.751	1.714	1.871	1.515	1 551	1.744	1.689
35 SALES/AVG OPER ASSETS	1.906	1.899	1.790	1.757	1.737	1.917	1.558	1 605	1.771	1.723
36 SALES/AVG GROSS P P E	2.928	2.718	2.297	2.151	2.106	2.371	1.840	1.756	2.271	2.098
BALANCE SHEET										
37 CASH/SALES	0.036	0.034	0.036	0.097	0.048	0.048	0.032	0 043	0.046	0.046
38 RECEIVABLES/SALES	0.170	0.155	0.140	0 148	0.145	0.138	0.126	0 135	0.145	0.139
41 INVENTORY/SALES	0.106	0 109	0.088	0.083	0.073	0.085	0.091	0 123	0.095	0.095
42 OTH CURR ASSETS/SALES	0.024	0.021	0 020	0.024	0.058	0.052	0.062	0.058	0.040	0.048
44 GROSS P P E/SALES	0.396	0.423	0.461	0.482	0.495	0.449	0.564	0.581	0.481	0.509
45 LINE 13/SALES	0.000	0.000	0.000	0.000	0 000	0 000	0.000	0 000	0.000	0.000
46 MISC ASSETS/SALES	0.004	0.004	0.002	0.002	0.014	0.015	0.019	0.024	0.010	0.014
47 ACCOUNTS PAYABLE/SALES	0 166	0 155	0.146	0.181	0.229	0.196	0.208	0 199	0.185	0 195
48 ACCRUED TAXES/SALES	0 031	0.023	0 016	0.016	0 017	0 024	0 012	0.005	0.018	0.015
51 ACCRUED LIABILITY/SALES	0 016	0 016	0 009	0 010	0 012	0 017	0.001	0 001	0.010	0.006
53 DEFERRED TAXES/SALES	0 000	0 000	0.000	0.000	0.000	0 000	0 000	0 000	0.000	0 000
54 MISC LIABILITIES/SALES	0.005	0.003	0.002	0.002	0.001	0.001	0.000	0.000	0.002	0.001
56 LINE 26/SALES	0.012	0.013	0.015	0.021	0.011	0.014	0.028	0.061	0.022	0.028
MISCELLANEOUS										
57 EQUITY PER COMMON SHARE	41 795	50.584	53.660	57.639	50 402	63.631	57.227	0.000	46.867	43.580
58 RETIRE/PREV GROSS P P E	(0.085)	(0.074)	(0.073)	(0.095)	(0.130)	(0.174)	(0.111)	(0.108)	(0.106)	(0.116)
61 DEPREC/PREV GROSS P P E	0.202	0.201	0.193	0.175	0.169	0.186	0.200	0.154	0.185	0.180
62 COM DIVS/ERN-PFD DIVS	0.264	0.217	0.434	0.328	(0.328)	0.153	(0.420)	0 000	0.081	(0.010)
63 TAX RATE	0.440	0.440	0.381	0.324	0.550	0.350	(0.032)	0.596	0.381	0.365
64 COST OF GOODS/SALES	0.599	0.587	0.617	0.614	0.688	0.570	0.612	0.616	0.613	0.615

Source: Texas Instruments, Inc.
Annual Reports
Dataquest
May 1987

Texas Instruments, Inc.

Texas Instruments, Inc.
13500 N. Central Expressway
Dallas, Texas 75265
Telephone: (214) 995-2011
(Millions of Dollars Except Per Share Data)

Balance Sheet (December 31)

	1981	1982	1983	1984	1985
Working Capital	$ 432	$ 568	$ 221	$ 446	$ 402
Long-Term Debt	$ 212	$ 214	$ 225	$ 381	$ 382
Shareholders' Equity	$ 1,260	$ 1,361	$1,203	$ 1,541	$ 1,428
After-Tax Return on Average Equity (%)	8.9	11.0	(11.3)	23.0	(8.0)

Operating Performance (Fiscal Year Ending December 31)

	1981	1982	1983	1984	1985
Revenue	$ 4,206	$ 4,327	$4,580	$ 5,742	$ 4,925
U.S. Revenue	$ 2,866	$ 2,998	$3,295	$ 4,087	$ 3,506
Non-U.S. Revenue	$ 1,340	$ 1,329	$1,285	$ 1,655	$ 1,419
Cost of Revenue	$ 3,060	$ 3,108	$3,607	$ 3,823	$ 3,669
R&D Expense	$ 219	$ 236	$ 301	$ 367	$ 402
SG&A Expense	$ 674	$ 700	$ 901	$ 858	$ 817
Pretax Income	$ 175	$ 213	($ 323)	$ 487	($ 115)
Pretax Margin (%)	4.2	4.9	N/A	8.5	N/A
Effective Tax Rate (%)	37.7	32.4	N/A	35.1	N/A
Net Income	$ 109	$ 144	($ 145)	$ 316	($ 119)
Average Shares Outstanding (Millions)	23.48	23.61	23.86	24.21	24.95
Per Share					
Earnings	$ 4.62	$ 6.10	($ 6.09)	$ 13.05	($ 4.76)
Dividends	$ 2.00	$ 2.00	$ 2.00	$ 2.00	$ 2.00
Book Value	$ 53.67	$ 57.65	$50.42	$ 63.65	$ 57.23
Price Range	$ 75- 126 1/4	$ 70 1/2- 152 1/2	$ 101- 176	$111 3/4- 149 1/2	$ 86 1/4- 131 3/4
Total Employees	83,714	80,007	80,696	86,563	77,872
Capital Expenditures	$ 341.4	$ 342.0	$478.0	$ 722.0	$ 515.0

N/A = Not Applicable

Source: Texas Instruments, Inc.
Annual Reports
DATAQUEST
May 1986

Texas Instruments, Inc.

Table 1

Texas Instruments, Inc.
ESTIMATED REVENUE BY OPERATING GROUP
(Millions of Dollars)

	Fiscal Year Ending December 31				
	1981	1982	1983	1984	1985
Semiconductor Group	$1,295	$1,305	$1,638	$2,480	$1,766
Digital Products Group	1,131	1,173	1,109	1,147	1,000
Government Electronics Group	898	1,084	1,236	1,417	1,480
Materials and Electrical Products Group	437	381	460	487	462
Services Group	649	629	440	431	407
Intracompany Sales	(204)	(245)	(303)	(220)	(191)
Total Revenue	$4,206	$4,327	$4,580	$5,742	$4,924

Source: Texas Instruments, Inc.
Annual Reports
DATAQUEST
May 1986

Texas Instruments, Inc.

Table 2

Texas Instruments, Inc.
ESTIMATED SEMICONDUCTOR REVENUE
(Millions of Dollars)

	1978	1979	1980	1981	1982	1983	1984	1985
Total Semiconductor	921	1,212	1,580	1,295	1,305	1,638	2,480	1,766
Total Integrated Circuit	679	952	1,305	1,075	1,155	1,535	2,373	1,677
Bipolar Digital (Technology)	306	422	598	510	520	667	1,048	781
TTL	286	400	575	495	505	650	1,028	771
ECL	8	10	5					
Other Bipolar Digital	12	12	18	15	15	17	20	10
Bipolar Digital (Function)	306	422	598	510	520	667	1,048	781
Bipolar Digital Memory	9	14	55	50	43	50	70	57
Bipolar Digital Logic	297	408	543	460	477	617	978	724
MOS (Technology)	238	360	502	350	400	572	917	524
NMOS		242	374	240	300	461	784	450
PMOS		110	120	100	80	91	101	46
CMOS		8	8	10	20	20	32	28
MOS (Function)	238	360	502	350	400	572	917	524
MOS Memory		240	330	200	250	371	693	345
MOS Micro Devices		80	95	80	95	135	117	94
MOS Logic		40	77	70	55	66	107	85
Linear	135	170	205	215	235	296	408	372
Total Discrete	176	184	191	150	90	48	57	50
Transistor	129	134	138	115	80	45	54	49
Small Signal Transistor	63	64	65	52	30	12	14	11
Power Transistor	66	70	73	63	50	33	40	38
Diode	34	37	39	25	5			
Small Signal Diode	20	22	22	13				
Power Diode	10	11	13	10	5			
Zener Diode	4	4	4	2				
Thyristor	7	7	8	6	3	2	1	
Other Discrete	6	6	6	4	2	1	2	1
Total Optoelectronic	66	76	84	70	60	55	50	39
LED Lamps	8	10	12	9	8	7	6	5
LED Displays	32	37	40	34	28	26	24	18
Optical Couplers	6	8	10	9	8	7	6	4
Other Optoelectronics	20	21	22	18	16	15	14	12

Source: DATAQUEST
May 1986

Texas Instruments, Inc.

Table 3

Texas Instruments, Inc.
FINANCIAL STATEMENT HISTORY 1978-1985
(Millions of Dollars)

		Fiscal Year Ending December 31									
		1978	1979	1980	1981	1982	1983	1984	1985	CAGR	LSQR
BALANCE SHEET											
1	CASH & LIQUID SECURITIES	115.37	116.64	139.80	150.00	420.00	184.90	274.40	158.80	4.67	10.49
3	RECEIVABLES	443.67	547.98	629.80	590.60	641.70	684.60	793.70	620 10	4.90	5.43
4	INVENTORY	300.50	340.25	442.70	372.00	360.00	335.60	489.20	447.70	5.86	4.56
5	OTHER CURRENT ASSETS	55.95	78.27	87.00	84.30	105.20	266.60	301.10	304.10	27.36	30.20
7	EXCESS FUNDS	0.00	0.00	0.00	0.00	0.00	0.00	0 00	0.00	0.00	0.00
8	TOTAL CURRENT ASSETS	915.50	1083 14	1299.30	1196.90	1526.90	1451.70	1858.40	1530.70	7.62	8.53
9	GROSS P P E	927.01	1275.61	1723.00	1939.00	2083.80	2266.30	2577.10	2775.60	16.96	15.48
10	ACCUMULATED DEPRECIATION	354.36	463.14	625.60	833.50	987.50	1067.30	1096.00	1325.60	20.74	20.00
11	NET P P E	572.65	812.47	1097.40	1105.50	1096.30	1199.00	1481.10	1450.00	14.19	12.32
12	MISC ASSETS	31.92	12.57	17.00	8.10	8.20	62.60	83.90	95.40	16.93	28.52
15	*TOTAL ASSETS*	1520.07	1908.18	2413.70	2310.50	2631.40	2713.30	3423.40	3076.10	10.59	10.44
16	LOANS PAYABLE OVERSEAS	45.83	179.30	178.40	32.40	49.50	37.30	46.30	29.60	(6.06)	(15.32)
17	ACCTS PYBLE & ACCRD EXPS	458.30	536.71	630.40	614.30	784.00	1050.80	1122.60	1024.70	12.18	14.13
18	ACCRUED TAXES	69.36	100 27	92.10	67.00	68.80	77.20	135.00	56.70	(2.84)	(0.51)
19	ACCRUED RETIRE BENES	40.18	52 92	66.50	38.00	44.60	53.20	96.00	5.30	(25.13)	(13.01)
20	CURR MAT LONG TERM DEBT	12.09	1.75	0.40	1.30	0.00	0.00	0.00	0.00	0.00	0.00
21	DIVIDENDS PAYABLE	11.39	11.41	11.60	11.80	11.80	12.00	12.30	12.60	1.46	1.42
22	TOTAL CURRENT LIABILITIES	637.16	882.36	971.40	764.80	958.70	1230.50	1412.20	1128.90	8.51	9.07
23	LONG TERM DEBT	19.07	17.56	211.70	211.70	214.00	225.10	380.70	381.90	53.44	54.52
24	DEFERRED TAXES	0.00	0.00	0.00	0.00	0.00	0 00	0.00	0.00	0.00	0.00
25	MISC LIABILITIES	16.58	17.11	12.70	9.10	6.00	3.00	7.20	0.00	0.00	0.00
26	DEFERD CREDITS & OTH LIAB	25.99	38.26	53.40	64.00	91.10	51.20	82.80	137.60	26.88	20.61
27	DEFICIT FUNDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	TOTAL LIABILITIES	698.80	955.29	1249.20	1050.40	1270.60	1510.60	1882.90	1648.40	13.04	12.86
29	PREFERRED STOCK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	COMMON STOCK	23.04	23.06	23.40	23.70	23.80	24.10	24.70	25.30	1.35	1.31
31	CAPITAL SURPLUS	106.91	107.81	149.50	181.20	186.60	218.00	287.10	342.50	18.10	18.43
32	RETAINED EARNINGS	715.44	842.71	1000.80	1070.30	1167.10	973.90	1241.30	1072.50	5.95	5.62
33	TREASURY STOCK	(24.12)	(20.70)	(17.20)	(15.10)	(16.70)	(13.30)	(12.60)	(12.60)	(8.86)	8.76
34	TOTAL EQUITY	821.27	952.88	1164.50	1260.10	1360.80	1202.70	1540.50	1427.70	8.22	7.98
35	*TOTAL LIAB & EQUITY*	1520.07	1908.18	2413.70	2310.50	2631.40	2713.30	3423.40	3076.10	10.59	10.44
36	NET WORKING CAPITAL	278.34	200.78	327.90	432.10	568.20	221.20	446.20	401.80	5.38	6.96
INCOME & EXPENSES											
38	SALES	2549.85	3224.13	4074.70	4206.00	4326.60	4579.80	5741.60	4924.50	9.86	9.82
40	COST OF GOODS	1526.40	1932.64	2391.10	2595.10	2656.10	3150.90	3274.30	3012.80	10.20	10.32
41	GROSS PROFITS	1023.45	1291.49	1683.60	1610.90	1670.50	1428.90	2467.30	1911.70	9.34	8.89
42	S G & A EXPENSE	419.80	515.65	636.70	674.10	699.60	901.00	858.10	816.90	9.98	10.37
43	EMPLOYEE PROFIT SHARING	111.05	134.34	188.50	219.40	236.50	301.00	367.00	64.20	(7.53)	3.23
44	INT FNDED R&D EXPS	61.40	76.73	96.50	40.30	47.70	58.50	168.10	402.00	30.79	20.61
45	OPERATING PROFIT	431.21	564.76	761.90	677.10	686.70	168.40	1074.10	628.60	5.53	1.61
46	DEPRECIATION	131.00	187.24	257.00	333.30	338.50	351.40	422.60	515.90	21.63	19.01
47	LEASE PAYMENTS	46.70	58.17	86.20	91.20	112.50	105.10	125.70	140.50	17.04	15.86
48	INTEREST EXPENSE	8.37	19.52	44.30	41.30	33.10	36.00	48.90	40.40	25.22	19.22
49	MISC EXPENSE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
51	MISC INCOME	12.25	8.91	4.60	(36.60)	10.50	0.90	9.60	(46.80)	0.00	0.00
53	PRETAX PROFIT	257.39	306.73	379.00	174.70	213.10	(323.20)	486.50	(115.00)	0.00	0.00
54	INCOME TAXES	117.12	135.84	166.80	66.50	69.10	(177.80)	170.50	3.70	(38.95)	0.00
56	NET PROFIT	140.28	172.89	212.20	108.20	144.00	(145.40)	316.00	(118.70)	0.00	0.00
57	EPS AFTER PFD DIVIDENDS	6.15	7.58	9.22	4.61	6.10	(6.09)	13.05	(4.76)	0.00	0.00
58	COMMON DIV PER SHARE	1.76	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.84	1.07

Source: Texas Instruments, Inc.
Annual Reports
DATAQUEST
May 1986

Texas Instruments, Inc.

BACKGROUND AND OVERVIEW

Texas Instruments, Inc., (TI) was formed in 1951 by Erik Jonsson, Cecil Green, and Patrick Haggerty as the manufacturing division for the sophisticated electronic equipment required to further the reflection seismology activities run by Geophysical Services Inc., an organization that was started in 1930. Semiconductor interest took shape in 1952, when TI bought one of the first licenses to manufacture the transistor, which was invented at Bell Laboratories in 1949. By 1953, these devices were in production, and a year later, prices had been reduced to a level where the first transistor radio became cost feasible.

In 1958, Jack Kilby, a TI engineer, invented the first integrated circuit (IC). Since that time, the Company has been considered a leader in IC technology and production.

European operations began in 1957 in Bedford, the United Kingdom. This was the Company's first site outside the United States, and it has since been supplemented by the addition of many more sites worldwide. The Company is now a broad product base supplier to all sectors of industry. At the present time, there are some 21 manufacturing sites in the Americas, 9 in Europe, and 9 in the Far East. However, not all of these sites manufacture semiconductors, since TI has diversified its business base into end equipment, both professional and consumer, as well as retaining interests in geophysical services, metals and controls, and design services.

There are three sites for wafer fabrication and six semiconductor assembly sites in Europe; these manufacture a broad range of products from discrete power transistors to advanced complex integrated circuits.

Dataquest estimates that in 1986, TI's European semiconductor revenue was $488 million. Table 1 gives Dataquest's estimates of TI's European semiconductor revenue. Dataquest estimates that revenue increased by 4 percent in 1986.

TI has an impressive record of industry firsts, ranging from invention of the first IC to development of the first microprocessor, the first microcomputer, and the first hand-held electronic calculator. In addition, TI has been a pioneer in speech synthesis.

The Company's strength in semiconductors has permitted it to gain important market shares in computers, calculators, learning aids, terminals, peripherals, and programmable controllers.

Texas Instruments, Inc.

Table 1

Texas Instruments, Inc.
ESTIMATED EUROPEAN SEMICONDUCTOR REVENUE BY PRODUCT LINE
(Millions of U.S. Dollars)

	1982	1983	1984	1985	1986
Total Semiconductor	$319	$330	$522	$468	$488
Total Integrated Circuit	$260	$283	$475	$434	$448
Bipolar Digital	111	132	204	182	183
MOS	89	93	176	142	157
Linear	60	58	95	110	108
Total Discrete	$ 36	$ 27	$ 29	$ 23	$ 27
Transistor	31	25	27	21	27
Diode	3	0	0	0	0
Thyristor	1	1	1	1	0
Other	1	1	1	1	0
Total Optoelectronic	$ 23	$ 20	$ 18	$ 11	$ 13

Source: Dataquest
February 1987
Ref. 0187-05

PRODUCTS AND MARKETS SERVED

TI is one of the world's broadest-range semiconductor manufacturers, and offers products ranging from discrete transistors to logic arrays and advanced microprocessors. The Company is the market leader in bipolar logic integrated circuits, and is also strong in linear and memory products. It is a major supplier of 256K dynamic RAMs. The Company serves all market segments, the major users being industrial, computer, and consumer goods manufacturers. Recent product developments have permitted even more involvement with the industrial and telecommunications markets, while there has been a sustained presence in the government and military end-user segments.

Texas Instruments, Inc.

In 1985, while many semiconductor manufacturers were pulling out of dynamic RAM production, TI was stepping up DRAM production, and began sampling 1Mb DRAMs. However, by 1986, DRAMs were declining in relative importance, while application-specific integrated circuits (ASICs), application processors, military semiconductors, and VLSI logic emerged as the primary thrust areas. Artificial intelligence is a rapidly growing activity, and is now the second biggest item in Research and Development after VLSI.

In 1986, TI introduced the TMS320C25, the first second-generation DSP chip. TI is considered the world leader in the single-chip DSP market.

In August 1986, TI introduced the TMS34010, a 32-bit CMOS graphics systems processor (GSP), which is a general-purpose processor with special capabilities for supporting high-performance computer graphics applications.

In February 1986, TI joined with Signetics Corporation and Philips to develop and manufacture a 1-micron advanced CMOS logic (ACL) chip family. In June 1986, the Company introduced a 2-micron CMOS family of standard cells called System Cell.

In 1986, TI opened a $350,000 surface-mount technology center at Bedford, TI's U.K. headquarters.

TI has recently consolidated its worldwide memory operations within its Japanese organization.

OUTLOOK

TI has maintained a strong position in Europe as a semiconductor supplier, and we expect that sustained product innovation should allow this to continue. The Company has rationalized its product range, having sold its interests in the diode market and withdrawn from supplying many small-signal discrete components. These decisions should allow the Company to devote more resources to development and support of the more advanced, high-technology products required by emerging markets and applications. Although the Company had lagged in certain technologies, such as CMOS, Dataquest believes that this situation has been corrected. The Company has been increasing its range of standard cell logic elements based on 3-micron, twin-well CMOS technology, and it is on target to duplicate all the 74 series TTL functions with high-speed, low-power CMOS versions.

Texas Instruments, Inc.

As the demand for the TTL families of standard logic begins to peak, the Company can be expected to market alternatives in VLSI form to this end. TI is increasing its resourcing of semicustom and custom product areas. Dataquest believes that TI is well positioned to be a major supplier in these markets, deriving great strength from its extensive in-house computer facilities.

Texas Instruments, Inc.

Table 4

Texas Instruments, Inc.
FINANCIAL STATEMENT HISTORY 1978-1985
(Percent)

		Fiscal Year Ending December 31									
		1978	1979	1980	1981	1982	1983	1984	1985	CAGR	LSQR
BALANCE SHEET											
1	CASH & LIQUID SECURITIES	7.59	6.11	5.79	6.49	15.96	6.81	8.02	5.16	(5.36)	0.05
3	RECEIVABLES	29.19	28.72	26.09	25.56	24.39	24.49	23.18	20 16	(5.15)	(4.53)
4	INVENTORY	19.77	17.83	18.34	16.10	13.68	12.37	14.29	14.55	(4.28)	(5.32)
5	OTHER CURRENT ASSETS	3.68	4.10	3.60	3.65	4.00	9.83	8.80	9.89	15.16	17.90
7	EXCESS FUNDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	TOTAL CURRENT ASSETS	60.23	56.76	53.83	51.80	58.03	53.50	54.29	49.76	(2.69)	(1.73)
9	GROSS P P E	60.98	66.85	71.38	83.92	79.19	83.53	75.28	90.23	5.76	4.56
10	ACCUMULATED DEPRECIATION	23.31	24.27	25.92	36.07	37.53	39.34	32.01	43.09	9.17	8.66
11	NET P P E	37.67	42.58	45.47	47.85	41.66	44.19	43.26	47.14	3.25	1.71
12	MISC ASSETS	2.10	0.66	0.70	0.35	0.31	2.31	2.45	3.10	5.73	16.38
15	*TOTAL ASSETS*	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	(0.00)
16	LOANS PAYABLE OVERSEAS	3.02	9.40	7.06	1.40	1.88	1.37	1.35	0.96	(15.05)	(23.32)
17	ACCTS PYBLE & ACCRD EXPS	30.15	28.13	26.12	26.59	29.79	38.73	32.79	33.31	1.43	3.34
18	ACCRUED TAXES	4.56	5.25	3.82	2.90	2.61	2.85	3.94	1.84	(12.15)	(9.91)
19	ACCRUED RETIRE BENES	2.64	2.77	2.76	1.64	1.69	1.96	2.80	0 17	(32.30)	(21.23)
20	CURR MAT LONG TERM DEBT	0.00	0.09	0.02	0.06	0.00	0.00	0.00	0.00	0.00	0.00
21	DIVIDENDS PAYABLE	0.75	0 60	0.48	0.51	0.45	0.44	0.36	0.41	(8.26)	(8.16)
22	TOTAL CURRENT LIABILITIES	41.92	46.24	40.25	33.10	36.43	45.35	41.25	36.70	(1.88)	(1.24)
23	LONG TERM DEBT	1.25	0.92	8.77	9.16	8.13	8.30	11.12	12.42	38.74	39.92
24	DEFERRED TAXES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	MISC LIABILITIES	1.09	0.90	0.53	0.39	0.26	0.14	0.21	0.00	0.00	0.00
26	DEFERD CREDITS & OTH LIAB	1 71	2.00	2.21	2.00	3.46	1.89	2.42	4.47	14.73	9.21
27	DEFICIT FUNDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	TOTAL LIABILITIES	45.97	50.06	51.75	45.46	48.29	55.67	55.00	53.59	2.21	2.19
29	PREFERRED STOCK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	COMMON STOCK	1.52	1.21	0.97	1.03	0.90	0.89	0.72	0.82	(8.36)	(8.26)
31	CAPITAL SURPLUS	7.03	5.65	6.19	7.84	7.09	8.03	8.39	11.13	6.78	7.24
32	RETAINED EARNINGS	47.07	44.16	41.79	46.32	44.35	35.89	36.26	34.87	(4.20)	(4.18)
33	TREASURY STOCK	(1 59)	(1.08)	(0.71)	(0.65)	(0.63)	(0.49)	(0.37)	(0.41)	(17.59)	17.38
34	TOTAL EQUITY	54.03	49.94	48.25	54.54	51.71	44.33	45.00	46.41	(2.15)	(2.23)
35	*TOTAL LIAB & EQUITY*	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	(0.00)
36	NET WORKING CAPITAL	18.31	10.52	13.58	18.70	21.59	8.15	13.03	13.06	(4.71)	(3.14)
INCOME & EXPENSES											
38	SALES	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	(0.00)
40	COST OF GOODS	59.86	59.94	58.68	61.70	61.39	68.80	57.03	61.18	0.31	0.45
41	GROSS PROFITS	40.14	40.06	41.32	38.30	38.61	31.20	42.97	38.82	(0.48)	(0.85)
42	S G & A EXPENSE	16.46	15.99	15.63	16.03	16.17	19.67	14.95	16.59	0.11	0.49
43	EMPLOYEE PROFIT SHAR	4.36	4.17	4.63	5.22	5.47	6.57	6.39	1.30	(15.83)	(6.01)
44	INT FNDED R&D EXPS	2.41	2.38	2.37	0.96	1.10	1.28	2.93	8.16	19.05	9.82
45	OPERATING PROFIT	16.91	17.52	18.70	16.10	15.87	3.68	18.71	12.76	(3.94)	(7.48)
46	DEPRECIATION	5.14	5.81	6.31	7.92	7.82	7.67	7.36	10.48	10.72	8.36
47	LEASE PAYMENTS	1.83	1.80	2.12	2.17	2.60	2.29	2.19	2.85	6.54	5.50
48	INTEREST EXPENSE	0.33	0.61	1.09	0.98	0.77	0.79	0.85	0.82	13.98	8.56
49	MISC EXPENSE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
51	MISC INCOME	0.48	0.28	0.11	(0.87)	0.24	0.02	0.17	(0.95)	0.00	0.00
53	PRETAX PROFIT	10.09	9.58	9.30	4.15	4.93	(7.06)	8.47	(2.34)	0.00	0.00
54	INCOME TAXES	4.59	4.21	4.09	1.58	1.60	(3.88)	2 97	0.06	(44.43)	0.00
56	NET PROFIT	5.50	5.36	5.21	2.57	3.33	(3.17)	5.50	(2.41)	0.00	0.00
57	EPS AFTER PFD DIVIDENDS	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	(0.00)
58	COMMON DIV PER SHARE	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	(0.00)

Source: Texas Instruments, Inc.
Annual Reports
DATAQUEST
May 1986

Texas Instruments, Inc.

Table 5

Texas Instruments, Inc.
FUNDS FLOW HISTORY 1978-1987
(Percent)

		Fiscal Year Ending December 31									
		1978	1979	1980	1981	1982	1983	1984	1985	CAGR	LSQR
SOURCES											
56	NET PROFIT	140.28	172.89	212.20	108.20	144.00	(145.40)	316.00	(118 70)	0.00	0.00
46	DEPRECIATION	131.00	187.24	257.00	333.30	338.50	351.40	422.60	515 90	21.63	19.01
61	NEW LONG TERM DEBT	1.49	0.25	194.54	1.30	2.30	11.10	155.60	1.20	(3.04)	30.99
62	NEW EQUITY	(23.51)	4.32	45 46	34.37	3.92	35.02	70.22	5.90	0.00	0.00
63	INCR OTHER LIABILITIES	28.39	12 80	10.73	7.80	24.00	(42.90)	35.00	47.60	7.66	0.00
66	TOTAL SOURCES	277.64	377.50	719.92	484.97	512.72	209.22	999.42	451.90	7.21	5.66
USES											
67	P P E EXPENDITURES	309.56	427 06	541.93	341.40	329.30	454.10	704.70	484.80	6.62	6.23
68	REPAYMENT LONG TERM DEBT	10.42	12.09	1.75	0.40	1.30	0.00	0.00	0.00	0.00	0.00
69	PREFERRED DIVIDENDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
70	COMMON DIVIDENDS	40 12	45 60	46.04	46.97	47.22	47.72	48.42	49 90	3.17	2.34
71	INCR OTHER ASSETS	(14.13)	(19.35)	4.43	(8.90)	0.10	54.40	21.30	11.50	0.00	0.00
72	INCR WORKING CAPITAL	(68.32)	(87.89)	125.76	105.10	134.80	(347.00)	225.00	(44.40)	(5.97)	0.00
74	TOTAL USES	277.64	377.51	719.92	484.97	512.72	209.22	999.42	501.80	6.82	6.59
75	EXCESS/DEFICIT	0.00	0 00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
76	CUMULATIVE SUR/DEF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: Texas Instruments, Inc.
Annual Reports
DATAQUEST
May 1986

Texas Instruments, Inc.

Table 6

Texas Instruments, Inc.
FINANCIAL RATIO HISTORY 1978-1985

	Fiscal Year Ending December 31									
	1978	1979	1980	1981	1982	1983	1984	1985	ST AVG	WT AVG
LIQUIDITY										
1 CURRENT RATIO	1.437	1.228	1.338	1.565	1.593	1.180	1.316	1.356	1.376	1.368
2 QUICK RATIO	0.877	0.753	0.792	0.968	1.107	0.690	0.756	0.690	0.829	0.809
3 CASH RATIO	0.181	0.132	0.144	0.196	0.438	0.150	0.194	0.141	0.197	0.201
4 WORKING CAPITAL/SALES	0.109	0.062	0.080	0.103	0.131	0.048	0.078	0.082	0.087	0.084
6 DAYS RECEIVABLES	63.510	62.036	56.416	51.253	54.135	52.967	50.456	45.961	54.592	51.978
7 DAYS INVENTORY	71.857	64.260	67.578	52.322	49.471	38.876	54.533	54.239	56.642	53.018
LEVERAGE										
8 LONG TERM DEBT/CAPITALIZ	0.023	0.018	0.154	0.144	0.136	0.158	0.198	0.211	0.130	0.161
11 LONG TERM DEBT/EQUITY	0.023	0.018	0.182	0.168	0.157	0.187	0.247	0.267	0.156	0.196
12 TOTAL DEBT/EQUITY	0.094	0.208	0.328	0.195	0.194	0.218	0.277	0.288	0.225	0.244
COVERAGE										
13 EBIT/INTEREST	31.752	16.816	9.555	5.230	7.438	(7.978)	10.949	(1.847)	8.990	4.616
14 FIXED CHARGE COVERAGE	5.674	4.974	3.904	2.318	2.464	(1.291)	3.786	0.364	2.774	1.961
16 REPAY LTD+FIX CHARGE COV	4.772	4.304	3.852	2.312	2.442	(1.291)	3.786	0.364	2.568	1.891
OPER PERFORMANCE										
17 GROSS PROFIT/SALES	0.401	0.401	0.413	0.383	0.386	0.312	0.430	0.388	0.389	0.386
18 OPER PROFIT/SALES	0.169	0.175	0 187	0.161	0.159	0.037	0.187	0.128	0.150	0.141
21 PRETAX PROFIT/SALES	0.101	0.096	0.093	0.042	0.049	(0.071)	0.085	(0.023)	0.046	0.027
22 NET PROFIT/SALES	0.055	0.054	0.052	0.026	0.033	(0.032)	0.055	(0.024)	0.027	0.016
23 NET PROFIT/AVG EQUITY	0.179	0.195	0 200	0.089	0.110	(0.113)	0.230	(0.080)	0.101	0.066
24 NET PROFIT/AVG CAPITALIZ	0.174	0 191	0.181	0.076	0.095	(0.097)	0.189	(0.064)	0.093	0.058
26 NET PROFIT/AVG TOT ASSETS	0.101	0.101	0.098	0.046	0.058	(0.054)	0.103	(0.037)	0.052	0.033
27 E P S GROWTH RATE	0.205	0.232	0.216	(0.500)	0.324	(1.999)	(3.142)	(1.365)	(0.754)	(1.221)
28 SALES GROWTH RATE	0.246	0.264	0.264	0.032	0.029	0.059	0.254	(0.142)	0.126	0.079
TURNOVER										
31 SALES/AVG EQUITY	3.257	3.635	3.849	3.469	3.302	3.573	4.186	3.318	3.574	3.604
32 SALES/AVG CAPITALIZ	3.158	3.561	3.473	2.954	2.840	3.051	3.429	2.640	3.138	3.059
33 SALES/AVG TOT DEBT + EQTY	2.962	3.146	3.020	2.756	2.765	2.965	3.345	2.587	2.943	2.918
34 SALES/AVG TOTAL ASSETS	1.838	1.881	1.886	1.781	1.751	1.714	1.871	1.515	1.700	1.740
35 SALES/AVG OPER ASSETS	1.891	1.906	1.899	1.790	1.757	1.737	1.917	1.556	1.807	1.768
36 SALES/AVG GROSS P P E	3.108	2.928	2.718	2.297	2.151	2.106	2.371	1.840	2.440	2.250
BALANCE SHEET										
37 CASH/SALES	0.045	0.036	0.034	0.036	0.097	0.040	0.048	0.032	0.046	0.047
38 RECEIVABLES/SALES	0.174	0.170	0.155	0.140	0.148	0.145	0.138	0.126	0.150	0.142
41 INVENTORY/SALES	0.118	0.106	0.109	0.088	0.083	0.073	0.085	0.091	0.094	0.089
42 OTH CURR ASSETS/SALES	0.022	0.024	0.021	0.020	0.024	0.058	0.052	0.062	0.036	0.043
44 GROSS P P E/SALES	0.364	0.396	0.423	0.461	0.482	0.495	0.449	0.564	0.454	0.468
45 LINE 13/SALES	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
46 MISC ASSETS/SALES	0.013	0.004	0.004	0.002	0.002	0.014	0.015	0.019	0.009	0.011
47 ACCOUNTS PAYABLE/SALES	0.180	0.166	0.155	0.146	0.181	0.229	0.196	0.208	0.183	0.191
48 ACCRUED TAXES/SALES	0.027	0.031	0.023	0.016	0.016	0.017	0.024	0.012	0.021	0.018
51 ACCRUED LIABILITY/SALES	0.016	0.016	0.016	0.009	0.010	0.012	0.017	0.001	0.012	0.011
53 DEFERRED TAXES/SALES	0.000	0.000	0.000	0.000	0.000	0.000	0 000	0.000	0.000	0.000
54 MISC LIABILITIES/SALES	0.007	0.005	0.003	0.002	0.002	0.001	0.001	0.000	0.003	0.002
56 LINE 26/SALES	0.010	0.012	0.013	0.015	0.021	0.011	0.014	0.028	0.016	0.018
MISCELLANEOUS										
57 EQUITY PER COMMON SHARE	36.030	41.795	50.584	53.668	57.639	58.402	63.631	57.227	51.371	54.996
58 RETIRE/PREV GROSS P P E	(0.135)	(0.065)	(0.074)	(0.073)	(0.095)	(0.130)	(0.174)	(0.111)	(0.110)	(0.116)
61 DEPREC/PREV GROSS P P E	0.184	0.202	0.201	0.193	0.175	0.169	0.186	0.200	0.189	0.188
62 COM DIVS/ERN-PFD DIVS	0.286	0.264	0.217	0.434	0.328	(0.328)	0.153	(0.420)	0.117	0.016
63 TAX RATE	0.455	0.440	0.440	0.381	0.324	0.550	0.350	(0.032)	0.364	0.314
64 COST OF GOODS/SALES	0.599	0.599	0.587	0.617	0.614	0.688	0.570	0.612	0.611	0.614

Source: Texas Instruments, Inc.
Annual Reports
DATAQUEST
May 1986

Texas Instruments, Inc.

(Page intentionally left blank)

DATAQUEST INCORPORATED RESEARCH NEWSLETTER

SIS Code: 8.12 Texas Instruments May 28, 1976

TEXAS INSTRUMENTS UPDATE

Recently DATAQUEST obtained some detailed information on Texas Instruments that we feel is of interest to our clients. The first section of this newsletter contains information received from various sources. The second is distilled from comments by TI management at a Distributor meeting on May 13 in Boston.

General Information

We estimate the following:

- First quarter 1976 bookings for TI's domestic semiconductor operation were $88 million, with a book-to-bill ratio of 1.06:1. First quarter 1975 bookings for domestic were $50 million. These compare to fourth quarter 1974 orders of less than $5 million--considerable time was spent in paperwork clean-up.

- The second quarter of 1976 should be stronger than the first quarter--in the range of $95 to $100 million.

- Japan and Europe used to have combined sales equal to domestic, but that may not be true in recent quarters.

Personnel

Reporting to Rolf Haberecht, Operations Manager for domestic semiconductors are:

- Al Stein, Dallas - Discrete and Optoelectronics

- Ed O'Neill, Dallas - Special circuits, CMOS, some linear and linear systems.

- Pierre Bonelli, Assistant Vice President, Houston Operations

  Gene MacFarland - Memory and Microprocessors
  (Name unknown) - Calculator Custom
  Pierre Bonelli, (Acting) - TTL and Schottky TTL
  Don Brooks, Lubbock - Linear and Calulator Test

Watches

- We estimate cumulative TI shipments now exceed 100K units; they will probably exceed 100 thousand per month by June or July 1976.
- The I^2L watch is now made in Sherman, Texas.
- The Operations/Project Manager is Hector Cordenis.
- TI has a goal of 3.5 million watches this year.
- The program has top management attention.
- TI is working to develop a low cost oscillator with an accuracy of five minutes a month to replace quartz (which has accuracy of one minute a year).
- TI has internal plans that call for a build-up to 500 thousand units per month.
- TI has a program for liquid crystal (LCD) development.
- TI has an electronic clock program under development.

TTL

- Bookings are very strong! Order peak may exceed previous high (1973) levels.
- Pricing for gates is about $0.12.

Miscellaneous

We understand Willis Adcock (an old TI hand) is involved in a CB project.

Bubbles

- TI has an Air Force contract for bubble development.
- TI is planning to offer sample quantities of both CCD and magnetic bubble memory by the end of 1976.

Bubble product targets:

- TI will go after the cassette and floppy disc market with a bubble system targeted for less than $1,000 at 1 megabit; $0.0004 (40 millicents) per bit gives memory a cost of $400. It is targeting to have controller and I/O for less than $600.

- TI expects the product to be 20K-100K bit chips with an access time of about 1 to 10 milliseconds.

TMS-1000

- Current market price is $20 in 5,000 quantity

- Identified application at Amana is for 10,000 modules at $36

DISTRIBUTOR MEETING

The following are comments by TI at its Distributor meeting in Boston on May 13, 1976. We are reporting them without offering comments.

TTL Delivery

Charlie Clough and Pierre Bonnelli, Digital Circuits Manager in Houston, are committed to keeping TTL plastic availability under 12 weeks except where technical problems exist. Low Power Schottky delivery will be kept under eight weeks. Mr. Bonelli felt that TI will be able to get TTL lead times down below ten weeks by the third quarter of this year and keep them there.

There is no critical TTL shortage according to TI; they claimed to be running at about 60 percent of production capacity without using contract labor. TI commented that all contract labor is booked up producing calculators, watches, etc., and that the TTL shortage has been contrived by the companies in silicon valley. TI stated that they booked all of IBM's outside purchases during the first quarter--which they had previously shared with National. TI claims this was booked solely on the ability of TI to make firm delivery commitments to IBM.

TI claims that 70 percent of the TTL business is turns business--orders that are booked and promised within 90 days. Seventy percent of the time they are shipping within 90 days; they intend to maintain this. During the most recent lead time crunch, the customers forced that percentage to drop because they were placing orders with considerably longer lead times. TI does not want this to happen again and re-emphasized that they discourage distributors from placing blanket long-term commitments, and soliciting these types of orders from their customers.

Linear

TI claims that both National and Fairchild have diverted plastic production efforts from lower ASP TTL into the linear area. This indicates strong competition for TI in linear. TI is concentrating very heavily on increasing their share of the linear market on both a direct and distribution basis. Don Brooks, PC Manager for Linear, attended the Distributor meeting and made a strong pitch for distribution support in linears. TI expects to attack Fairchild, Motorola, and National in the linear area with new product introductions and aggressive second-sourcing techniques, including dual or single marketing of popular linear devices.

Market Forecast

In their opening comments, TI increased their forecast of U.S. consumption. TI predicted 1976 will show 31 to 35 percent growth over 1975; earlier estimates were 30 percent. TI expects U.S. distribution to be up 50 percent this year over last, and that this uptrend will extend through the third and possibly fourth quarter of calendar 1977. TI claims that the minicomputer and terminal markets will be up over 30 percent; however, mainframe consumption will stay flat for the balance of this year and possibly through the first quarter of 1977.

Microprocessors

Ed Huber from the MOS Division in Houston, indicated that by mid-year TI would have a 9980 part (a 16-bit 8080A). It should have the 8080 in plastic by June and the 8080A shortly thereafter. It is scheduled to have an 8708 (the Intel erasable ROM) probably sometime during the third quarter of 1976. TI estimates that the microprocessor (and associated component) market will be $150 million in 1976; it forecasts that 60 percent of the market will be sold through distribution.

James F. Riley
Frederick L. Zieber
Denny K. Paul

DATAQUEST INCORPORATED

RESEARCH NEWSLETTER

April 30, 1976

TEXAS INSTRUMENTS ANNUAL MEETING AND ANALYSTS MEETING (April 22, 1976)

Attached is a consolidation of notes taken during the Texas Instruments Annual Meeting and the Analysts Meeting that followed. An asterisk (*) is used to denote input partially or totally derived at the Analysts Meeting. All estimates are those of Texas Instruments.

James F. Riley
Frederick L. Zieber

I. Balance Sheet Items

- $267 million cash on hand at the end of 1975
- Capital expenditures of $71 million in 1975, $130 million planned in 1976
- Backlog of $601 million at the end of 1975, up $44 million from a year earlier
- R&D: $51 million in 1975; $63 million anticipated in 1976
- Personnel 56,682--12-31-75; 58,000--3-31-76

* II. Worldwide Semiconductor Shipments
Texas Instruments Estimates (Dollars in Millions):

GEOGRAPHIC BREAKDOWN

	1973	1974	1975	1976
UNITED STATES	$1,903	$2,198	$1,685	$2,200
EUROPE	1,198	1,496	1,219	1,320
JAPAN	1,259	1,074	935	1,180
ROW	200	267	250	320
TOTAL	$4,560	$5,035	$4,079	$5,020

IC/DISCRETE

IC	$1,900	$2,300	$1,900	$2,470
DISCRETE	2,600	2,700	2,100	2,550
TOTAL	$4,500	$5,000	$4,000	$5,020

U.S. SALES BY MARKET

GOVERNMENT	$ 328	$ 357	$ 369	$ 397
INDUSTRIAL	406	497	356	497
COMPUTER	390	439	326	366
CONSUMER	397	455	358	501
DISTRIBUTION	382	450	276	439
TOTAL	$1,903	$2,198	$1,685	$2,200

III. Corporate Target $10 billion in the late 1980s

A. 84 percent of TI's current sales are electronics-based; this will grow to 93 percent in the 1980s.

B. TI expects worldwide electronics market of $280 billion in the late 1980s; this assumes 7 percent inflation plus 11.5 percent annual growth rate. TI expects to grow 15 percent per year.

C. 66 percent of 1980s' goal of $10 billion will be from:
1. Semiconductors
2. Distributed computing
3. Consumer

D. Expect worldwide semiconductor market of $22 billion in late 1980s.

E. Distributed computing (minicomputers, terminals) will grow to $28 billion in 1980s.

F. To achieve a 15-16 percent growth rate TI needs:
1. 1.7 asset turn
2. 12 percent ROA
3. 7 percent NPAT

G. Criteria of $10 billion program:
1. Self funded
2. Primarily internal growth
3. Concentration on market share
4. Expansion into contiguous markets
5. Markets will be electronic based

H. Key corporate ingredients for $10 billion:
1. Meet ROA goal
2. Use operating models
3. OST for major thrusts
4. Continuation of TI Management philosophy
5. Viable technology
6. Success sharing
7. High caliber people

IV. Consumer Products

A. Calculators
1. Substantial redesign--TI 19 had 47 parts, of which 16 were electronic; TI 1200 has 23 parts of which 2 are electronic.
2. Product line slimmed down from 28 models to 12.
3. TI estimates that 45,000,000 units of hand-held calculators were shipped in 1975; this will rise to 58,000,000 in 1976 with a retail value of $1.7 billion; 50 percent of consumption will be U.S.; 50 percent outside U.S. Have added or will add SR-52 and SR-60 to line.

B. Watches
1. $20.00 retail watches are in production.
*2. Estimate 1975 electronics watch industry shipments were 3.5 million units.
3. Estimate 1976 shipments will be 18 million units (66 percent LED and 33 percent LCD) with approximately $30 ASP.

* V. Microprocessors

A. TI expects $150 million market in 1976 (including memory); 60-70 percent 8 bit; 15-20 percent 4 bit; balance 16 bit.

B. 9900 microprocessor
1. Currently being sampled
2. Expect 8 bit version of 9900 in 1976
Expect 4 bit version of 9900 in 1977
3. Shipments of 990-4 and -10 have been good; TI has shipped over 65,000 terminals and minicomputers.

C. 8080 microprocessor--TI has a majority of the peripheral devices now and expects to have all parts within 6 months.

D. 32 bit--Anticipated 1978 introduction.

* VI. Memory

A. 4K RAM
1. Stated that 4K will be $100 million in 1976.
2. M. Chang stated later that 22 million unit forecast is probably low.
3. Plan to introduce a static RAM in 1976.
4. 1976 pin out estimate: 60 percent 22 pin; 20 percent 18 pin; 20 percent 16 pin.

B. 16K RAM
   1. Will follow 4K with 3 year lag.
   2. Plan 16 pin, 20 pin, and 22 pin.
   3. Will be leading memory component in 1980.

C. 64K--Anticipated 1978 introduction.

D. Bubble Memory--Anticipate 1980 market of $100 million; need .02 cents-.04 cents/bit manufacturing cost.

E. CCD--Brief mention that TI is working on a new device.

VII. Automotive--A $200 million market in 1976 growing to $1 billion in 1980.

*VIII. I^2L--Applications are spreading; customer acceptance is growing. TI is shipping a custom camera chip and is active with this process in microprocessors, TV circuits, and memory. No standard products are available.

* IX. Linear

A. Consumer--TI gaining market share

B. OP Amps--Not a significant factor; planning more effort in this area.

C. Interface--Claim 50 percent of the market.

D. Voltage regulators--Not a significant factor.

* X. Capacity

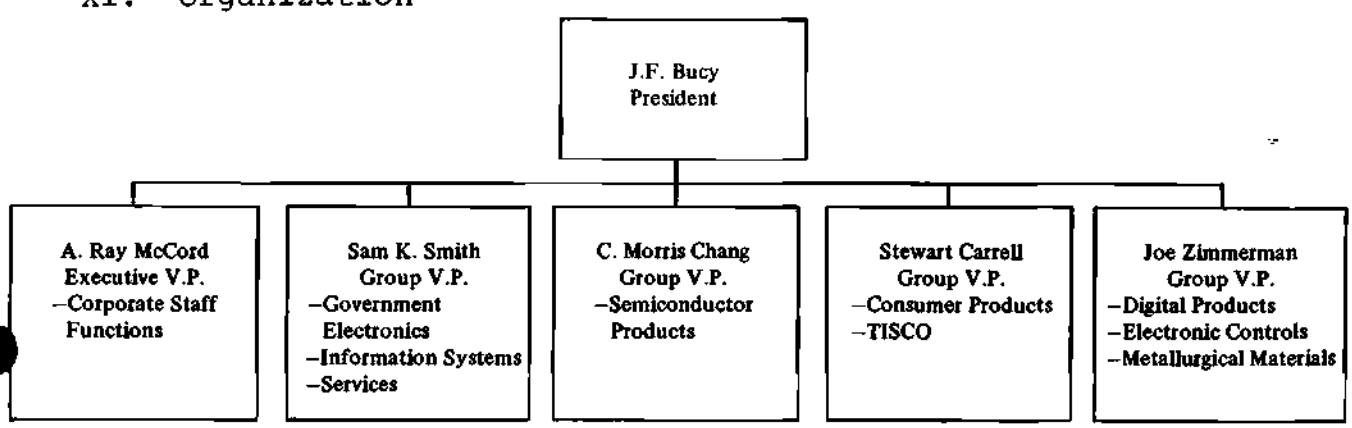
A. Adding 60,000 square feet in Lubbock, Texas.

B. Adding a module in Houston.

C. Have closed Curacao plant.

D. Discrete capacity utilization is "below 90 percent".

XI. Organization



Thomson-CSF

Thomson-CSF GaAs Department
Route Departmentale 128
BP48
91401 Orsay Cedex
France
(1)6019 7000

Established 1968
No. of Employees: 250

BACKGROUND

Thomson-CSF is a vertically integrated high-technology company dedicated to R&D of advanced manufacturing technology and to the manufacture of electronic equipment and systems. The Mitterand government has taken a significant interest in Thomson-CSF as part of the government's restructuring of French industry.

Thomson produces its own GaAs crystals, wafers, and discrete and IC semiconductors. It has about 250 employees involved in GaAs device production. Thomson has used 2-inch wafers since 1983 and 3-inch wafers since 1986. In 1988, the Company added a fab line with capacity for 50 2-inch wafers per week. Thomson's GaAs facilities supply 80 percent of the Company's internal needs for military and communications end-equipment usage of compound semiconductors.

Thomson-CSF is a stakeholder in ANADIGICS (Warren, New Jersey), a U.S.-based GaAs IC company.

COMPANY EXECUTIVES

- Director—John Magarshack
- Manager, Hybrid Strategy—Francois Bizec

ALLIANCES

Thomson-CSF invested $3 million in ANADIGICS in mid-1988 and another $3 million in 1989.

SERVICES

- GaAs MMIC and digIC foundry
- Training in custom GaAs IC design

Thomson-CSF

- Wafer testing
- JANTX-V equivalent military screening

PROCESS TECHNOLOGIES

- 1u D-MESFET
- 0.3u MESFET and HEMT
- Ion implantation
- Air-bridge interconnects

PRODUCTS

- GaAs and InP diodes—power generator, receiver, and control
- GUNN diodes to 100 GHz
- GaAs FETs—power and low noise
- HEMTs to 40 GHz
- MMICs
- Linear GaAs ICs
- BFL logic devices

Applications

- Military and aerospace signal processing
- Instrumentation and communications hardware

FACILITIES

Thomson-CSF has 13,000 square meters including 2,000 square meters of Class 100 clean rooms.

Thomson–CSF

Thomson Composants
Orsay, France
(1)4743–9640

Established 1968
No. of Employees: N/A

BACKGROUND

Thomson–CSF is a vertically integrated high–technology company dedicated to R&D of advanced manufacturing technology and to the manufacture of electronic equipment and systems. The Mitterand government has taken a significant interest in Thomson–CSF as part of the government's restructuring of French industry.

Thomson produces its own GaAs crystals, wafers, and discrete and IC semiconductors. Thomson Composants has about 100 employees involved in GaAs device production. The activity serves the Company's captive needs for military and communications end equipment usage of GaAs devices. Thomson has used 2–inch wafers since 1983 and 3–inch wafers since 1986.

COMPANY EXECUTIVES

The Company's Manager of Hybrid Strategy is Francois Bizec.

ALLIANCES

Not available

SERVICES

- GaAs foundry
- Training in custom GaAs IC design
- Wafer testing

PROCESS TECHNOLOGY

- 1u D–MESFET
- Ion implantation
- Air–bridge interconnects

Thomson-CSF

PRODUCTS

- GaAs diodes
- GaAs FETs
- MMICs
- BFL logic devices

Applications

- Military and aerospace signal processing
- Instrumentation and communications hardware

FACILITIES

Not available

Thomson-CSF

THE COMPANY

STOP PRESS

The merger between SGS Semiconductors and Thomson Semiconductors was announced in April 1987. The new company will be called SGS Thomson Microelectronics. Dataquest's European Semiconductor Industry Service will continue to publish two separate profiles until the formal details and information on the merger are available.

Background

Thomson-CSF, a subsidiary of the Thomson Group, was formed in 1968 following the merger of the electronics interests of Compagnie Francaise Thomson Houston-Hotchkiss Brandt (which subsequently became Thomson-Brandt and, in December 1983, became Thomson S.A.) and Compagnie Generale de Telegraphie sans Fil (CSF).

Thomson-CSF is dedicated to research in, and development of, advanced manufacturing techniques and technology, and to the manufacture of electronic equipment and systems.

Operations

In February 1982, Thomson-Brandt was nationalized by the French government. Thomson-Brandt, the parent company of the Thomson Group, held 40.4 percent of Thomson-CSF's equity at that time. At the beginning of 1984, this equity share was raised to 50.5 percent.

In September 1982, a broad reorganization of the Thomson Group began. Thomson-CSF was organized around four main high-technology areas: detection systems, communications, electronic components, and medical equipment.

Thomson-CSF is currently organized around electronics and defense systems, electronic components, and other industrial activities. The medical equipment division was transferred to General Electric in 1987, in exchange for General Electric's consumer electronics business. Thomson-CSF also paid General Electric an undisclosed amount of cash (estimates range from $500 million to $1 billion).

In 1983, the Company's semiconductor activities were regrouped under the name Thomson Semiconductors. In 1984, Thomson Semiconductors became a subsidiary of Thomson-CSF.

In 1986, Thomson-CSF's sales and revenue were about FFr 36 billion, an increase of 11 percent over the 1985 figure of about FFr 32 billion.

Thomson-CSF

Research and Development

In 1986, Thomson-CSF spent almost FFr 7 billion on research and development (R&D). Of this amount, 52 percent is self-financed, while the remainder consists of government grants.

The Company is also active in European research programs, such as ESPRIT, RACE, Eureka, and BRITE.

Company Structure

Thomson-CSF is divided into operational branches, each managed by an executive vice president. On a functional basis, the financial, planning, research, personnel, and information activities of each branch are coordinated at the Thomson Group level.

Financially, Thomson-CSF is the holding company for numerous subsidiaries. These subsidiaries, together with Thomson-CSF's own industrial and commercial activities, constitute the overall operational branch structure of the Company.

THOMSON SEMICONDUCTORS

Background

In 1983, Thomson-CSF's semiconductor activities were regrouped after the merging of the Rousset and Annecy facilities. In July 1985, the electronic components operating group was reorganized into two main areas—semiconductors and passive components. The group is headed by Jacques Noels, who also heads Thomson Semiconductors.

In November 1985, Thomson acquired Mostek (a subsidiary of United Technologies Corporation), which expanded Thomson's semiconductor activity in the United States. The new venture is called Thomson Components-Mostek Corporation. Due to this acquisition, in 1986, Thomson Semiconductors' U.S. sales accounted for a quarter of the Company's total revenue.

In April 1987, Thomson and SGS signed an agreement merging both companies' nonmilitary semiconductor activities. The combined group is now the world's twelfth largest semiconductor manufacturer and Europe's second largest. The new company is based in the Netherlands and is 50 percent-owned by Thomson-CSF and 50 percent-owned by STET.

Thomson-CSF

Operations

Thomson Semiconductors is divided into the following product divisions, each managed by an executive vice president reporting to Mr. Noels:

- Discrete Semiconductor Division and Le Silicium Semiconductor subsidiary
- Bipolar Integrated Circuits Division
- EFCIS, Eurotechnique, SCA (for MOS integrated circuits)
- Military and Space Division
- Hybrid and Microwave Component Division
- Thomson-CSF Components Corporation USA (for radio frequency circuits)

Through the agreement with SGS, the Company's goal to attain 3 percent of the worldwide semiconductor market by 1990 has been achieved. Thomson Semiconductors, however, continues its expansion through an aggressive worldwide sales drive, through research and development, and through investment.

Below is a selection of recently published highlights of Thomson's semiconductor activities:

In June 1987, Thomson Grand Public (consumer electronics division) bought Thorn-EMI's television and other electronic brown goods operations for $90 million. This makes Thomson number two in Europe, after Philips, in this sector.

In April 1987, Thomson and SGS merged their nonmilitary semiconductor operations. It will be the second-largest semiconductor group in Europe (after Philips), with sales of approximately $800 million and 3 percent of the world semiconductor market. Mr. Pasquale Pistorio, managing director of SGS, is the chief executive officer of the new venture, while Mr. Henri Starck, the executive vice president of Thomson-CSF, is the new chairman.

In March 1987, Thomson-Mostek signed a second-source agreement with VLSI Technology, covering FIFOs, dual-port RAMs, cache-TAG RAMs, and lithium cell nonvolatile SRAMs. The agreement allows for the second-sourced devices to be put into megacells for ASICs.

In February 1987, Whitechapel Workstations (a U.K. company and one of Europe's leaders in scientific workstations) announced that its machines will be manufactured in France, by Thomson. The company hopes that this agreement will help it take 5 percent of the French market, where it has negligible sales.

Thomson-CSF

In January 1987, Thomson-CSF put a one-million-share rights issue worth $300 million on the market. The parent company was to buy 34 percent, and, thus, to hold more than 50 percent of the stock, while the remainder of the issue will be sold in France and abroad.

In January 1987, Thomson and SGS signed a cooperative agreement in the manufacture of EPROMs for the Eureka program. The five-year project is likely to cost each partner £154 million.

In December 1986, Thomson and Philips signed a cooperative agreement in power semiconductors, to promote the Isotop package as a worldwide standard, suited to compact, high-power industrial applications.

In November 1986, Thomson produced its 16th million chip set for microprocessor-memory smart cards, destined to be issued by French Telecom and the country's banks.

In October 1986, Thomson opened an ASIC design center at its northern European marketing headquarters in Basingstoke, United Kingdom.

Facilities

Thomson's semiconductor facilities are listed below:

Aix en Provence, France

Size	-14,850 square meters
Number of employees	-950
Year established	-1962
Products/technologies	-Fabrication, assembly, and testing of power discretes,transistors, rectifiers, and diodes
Wafer capacity	-N/A
Wafer size	-4 inches

Alencon, France

Size	-4,700 square meters
Number of employees	-320
Year established	-N/A
Products/technologies	-Assembly and testing of discretes, metal stacks, and diodes
Wafer capacity	-N/A
Wafer size	-4 inches

Thomson-CSF

Tours, France

Size	-14,000 square meters
Number of employees	-720
Year established	-1968
Products/technologies	-Fabrication, assembly, and testing of discretes, rectifiers, thyristors, and RF power transistors
Wafer capacity	-N/A
Wafer size	-4 inches

Casablanca, Morocco

Size	-N/A
Number of employees	-1,000
Year established	-1972
Products/technologies	-Assembly, and testing only, of bipolar ICs, discretes

Montgomeryville, Pennsylvania - USA

Size	-1,400 square meters
Number of employees	-300
Year established	-1979
Products/technologies	-Assembly and testing of discretes, RF, and microwave power transistors

Grenoble, France (EFCIS and Special Circuits)

Size	-27,000 square meters
Number of employees	-800
Year established	-1973
Products/technologies	-HMOS, CMOS, SOS/CMOS
Wafer capacity	-N/A
Wafer size	-4 inches

Saint-Egreve, France

Size	-25,000 square meters
Number of employees	-1,300
Year established	-1957
Products/technologies	-Linear, bipolar ICs
Wafer capacity	-N/A
Wafer size	-4 inches

Thomson-CSF

Rousset, France

Size	-34,000 square meters
Number of employees	-5,000
Year established	-1980
Products/technologies	-HMOS, CMOS IC, memory, and microprocessors
Wafer capacity	-N/A
Wafer size	-4 inches and 5 inches

Manilla, Philippines

Size	-N/A
Number of employees	-N/A
Year established	-N/A
Products/technologies	-Assembly and testing of discretes and bipolar

Singapore

Size	-N/A
Number of employees	-N/A
Year established	-N/A
Products/technologies	-Assembly and testing of bipolar and linear ICs

Annecy, France

Size	-N/A
Number of employees	-N/A
Year established	-Thomson took over this facility in December 1983
Products/technologies	-Special circuits
Wafer capacity	-N/A
Wafer size	-4 inches

Maxeville, France

Size	-3,700 square meters
Number of employees	-330
Year established	-Start-up date 1986
Products/technologies	-Assembly and testing of ICs

N/A = Not Available

Thomson-CSF

Thomson-CSF
ESTIMATED SEMICONDUCTOR REVENUES
(Millions of Dollars)

	1978	1979	1980	1981	1982	1983	1984	1985
Total Semiconductor	140	171	221	180	148	195	301	324
Total Integrated Circuit	40	51	81	59	60	99	174	197
Bipolar Digital (Technology)	2	2	3	2	7	10	21	24
TTL	2	2	3	2	7	10	21	24
ECL	0	0	0	0	0	0	0	0
Other Bipolar Digital	0	0	0	0	0	0	0	0
Bipolar Digital (Function)	2	2	3	2	7	10	21	24
Bipolar Digital Memory	2	2	3	2	4	6	11	13
Bipolar Digital Logic	0	0	0	0	3	4	10	11
MOS (Technology)	16	19	42	30	23	50	93	107
NMOS	12	14	34	22	15	37	64	72
PMOS	0	0	0	0	0	0	0	0
CMOS	4	5	8	8	8	13	29	35
MOS (Function)	16	19	42	30	23	50	93	107
MOS Memory	2	3	6	4	7	25	38	30
MOS Micro Devices	2	3	4	4	6	10	23	40
MOS Logic	12	13	32	22	10	15	32	37
Linear	22	30	36	27	30	39	60	66
Total Discrete	100	120	140	121	88	96	127	123
Transistor	36	38	51	45	33	38	50	44
Small Signal Transistor	12	14	19	16	11	15	20	16
Power Transistor	24	24	32	29	22	23	30	28
Diode	49	65	70	59	40	43	57	57
Small Signal Diode	16	29	20	9	7	6	8	7
Power Diode	20	22	31	31	22	25	33	34
Zener Diode	13	14	19	19	11	12	16	16
Thyristor	15	16	18	16	12	11	14	14
Other Discrete	0	1	1	1	3	4	6	8
Total Optoelectronic	0	0	0	0	0	0	0	4
LED Lamps	0	0	0	0	0	0	0	0
LED Displays	0	0	0	0	0	0	0	0
Optical Couplers	0	0	0	0	0	0	0	0
Other Optoelectronics	0	0	0	0	0	0	0	4

Source: Dataquest
August 1986

Thomson-CSF

Semiconductor Revenue

Tables 1 and 2 illustrate worldwide and European semiconductor revenue for Thomson Semiconductors.

Table 1

Thomson Semiconductors
Estimated Worldwide Semiconductor Revenue by Product Line
(Millions of U.S. Dollars)

	1982	1983	1984	1985	1986
Total Semiconductor	$148	$205	$301	$324	$436
Total Integrated Circuit	$ 60	$109	$174	$197	$293
Bipolar Digital	7	20	21	24	10
MOS	23	50	93	107	210
Linear	30	39	60	66	73
Total Discrete	$ 88	$ 96	$127	$123	$138
Transistor	33	38	50	44	41
Diode	40	43	57	57	77
Thyristor	12	11	14	14	19
Other	3	4	6	8	1
Total Optoelectronic	0	0	0	$ 4	$ 5

Source: Dataquest
December 1987

Table 2

Thomson Semiconductors
Estimated European Semiconductor Revenue by Product Line
(Millions of U.S. Dollars)

	1982	1983	1984	1985	1986
Total Semiconductor	$133	$157	$210	$240	$302
Total Integrated Circuit	$ 58	$ 79	$125	$147	$203
Bipolar Digital	6	8	14	17	10
MOS	22	36	60	75	135
Linear	30	35	51	55	58
Total Discrete	$ 75	$ 78	$ 85	$ 91	$ 95
Transistor	23	25	27	29	291
Diode	38	39	41	42	47
Thyristor	11	10	11	12	13
Other	3	4	6	8	6
Total Optoelectronic	0	0	0	$ 2	$ 4

Source: Dataquest
December 1987

Thomson-CSF

THE COMPANY

Background

Thomson-CSF, a subsidiary of the Thomson Group, was formed in 1968 following the merger of the electronics interests of Compagnie Francaise Thomson Houston-Hotchkiss Brandt (which subsequently became Thomson-Brandt and in December 1983 become Thomson S.A.), and Compagnie Generale de Telegraphie sans Fil (CSF).

Thomson-CSF is dedicated to research in, and development of, advanced manufacturing techniques and technology, and to the manufacture of electronic equipment and systems. The Company is active in more than 100 countries through industrial subsidiaries, commercial offices, and local representatives.

The Mitterand government has taken a significant interest in Thomson-CSF as part of the government's restructuring of French industry.

The French government's aim in restructuring the French electronics industry is to boost sales by giving certain nationalized companies leadership in specific manufacturing areas. These companies and their areas of leadership are as follows:

- Consumer Electronics--Thomson S.A.
- Computers--Cii Honeywell Bull
- Office Automation--Compagnie Generale d'Electricite (CGE)
- Electronic Components--Thomson-CSF and Matra
- Government and Military Electronics--Thomson-CSF

Operations

In February 1982, Thomson-Brandt was nationalized by the French government. Thomson-Brandt, the parent company of the Thomson Group, held 40.4 percent of Thomson-CSF's equity at that time. At the beginning of 1984 this equity share was raised to 50.5 percent.

In September 1982, a broad reorganization of the Thomson Group began. Thomson-CSF was organized around four main high-technology areas: detection systems, communications, electronic components, and medical equipment.

Thomson-CSF

In September 1983, a major assets shift relating to civil communications products was announced with CGE. CGE took over Thomson-CSF's communications division, while Thomson-CSF took over GCE's semiconductor subsidiary, Semiconducteurs Alcatel (SCA).

At the beginning of 1984, Thomson-CSF was reorganized into three main divisions: electronic equipment and systems (industrial and government electronics), electronic components, and medical equipment. Thomson-CSF also is active in the field of professional television and equipment. In 1983 the Company's semiconductor activities were regrouped under the name Thomson Semiconductors.

In 1983, consolidated sales for the Thomson Group rose to F56,371 million. Thomson-CSF's sales in the same period were F18,260 million, an increase of 21.6 percent over the 1982 figure of F15,022 million.

Consolidated sales for Thomson-CSF and its subsidiaries totalled F31,990 million in 1983, with exports accounting for 51.7 percent of that amount. Consolidated turnover breakdown in 1983 was as follows:

- Equipment and systems 31 percent
- Communications 44 percent
- Electronic components 10 percent
- Medical equipment 12 percent
- Miscellaneous 3 percent

Thomson-CSF's 1983 net loss was F892 million. However, a comparison with 1982 results shows that Thomson-CSF's loss in 1982 was more than double the 1983 figure. Thomson-CSF envisages a continued improvement in results for 1984 and a return to profitability in fiscal 1985.

With Thomson-CSF's new structure (following the changeover with CGE), a loss of approximately F566 million is forecast for 1984.

International Operations

Nearly 52 percent of Thomson-CSF's 1983 business was conducted outside of France, with domestic business accounting for the remaining 48 percent. The diversity of the Company's interests and the large number of countries in which it operates have led Thomson-CSF to seek greater efficiency in its operations by adopting a system of direct liaison between its operational units, its foreign establishments, and

its customers. At the highest level, the international operations management coordinates policy and implementation, technology transfer, and industrial plant locations abroad.

Research and Development

The Thomson Group annually spends around 10 percent of its consolidated sales in Research and Development. Between 60 and 70 percent of this amount is self-financed, while the remainder consists of government grants.

In 1983, Thomson-CSF made nearly 440 patent applications in France (the largest number made by a single company).

Research and development within the Thomson Group is split as follows:

- 95 percent is carried out in each operational unit and is coordinated through corporate R&D management
- 5 percent is carried out in the four Central Research Laboratories of the Group
  - The Laboratoire de Recherches (LRC) at Orsay, and the Laboratoires Electroniques de Rennes (LER) in Brittany specialize in professional electronics
  - The laboratories in Angers (France) and Villingen (West Germany) specialize in consumer electronics.

Company Structure

Thomson-CSF is divided into operational branches, each managed by an executive vice president. On a functional basis, the financial, planning, research, personnel, and information activities of each branch are coordinated at the Thomson Group level.

Financially, Thomson-CSF is the holding company for numerous susbsidiaries. These subsidiaries, together with Thomson-CSF's own industrial and commercial activities, constitute the overall operational branch structure of the Company.

Thomson-CSF

Thomson-CSF's main subsidiaries include:

- Industrial and government electronics
  - Cie d'Informatique Militaire, Spatiale et Aeronautique (CIMSA)--military and aerospace data processing
  - LMT Radio Professionnelle--radio products including radio navigation, identification, military products, and ground surveillance radar
  - SYSECA--specialized software services
  - BURTEK (in the United States)--simulators
  - SINTRA ALCATEL--industrial and government electronics (this is a new company within the Group; it came from the CGE asset exchange)
  - JAEGER Avionique et Systemes--avionics
- Components
  - EFCIS, EUROTECHNIQUE, SSC, and SCA Semiconducteurs Alcatel--semiconductors
  - LCC-CICE, SOCAPEX--passive components
  - Cie Europeenne de Piezo Electricite (CEPE)--piezoelectric components
- Medical
  - Thomson-CGR (radiology, scanners, nuclear magnetic resonance equipment) and its subsidiaries CGR MeV (radiation therapy) and CGR Ultrasonic (ultrasound)
- Radio and television broadcasting
  - Laboratoire General des Telecommunications (LGT)
  - Thomson-CSF Broadcast (in the United States)
- Instrumentation
  - CAMECA and SAPHYMO-STEL

Thomson-CSF

In the United States, Thomson Corporation of America is the holding company for Thomson-CSF subsidiaries, which include:

- Thomson-CSF Broadcast Inc.
- Thomson-CSF Components Corp.
- BURTEK Inc.
- CGR Medical Corp.
- Thomson-CSF Inc.

In West Germany, Thomson-CSF GmbH is the holding company for the following main subsidiaries:

- Thomson-CSF Electronik GmbH
- Thomson-CSF Bauelemente GmbH
- CGR Koch & Sterzel

In addition, Thomson-CSF has industrial or commercial subsidiaries in Austria, Belgium, Denmark, Great Britain, Greece, Ireland, Italy, the Netherlands, Portugal, Spain, Sweden, Switzerland, and the USSR.

THOMSON SEMICONDUCTORS

Background

In 1983 Thomson-CSF's semiconductor activities were regrouped following the merging of the Rousset and Annecy facilities. A new, dynamic company emerged, Thomson Semiconductors, which is headed by Jacques Noels, aided by his commercial director, Carlo Zanni.

Operations

Thomson Semiconductors is divided into the following divisions, each managed by an executive vice president reporting to Mr. Noels:

- Discretes
- MOS

Thomson-CSF

- Bipolar and linear
- Military and aerospace
- Semicustom

Throughout 1983 Thomson Semiconductors concentrated on developing international, as well as national, business. Bookings rose by 30 percent for discretes and 90 percent for ICs in the first three quarters of 1983. Exports accounted for more than 50 percent of Thomson Semiconductors' turnover of Fl,475 million in 1983, compared with 35 percent in 1982. The Company's aim is to attain 3 percent of the worldwide semiconductor market by 1990 (the Company held 1 percent of this market in 1982).

Thomson Semiconductors hopes to achieve this goal through an aggressive worldwide sales drive, through research and development, and through investment.

In 1983 the French government invested approximately Fl,000 million in Thomson-CSF. The 1984 amount is approximately F750 million. The Company does not envisage any losses after 1985.

Part of the 1983 reorganization included the partial transfer of Thomson Semiconductors' telephone activities to CGE. The transition is expected to take three years, at the end of which CGE will hold 60 percent and Thomson 40 percent of the equity.

Also as part of the reorganization program, in December 1983 Thomson Semiconductors acquired Semiconducteurs Alcatel, formerly part of CIT-Alcatel. This gives the Company an additional facility at Annecy, France.

Thomson Semiconductors' latest products include:

- MOS memories
- Microprocessor and dedicated peripherals
- ASICs (full custom, gate array, and standard cell) for telecommunications, military, and aerospace applications
- Linear products for military and consumer applications
- Power discrete and protection devices

Thomson-CSF

Facilities

As of December 1983, Thomson Semiconductors had the following manufacturing locations:

Aix-en-Provence - France		
Size	-	14,850 square meters
No. of employees	-	950
Year established	-	1962
Products/technologies	-	Fabrication, assembly, testing of power discretes, transistors, rectifiers, diodes
Wafer capacity	-	N/A
Wafer size	-	4 inches
Alencon - France		
Size	-	4,700 square meters
No. of employees	-	320
Year established	-	N/A
Products/technologies	-	Assembly, testing of discretes, metal stacks, diodes
Tours - France		
Size	-	14,000 square meters
No. of employees	-	720
Year established	-	1968
Products/technologies	-	Fabrication, assembly, testing of discretes, rectifiers, and thyristors, RF power transistors
Wafer capacity	-	N/A
Wafer size	-	4 inches
Casablanca - Morocco		
Size	-	N/A
No. of employees	-	1,000
Year established	-	1972
Products/technologies	-	Assembly and testing only, bipolar ICs, discretes
Montgomeryville, PA - USA		
Size	-	1,400 square meters
No. of employees	-	300
Year established	-	1979
Products/technologies	-	Assembly and testing of discretes, RF, and microwave power transistors

N/A = Not Available

Thomson-CSF

Grenoble - France (EFCIS and Special Circuits)		
Size	-	27,000 square meters
No. of employees	-	800
Year established	-	1973
Products/technologies	-	HMOS, CMOS, SOS/CMOS
Wafer capacity	-	N/A
Wafer size	-	4 inches
Saint-Egreve - France		
Size	-	25,000 square meters
No. of employees	-	1,300
Year established	-	1957
Products/technologies	-	Linear, bipolar
Wafer capacity	-	N/A
Wafer size	-	4 inches
Rousset - France		
Size	-	17,000 square meters
No. of employees	-	5,000
Year established	-	1980
Products/technologies	-	HMOS, CMOS IC, memory, microprocessors
Wafer capacity	-	N/A
Wafer size	-	4 inches and 5 inches
Manilla - Philippines		
Size	-	N/A
No. of employees	-	N/A
Year established	-	N/A
Products/technologies	-	Assembly and test of discretes and bipolar
Singapore		
Size	-	N/A
No. of employees	-	N/A
Year established	-	N/A
Products/technologies	-	Assembly and test of bipolar and linear
Annecy - France		
Size	-	N/A
No. of employees	-	N/A
Year established	-	Thomson took over this facility in December 1983
Products/technologies	-	Special circuits
Wafer capacity	-	N/A
Size of wafer	-	4 inches

N/A = Not Available

Thomson-CSF

The latest development:

Lorraine - France

Size	-	N/A
No. of employees	-	460
Year established	-	Start-up date 1985
Products/technologies	-	Assembly and test of ICs

N/A = Not Available

Semiconductor Revenues

Tables 1 and 2 illustrate worldwide and European semiconductor revenues for Thomson Semiconductors.

Table 1

Thomson Semiconductors
ESTIMATED WORLDWIDE SEMICONDUCTOR REVENUES BY PRODUCT LINE
(Millions of U.S. dollars)

	1978	1979	1980	1981	1982	1983
Total Semiconductor	$140	$171	$221	$180	$148	$193
Total Integrated Circuit	$ 40	$ 51	$ 81	$ 59	$ 60	$100
Bipolar Digital	2	2	3	2	7	10
MOS	16	19	42	30	23	50
Linear	22	30	36	27	30	40
Total Discrete	$100	$120	$140	$121	$ 88	$ 93
Transistor	36	38	51	45	33	33
Diode	49	65	70	59	40	45
Thyristor	15	16	18	16	14	13
Other	0	1	1	1	1	2
Total Optoelectronic	0	0	0	0	0	0
Exchange Rate: F per US$	4.51	4.25	4.23	5.43	6.57	7.62

Source: DATAQUEST
September 1984

Thomson-CSF

Table 2

Thomson Semiconductors
ESTIMATED EUROPEAN SEMICONDUCTOR REVENUES BY PRODUCT LINE
(Millions of U.S. dollars)

	1978	1979	1980	1981	1982	1983
Total Semiconductor	$130	$159	$186	$144	$133	$166
Total Integrated Circuit	$ 40	$ 51	$ 81	$ 59	$ 58	$ 88
Bipolar Digital	2	2	3	2	6	8
MOS	16	19	42	30	22	45
Linear	22	30	36	27	30	35
Total Discrete	$ 90	$108	$105	$ 85	$ 75	$ 78
Transistor	33	33	30	32	23	22
Diode	46	62	60	42	38	42
Thyristor	11	12	14	10	13	12
Other	0	1	1	1	1	2
Total Optoelectronic	0	0	0	0	0	0
Exchange Rate: F per US$	4.51	4.25	4.23	5.43	6.57	7.62

Source: DATAQUEST
September 1984

Thomson-CSF

Thomson-CSF
173, bd Haussmann, B.P. 700-08
75360 Paris Cedex 08 France
Tel 256-96-00
(Millions of French Francs Except Per Share Data)

Balance Sheet (December 31)*	1977	1978	1979	1980
Working Capital	F 392	F 429	F 775	F 1,106
Long-Term Debt	F 1,165	F 1,048	F 984	F 1,436
Shareholders' Equity	F 802	F 994	F 1,609	F 2,129
After-Tax Return on Average Equity (%)	16.1	17.6	16.2	14.9

Operating Performance (Fiscal Year Ending December 31)*

	1977	1978	1979	1980
Revenue	F 6,007	F 6,955	F 9,440	F12,794
Domestic	F 2,682	F 3,060	F 3,776	F 5,285
Non-Domestic	F 3,325	F 3,895	F 5,664	F 7,689
Cost of Revenues**	F 5,721	F 6,568	F 8,925	F12,218
R&D Expense	N/A	N/A	N/A	N/A
Marketing Expense	N/A	N/A	N/A	N/A
G&A Expense	N/A	N/A	N/A	N/A
Pretax Income	F 286	F 387	F 515	F 576
Pretax Margin (%)	4.8	5.6	5.5	4.5
Effective Tax Rate (%)	57.0	59.2	59.2	51.6
Net Income	F 123	F 158	F 211	F 279
Average Shares Outstanding (Millions)	6.12	6.71	7.74	9.07
Per Share				
Earnings	F 20.11	F 23.58	F 27.22	F 30.78
Dividends	F 7.20	F 7.80	F 9.50	F 10.50
Book Value	F131.01	F148.05	F207.91	F234.63
Price Range	F 86.5-158.9	F 123.1-415.4	F 343.0-489.5	F 404.9-579.0
Total Employees*	30,335	31,781	33,222	35,909
Capital Expenditures	F 198.5	F 240.1	F 366.6	F 440.3
Exchange Rate ($ per F)	0.20	0.22	0.24	0.23

*Thomson-CSF only, not including subsidiaries
**Includes R&D, SG&A and Marketing Expenses
N/A = Not Available

Source: Thomson-CSF Annual Reports
DATAQUEST, Inc.

Thomson-CSF

Table 1

Thomson-CSF
ESTIMATED REVENUES BY BUSINESS ACTIVITY*
(Millions of French Francs)

	1977	1978	1979	1980
Electronic Equipment	F5,266	F6,825	F 9,779	F12,398
Telephone Switching	1,759	1,861	2,630	2,653
Computer	1,093	1,265	1,356	1,605
Components and Electron Tubes	1,570	1,658	1,969	2,386
Medical	-	-	-	2,609
Miscellaneous	248	322	403	646
Total	F9,936	F1,931	F16,137	F22,298
Foreign Activities	F4,412	F4,951	F 6,939	F10,703
Domestic Activities	F5,524	F6,980	F 9,198	F11,595

*Consolidated Operations

Source: Thomson-CSF in 1980: The Year In Review
DATAQUEST, Inc.

Thomson-CSF

Table 2

THOMSON-CSF SEMICONDUCTOR REVENUES
(Millions of Dollars)

	1973	1974	1975	1976	1977	1978	1979	1980
TOTAL SEMICONDUCTOR	65	80	74	82	93	130	152	179
Total Integrated Circuit	14	19	14	17	20	30	32	39
Bipolar Digital	0	0	1	1	1	2	2	3
TTL								
DTL								
ECL								
Other								
Bipolar Digital (Recap)							2	3
Memory							0	0
Logic							2	3
MOS	0	0	1	2	4	5	0	0
NMOS								
PMOS								
CMOS								
MOS (Recap)							0	0
Memory								
Microprocessor								
Logic								
Linear	14	19	12	14	15	23	30	36
Total Discrete	51	61	60	65	73	100	120	140
Transistor							45	51
Small Signal							10	12
Power Transistor							35	39
Diode							40	50
Small Signal							5	7
Power							0	0
Zener							35	43
Thyristor							35	39
Other							0	0
Total Optoelectronic	0	0	0	0	0	0	0	0
LED Lamps								
LED Displays								
Optical Couplers								
Other								

Source: DATAQUEST, Inc.

Thomson SA

Thomson SA
173 Boulevard Haussmann
75379 Paris Cedex 08, France
Telephone: (1) 4561 9600
Telex: Tcsf 204780 f
Fax: Not Available
Dun's Number: 27-525-0553

Date Founded: Not Available

CORPORATE STRATEGIC DIRECTION

Thomson SA is the parent company of a large group of diversified companies, numbering over 140, engaged in a wide range of electrical and electronic manufacturing and sales functions. The Company reorganized the Electronics and Defense Systems sector of Thomson-CSF in April 1990 in an effort to raise money. As a result, the Company currently has the following six operating groups: Thomson Consumer Electronics, Thomson Electromenager (home appliances), Thomson-CSF, Sextant Avionique (flight electronics), SGS-Thomson (semiconductors), and Altus Finance.

Revenue increased 2.4 percent in fiscal 1989 to FFr 76.7 billion (US$12.0 billion) from FFr 74.8 billion (US$12.6 billion) in fiscal 1988. (Percentage changes refer to FFr amounts only; US$ percentage changes will differ because of fluctuations in Dataquest exchange rates.) Thomson Consumer Electronics accounted for 47.0 percent of total revenue for 1989, totaling FFr 36.0 billion (US$5.6 billion). In particular, the TV Americas segment showed signs of vigorous growth, increasing sales 10.0 percent in dollar terms and recording substantial improvement in income from operations. In the European market, deteriorating prices and product mix degradation resulted in a slight decrease in sales over the previous year. The United Kingdom experienced another severe year as a result of very high interest rates that brought a 14.0 percent decrease in demand from that of the previous period.

Electronics and defense systems accounted for 42 percent of total revenue for 1989, totaling FFr 32.2 billion (US$5.0 billion). Sixty-two percent of sales in this group were international sales. Thomson-CSF took an active role in restructuring the European defense electronics industry through a number of major partnership agreements. Not all of these agreements were finalized in 1989. The acquisition of the majority of the European defense business of the Philips group, for example, did not become effective until January 1990. Moreover, the Eurodynamics joint venture with British aerospace is not expected to begin trading until 1991, and the alliance with Credit Lyonnais was not approved until February 1990. The transfer of the Company's flight electronics activities to Sextant Avionique, the sale of ABG-Semca at the beginning of 1989, and the nonconsolidation of Bronzavia Air Equipment in late 1988 brought an effective drop in revenue of FFr 2.3 billion.

Home appliances accounted for 7 percent of 1989 revenue, totaling FFr 5.4 billion (US$843.7 million), while other activities accounted for the remaining 4 percent of revenue, or FFr 3.1 billion (US$479.1 million).

Expenditure on R&D totaled FFr 4.2 billion (US$654.1 million) in 1989, representing 5.5 percent of total revenue. The government of France contributed another FFr 4.2 billion (US$654.1 million), bringing the total for the year to FFr 8.4 billion (US$1.3 billion). The Company's expenditure remained level with that of the previous year's total. Capital expenditure was not available for fiscal 1989 but was reported to be FFr 3.4 billion (US$564.1 million) in fiscal 1988. Thomson SA employed approximately 100,000 people during fiscal 1989.

More detailed information is available in Tables 1 and 2, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region. Information on revenue by distribution channel is not available. Tables 3 and 4, comprehensive financial statements, are at the end of this backgrounder.

BUSINESS SEGMENT STRATEGIC DIRECTION

Thomson-CSF

Thomson-CSF is one of the world's leading electronics companies. In the defense market, the Company is involved with sophisticated military electronic equipment, aerospace, weapons systems, and detection control and communications systems. It is also a leader in military simulation markets and produces head-up displays (which allow one look at a display without diverting attention needed to navigate or fly) and navigation equipment.

Thomson-CSF Activites Sous-Marines (ASM) is a world leader in mine warfare field implements and produces combat systems such as Eledon. This system is in operation onboard the submarines of several countries. Thomson-CSF ASM also produces a complete range of digital panoramic sonars, as well as airborne ASW systems such as the DSAX1.

This sector was reorganized in April 1990 subsequent to a number of agreements concluded in 1989 and early 1990. Since April 1990, the sector has been organized as six operating groups: Aerospace, Detection Systems, Communications and Command Systems, Information Technology, Missile Systems, and Specific Components.

Thomson-CSF researchers developed ultrahigh-speed laser semiconductors and photodiodes in 1989 to back up research into optoelectronics techniques applied to radar architectures, optronic systems, power lasers, and, ultimately, optical computers. The group's researchers also developed new thin-film superconductors with the high critical temperatures and microwave characteristics that conventional materials cannot offer. The development of neural networks for data processing applications is the focus of another extensive research program at Thomson-CSF. Neural networks offer considerable potential for machine learning and massively parallel processing and are expected to find applications in acoustic or radio frequency signal recognition and high-speed image analysis.

In the field of image transmission, a reduced bit-rate encoding-decoding device for high-quality links (34Mb) was presented to international standardization bodies in 1989.

Finally, as part of the Eureka 95 high-definition television (HDTV) project, Thomson-CSF made significant progress toward the development of passband reduction or enlargement equipment, relying on complex detection/reduction and movement-compensation algorithms. This will soon provide the level of compatibility needed to transmit and display HD-MAC signals using conventional television channels.

SGS-Thomson/Thomson TMS

Dataquest estimates that SGS-Thomson/Thomson TMS ranked sixth in the worldwide military/aerospace semiconductor shipments by dollar amounts in 1989. The group had 3.8 percent of the market based on FFr 697.6 million (US$109 million) of shipments. In North America, the group had 1.5 percent market share, or FFr 192.0 million (US$30.0 million), in shipments; in Europe, the group ranked first with 11.7 percent of the market, or FFr 486 million (US$76.0 million), in shipments.

This group generated FFr 4.0 billion (US$619.0 million) in revenue from the sale of MOS technology components in 1989, representing 60 percent of its worldwide semiconductor revenue. Of this, nearly 44 percent was from memory chips, 30.1 percent from logic chips, and nearly 26 percent from microdevices.

Thomson Consumer Electronics

Sales and profitability in the core business of Thomson Consumer Electronics increased significantly in 1989 despite fierce competition in the worldwide marketplace. With its RCA and GE brands, Thomson Consumer Electronics is a leader in the American color television market.

The TV Europe segment proved its leadership in product creativity with the launch of the D2-MAC SAT (the first decoder for European pay television), Advanced Definition Television (ADTV), Interactive Menu Control (IMC), and dual tuner Picture in Picture (PIP).

One of the group's most important introductions was the first consumer widescreen Highscan television at the 1989 Berlin International Audio Video Fair (IFA). The 1,250-line unit is a true high-definition monitor and offers full HD-MAC display capabilities in preparation for the first transmissions in that standard.

Thomson Electromenager

Thomson Electromenager manufactures and markets home appliances. This group is the market leader in France.

Further Information

For further information about the Company's business segments, please contact the appropriate Dataquest industry service.

Table 1
Corporate Highlights (Millions of US Dollars)*

	1987	1988	1989
Three-Year Revenue	$9,997.0	$12,556.0	$11,997.3
Percent Change	-	25.60	(4.45)
Capital Expenditure	$595.8	$564.1	NA
Percent of Revenue	5.96	4.49	NA
R&D Expenditure	$626.6	$701.5	$654.1
Percent of Revenue	6.27	5.59	5.45
Number of Employees	99,233	NA	100,000
Revenue ($K)/Employee	$101	NA	$120
Net Income	$176.6	$200.8	$77.8
Percent Change	-	13.74	(61.27)
Exchange Rate (US$1=FFr)	FFr 6.02	FFr 5.96	FFr 6.39

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	NA	NA	NA	NA
Quarterly Profit	NA	NA	NA	NA

*Financial information for 1986 and 1985 was not reported in a consolidated format and thus is not representative of the entire company.
NA = Not available

Source: Thomson SA
Annual Reports and Forms 10-K
Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)*

Region	1987	1988	1989
Europe	38.60	29.00	28.00
France	38.60	29.00	28.00
International	61.40	71.00	72.00

*Financial information for 1986 and 1985 was not reported in a consolidated format and thus is not representative of the entire company.

Source: Thomson SA
Annual Reports and Forms 10-K
Dataquest (1990)

1989 SALES OFFICE LOCATIONS

Information is not available.

SUBSIDIARIES

Information is not available.

MANUFACTURING LOCATIONS

North America

Burtek, Oklahoma
Aircraft training/simulation equipment

Phonon Corporation, Connecticut
Defense ground support equipment, electronic subsystems, passive components, measuring/sensing/controlling, data communications equipment

SGS-Thomson Microelectronics, Inc., Texas
Computers, semiconductors/devices

Europe

CIMSA SINTRA Division, Colombes, France
Data processing and display equipment

Defense & Control Systems Division, Bagneaux Cedex, France
Development and production of surface radars and display systems

Electronics Systems Division, Bagneaux Cedex, France
Development and production of weapon systems

General Avionics Division, Issy les Moulineaux Cedex, France
General avionic equipment

LMT-Radio Professionelle, Boulonge-Billancourt Cedex, France
Military communications, ground surveillance radar

Radar, Countermeasures, and Missile Electronics Division, Malakoff, France
Airborne radars, countermeasures, and missile electronics

Simulator Division, Trappes Cedex, France
Development and production of simulators for aircraft, tanks, ships, and submarines

Thomson SINTRA Activities Sous-Marines, Cagnes-sur-Mer, France
Development and production of sonars, torpedo homing heads, and airborne ASW equipment

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

Oki Electric Industry Company, Ltd.
SGS-Thomson and Oki plan to produce 4Mb DRAMs at a Thomson-owned factory in Nancy, France.

British Aerospace
Thomson-CSF and British Aerospace formed Eurodynamics as an R&D joint venture.

Credit Lyonnais
Thomson-CSF formed a strategic alliance with Credit Lyonnais, the second largest bank in France.

MERGERS, ACQUISITIONS, AND DIVESTITURES

1989

N.V. Philips Defense Group
Thomson-CSF acquired a majority of the European defense businesses of the Philips Defense Group.

ATEV and SECM
Thomson SA purchased 50 percent of both ATEV and SECM.

Cryotechnologies SA, Dex Aero, SI Cholet, Thomson Auxilec, and Thomson Finance Immobiliere
Thomson purchased 99 percent of these companies.

Bassano Investissement, Coreli, Eurodisplay, SDSA, Societe Vendomoise d'Avionique, and U3S Europe
Thomson completely divested itself of these companies.

KEY OFFICERS

Alain Gomez
Chairman of the board and chief executive officer

N. Goutard
Vice chairman

C. Aubl
Director of Finance

P. Cabanes
Director of Industry and Law

P. G. d'Estaing
Director of International Operations

E. Spitz
Director of Research and Development

PRINCIPAL INVESTORS

Information is not available.

FOUNDERS

Information is not available.

Table 3
Comprehensive Financial Statement*
Fiscal Year Ending December
(Millions of US Dollars, except Per Share Data)

Balance Sheet	1987	1988	1989
Total Current Assets	$9,582.7	$9,653.7	$8,990.3
Cash	305.8	494.1	597.5
Receivables	4,379.6	4,050.8	3,739.9
Marketable Securities	176.6	147.5	126.4
Inventory	3,918.3	3,890.4	3,393.4
Other Current Assets	802.5	1,070.8	1,133.0
Net Property, Plants	$1,850.8	$2,134.2	$2,041.6
Other Assets	$2,337.9	$10,394.1	$4,205.9
Total Assets	$13,771.4	$22,182.0	$15,237.9
Total Current Liabilities	$8,404.2	$8,418.5	$7,390.1
Long-Term Debt	$2,734.6	$3,945.1	$4,528.0
Other Liabilities	$296.5	$6,877.2	$213.0
Total Liabilities	$11,435.2	$19,240.8	$12,131.1
Total Shareholders' Equity	$2,336.2	$2,941.3	$3,106.7
Common Stock	313.6	350.3	326.8
Other Equity	1,284.4	1,466.1	1,060.7
Retained Earnings	738.2	1,124.8	1,719.2
Total Liabilities and Shareholders' Equity	$13,771.4	$22,182.0	$15,237.9
Income Statement	**1987**	**1988**	**1989**
Revenue	$9,997.0	$12,556.0	$11,997.3
French Revenue	3,859.1	3,641.3	3,359.3
Non-French Revenue	6,137.9	8,914.8	8,638.0
Cost of Sales	$7,722.6	$9,828.4	$9,314.4
R&D Expense	$626.6	$701.5	$654.1
SG&A Expense	$1,313.6	$1,601.0	$1,597.5
Capital Expense	$595.8	$564.1	NA
Pretax Income	$566.4	$643.1	$200.8
Pretax Margin (%)	5.67	5.12	1.67
Effective Tax Rate (%)	NA	NA	NA
Net Income	$176.6	$200.8	$77.8
Shares Outstanding, Millions	18.9	20.9	20.9
Per Share Data			
Earnings	$9.35	$10.61	$3.73
Dividend	$1.40	$1.21	0
Book Value	$123.61	$140.73	$148.65
Exchange Rate (US$1=FFr)	FFr 6.02	FFr 5.96	FFr 6.39

*Financial information of years 1986 and 1985 was not reported in a consolidated format and thus is not representative of the entire company.
NA = Not available

Source: Thomson SA
Annual Reports and Forms 10-K
Dataquest (1990)

Table 4
Comprehensive Financial Statement*
Fiscal Year Ending December
(Millions of French Francs, except Per Share Data)

Balance Sheet	1987	1988	1989
Total Current Assets	FFr 57,688.0	FFr 57,536.0	FFr 57,448.0
Cash	1,841.0	2,945.0	3,818.0
Receivables	26,365.0	24,143.0	23,898.0
Marketable Securities	1,063.0	879.0	808.0
Inventory	23,588.0	23,187.0	21,684.0
Other Current Assets	4,831.0	6,382.0	7,240.0
Net Property, Plants	FFr 11,142.0	FFr 12,720.0	FFr 13,046.0
Other Assets	FFr 14,074.0	FFr 61,949.0	FFr 26,876.0
Total Assets	FFr 82,904.0	FFr 132,205.0	FFr 97,370.0
Total Current Liabilities	FFr 50,593.0	FFr 50,174.0	FFr 47,223.0
Long-Term Debt	FFr 16,462.0	FFr 23,513.0	FFr 28,934.0
Other Liabilities	FFr 1,785.0	FFr 40,988.0	FFr 1,361.0
Total Liabilities	FFr 68,840.0	FFr 114,675.0	FFr 77,518.0
Total Shareholders' Equity	FFr 14,064.0	FFr 17,530.0	FFr 19,852.0
Common Stock	1,888.0	2,088.0	2,088.0
Other Equity	7,732.0	8,738.0	6,778.0
Retained Earnings	4,444.0	6,704.0	10,986.0
Total Liabilities and Shareholders' Equity	FFr 82,904.0	FFr 132,205.0	FFr 97,370.0
Income Statement	**1987**	**1988**	**1989**
Revenue	FFr 60,182.0	FFr 74,834.0	FFr 76,663.0
French Revenue	23,232.0	21,702.0	21,466.0
Non-French Revenue	36,950.0	53,132.0	55,197.0
Cost of Sales	FFr 46,490.0	FFr 58,577.0	FFr 59,519.0
R&D Expense	FFr 3,772.0	FFr 4,181.0	FFr 4,180.0
SG&A Expense	FFr 7,908.0	FFr 9,542.0	FFr 10,208.0
Capital Expense	FFr 3,587.0	FFr 3,362.0	NA
Pretax Income	FFr 3,410.0	FFr 3,833.0	FFr 1,283.0
Pretax Margin (%)	5.67	5.12	1.67
Effective Tax Rate (%)	NA	NA	NA
Net Income	FFr 1,063.0	FFr 1,197.0	FFr 497.0
Shares Outstanding, Millions	18.9	20.9	20.9
Per Share Data			
Earnings	FFr 56.31	FFr 63.23	FFr 23.81
Dividend	FFr 8.44	FFr 7.20	0
Book Value	FFr 744.13	FFr 838.76	FFr 949.86

Table 4 (Continued)
Comprehensive Financial Statement*
Fiscal Year Ending December
(Millions of French Francs, except Per Share Data)

Key Financial Ratios	1987	1988	1989
Liquidity			
Current (Times)	1.14	1.15	1.22
Quick (Times)	0.67	0.68	0.76
Fixed Assets/Equity (%)	79.22	72.56	65.72
Current Liabilities/Equity (%)	359.73	286.22	237.88
Total Liabilities/Equity (%)	489.48	654.16	390.48
Profitability (%)			
Return on Assets	2.56	1.11	0.43
Return on Equity	15.12	7.58	2.66
Profit Margin	1.77	1.60	0.65
Other Key Ratios			
R&D Spending % of Revenue	6.27	5.59	5.45
Capital Spending % of Revenue	5.96	4.49	NA
Employees	99,233	NA	100,000
Revenue (FFr K)/Employee	FFr 606	NA	FFr 767
Capital Spending % of Assets	4.33	2.54	NA
Exchange Rate (US$1=FFr)	FFr 6.02	FFr 5.96	FFr 6.39

*Financial information of years 1986 and 1985 was not reported in a consolidated format and thus is not representative of the entire company.
NA = Not available

Source: Thomson SA
Annual Reports and Forms 10-K
Dataquest (1990)

THORN EMI Plc

4 Tenterden Street
Hanover Square
London, England W1A 2AY
Telephone: 44 (71) 355-4848
Fax: 44 (71) 495-1307
Telex: 264855 G
Dun's Number: 21-029-3668

Date Founded: 1924

CORPORATE STRATEGIC DIRECTION

THORN EMI Plc designs, develops, manufactures, and markets electronic, software, and security products. This part of its business accounted for 18.4 percent of THORN EMI's revenue in fiscal 1989. The remaining 81.6 percent of revenue came from rental and retail, music, and lighting. Dataquest tracks THORN EMI's high-technology businesses.

The THORN EMI Electronics division continued to place a strong focus on its international business activities in fiscal 1989, as indicated by 30 percent of sales derived from countries outside the United Kingdom. A US corporate marketing office was established in Washington, D.C. The Company's greater marketing emphasis is benefiting the international development of each division and improving coordination of its specialized capabilities on major, multidisciplined projects.

In fiscal 1989, a new chairman and chief executive was appointed to direct the next stages in the THORN Software division's strategic direction. THORN Software employs 2,900 people.

In 1989, THORN EMI sold off INMOS, a well-known company that developed the Transputer microprocessor, to SGS-Thompson Microelectronics BV. The Company has acquired 30 companies, 90 percent of which reside outside the United Kingdom. The corporate streamlining and European expansion appears to be paying off, as THORN EMI's 1989 pretax profits have increased more than 2.5 times, with 49 percent of total net income derived from outside the United Kingdom.

Total revenue increased 8 percent to £3.3 billion (US$5.40 billion) in fiscal 1989 from about £3.1 billion (US$5.45 billion) in fiscal 1988. (Percentage changes refer only to £ amounts; US$ percentage changes will differ because of fluctuations in Dataquest exchange rates.) Net income increased 41 percent to £174 million (US$285 million) in fiscal 1989 from £123 million (US$219 million) in fiscal 1988. THORN-EMI employs 65,444 people worldwide.

R&D expenditure totaled £41 million (US$67 million) in fiscal 1989, representing 1 percent of revenue. Capital spending totaled £343 million (US$563 million) in fiscal 1989, representing 10 percent of revenue.

More detailed information is available in Tables 1 and 2, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region. Information on revenue by distribution channel is not available. Tables 3 and 4, comprehensive financial statements, are at the end of this backgrounder. Due to differences in US and British accounting principles and policies, financial analysis is not possible.

BUSINESS SEGMENT STRATEGIC DIRECTION

Technology Businesses

THORN EMI's technology businesses primarily are in electronics and software. In fiscal 1989, the Company's technology businesses achieved a profit increase of 22 percent.

Military and Aerospace

Many important contracts were won in fiscal 1989 in both the civil and military aerospace markets. Outstanding among the latter is a multimillion dollar contract for inertial measuring units incorporating the Company's unique quartz rate sensors. Other key projects in 1989 included major international contracts in Japan: a computer-based defense simulation and modeling system for one of the country's leading electronics companies, and a division support system for the Long Term Credit Bank of Japan; in Sweden, an electronic warfare evaluation system for Ericsson; and in Brazil, an air defense planning system for the Brazilian Army.

Computer Systems captured some major orders in fiscal 1989, including major contracts to enhance mission support systems for the British Royal Air Force. Access and revenue control equipment continued to grow. Customers included British Rail and railways in Turkey and Iraq.

In fiscal 1989, THORN EMI Electronics won all the principal civil orders placed for satellite ground stations within the United Kingdom. The major customers were British Telecom International and the Independent Broadcasting Authority.

Orders from Europe and strong interest from around the world followed the Naval Systems Division's introduction of the advanced new MS 90 system for measuring the magnetic signatures of ships. This division is an industry leader in providing motor drives and rectifiers. Its major contracts in fiscal 1989 included British Steel and the Channel Tunnel project.

In the early part of fiscal 1989, the Radar Division won a contract to develop and manufacture the Manportable Surveillance and Target Acquisition Radar (M-Star) for the British Army, with equipment due for delivery at fiscal year end. According to THORN EMI, equipment demonstrations have aroused considerable interest from many potential customers outside the United Kingdom. Also, the Radar Division is Europe's only manufacturer of operational airborne early warning (AEW) radar. In addition, the division won further orders for its high-performance Searchwater AEW radar in fiscal 1989.

The Defense Systems Division remained an industry leader in fiscal 1989 in its fuzing operations, which was confirmed by major UK and overseas contracts. Fuze manufacturing was maintained at a high rate throughout fiscal 1989. The introduction into service of the Multi Role Fuze with the British Army and the Multi Function Bomb Fuze with the Royal Air Force led to substantial further production, in the latter case for both the United Kingdom and export.

Important progress on the Multiple Launch Rocket System (MLRS) was indicated by successful completion of the component demonstration stage. THORN EMI is in the final stages of negotiations for the follow-on systems demonstration phase of this major new NATO project. One key achievement was the selection of the division to provide the three-nation TRIGAT (Tri-National Next Generation Anti Tank) defense system consortium with the on-board instrumentation and telemetry equipment, under a contract worth well over £10 million (US$16.4 million).

In 1990, the Electro Optics Division will deliver to the United Kingdom Ministry of Defense the first preproduction units of the Air Defense Alerting Device (ADAD), under a high-value contract won against intense competition in 1987. According to THORN EMI, ADAD has aroused considerable interest from outside the United Kingdom. The division won further international orders for thermal imagers; to date, more than 1,000 units have been produced.

Discrete Devices

At the end of fiscal 1989, THORN EMI Varian Limited, a joint venture with Varian Associates of California in the field of high-power microwave tubes, became a wholly owned THORN EMI subsidiary, changing its name to THORN EMI Microwave Devices Limited.

THORN EMI Electron Tubes maintained leadership in international markets for specialized light detection and amplification devices. In fiscal 1988, US major equipment manufacturers contributed significantly to the 20 percent increase of photomultiplier orders.

Software

THORN Software comprises three principal groups: Software Sciences, Datasolve, and THORN EMI Computer Software (TECS). In fiscal 1989, the proportion of sales generated in international markets increased.

In fiscal 1989, Software Sciences experienced good revenue growth with more than 15 percent of the

revenue coming from markets other than the United Kingdom.

In November 1989, THORN EMI's computer-aided software engineering tools division of THORN Software Sciences broke away from THORN EMI and became an independent company called Ipsys Software Plc. The new company began with 35 people and is placing a strong focus on systems integration.

Datasolve, which now generates more than £30 million (US$49.2 million) of its business from data center management and related services, consolidated its position as a leading supplier of information systems management services. Major new facilities management agreements were extended or brought into operation with leading companies such as Hertz, Thames Television, and Unilever. In addition, substantial processing services contracts were signed with the London Underground and the Police National Computer Organization. Also in fiscal 1989, Datasolve Education won a key contract from the British Post Office, related to the Counter Automation project being undertaken by Software Sciences. Also, Datasolve Computeraid won large contracts with Marks and Spencer and other retail chain stores, as well as with British Rail. With over 300 engineers, it is focused on providing complete management and maintenance of client companies' workstation requirements.

In 1989, TECS had ten leading European companies, including Allied Irish Bank and Grand Metropolitan, commit to the Company's FCS PILOT executive information system.

Other

In the United Kingdom, THORN EMI Micrologic, the Company's point-of-sale business, committed itself to the development of an exciting new personal computer-based product and finished the year with important orders from Allied Carpets and Royal Doulton.

THORN EMI also is engaged in rental and retail, music, lighting, and security.

Further Information

For more information about the Company's business segments, please contact the appropriate Dataquest industry service.

Table 1
Five-Year Corporate Highlights (Millions of US Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	$4,161.6	$4,877.1	$5,221.3	$5,453.6	$5,394.4
Percent Change	-	3.50	(3.96)	(4.11)	7.75
Capital Expenditure	NA	NA	NA	NA	$563.0
Percent of Revenue	NA	NA	NA	NA	NA
R&D Expenditure	NA	NA	NA	NA	$67.0
Percent of Revenue	NA	NA	NA	NA	NA
Number of Employees	89,354	85,700	74,321	66,630	65,444
Revenue ($K)/Employee	$35.86	$38.70	$42.85	$45.84	$50.28
Net Income	$49.1	$0.6	$122.8	$220.2	$284.6
Percent Change	-	(98.94)	18,625.00	64.62	40.79
Exchange Rate (US$1=£)	£0.77	£0.68	£0.61	£0.56	£0.61

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	NA	NA	NA	NA
Quarterly Profit	NA	NA	NA	NA

NA = Not available

Source: THORN EMI Plc Annual Reports
Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
North America	76.86	79.99	81.04	80.05	75.30
International	23.14	20.01	18.96	19.95	24.70
North America	15.00	13.00	12.00	13.00	17.00
Asia/Pacific	6.00	6.00	6.00	6.00	6.00
ROW	1.00	1.00	1.00	1.00	1.00

Source: THORN EMI Plc Annual Reports
Dataquest (1990)

1989 SALES OFFICE LOCATIONS

Information is not available.

MANUFACTURING LOCATIONS

In 1989, Deanway Technology Centre, a £2 million (US$3.3 million) high-tech facility, went into full operation. Located in Wilmsol, Cheshire, United Kingdom, it is designed specifically to house the Company's northern offices, Software Technology, Retail, and the northern-based development teams.

SUBSIDIARIES

North America

Systron Donner Corporation (United States)

Europe

EMI Music Worldwide (United Kingdom)
HMV Group (United Kingdom)
THORN EMI Microwave Devices Limited (United Kingdom)
THORN Home Electronics International Ltd. (United Kingdom)
THORN Lighting (United Kingdom)
THORN Software and Software Sciences Group (United Kingdom)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

General Electric Aerospace, Siemens, and Thomson-CFS
A four-member consortium of THORN EMI, General Electric Aerospace, Siemens, and Thomson-CFS and known collectively as Euro-Art, signed a memorandum of understanding to develop advanced ground-based weapons-locating radar for the armed forces of France, Germany, and the United Kingdom.

MERGERS AND ACQUISITIONS

1989

Rediffusion Business Electronics (RBE)
THORN EMI will acquire RBE, a producer of messaging, minibar, and Muzak, for approximately £13 million (US$21.3 million). The deal is subject to approval from the Office of Fair Trading. Should the deal go through, THORN EMI will integrate RBE into its business communications operations. RBE's parent BET will retain the public address system and background music activities, while THORN EMI will acquire the TV satellite reception, minibar, and video equipment business.

1988

Howard Smith Industries
THORN EMI acquired Howard Smith Industries, a light-fitting company.

Electronic Rentals Group (ERG)
THORN EMI acquired ERG's Australian and Hong Kong television rental business.

Holophane
THORN EMI acquired Holophane (France), a lighting equipment manufacturer. The acquisition will give THORN EMI 32 percent of the French streetlighting market. Philips holds a 49 percent share.

Informatik Forum
THORN EMI acquired Informatik Forum (Germany), a financial software firm.

KEY OFFICERS

Colin Southgate
Chairman and chief executive officer

James Maxmin
Chairman and chief executive, Home Electronics

Tom Mayer
Executive director

Bhasker Menon
Chairman, EMI Music Worldwide

PRINCIPAL INVESTORS

Information is not available.

FOUNDERS

Information is not available.

Table 3
Comprehensive Financial Statement
Fiscal Year Ending March
(Millions of US Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Fixed Assets	$1,453.1	$1,282.8	$1,234.6	$2,131.6	$2,201.3
Tangible Assets	17.8	17.8	40.0	4.6	5.4
Investments	1,435.3	1,265.0	1,194.6	2,127.0	2,195.9
Current Assets	$129.5	$642.1	$784.1	$2,004.5	$804.9
Stocks	-	-	-	-	-
Debtors	129.4	610.0	753.1	1,987.5	704.6
Cash	0	32.0	31.0	17.0	100.0
Current Liabilities	$700.8	$571.6	$519.7	$1,754.8	$851.0
Long-Term Debt	$194.0	$542.2	$582.0	$575.9	$458.9
Other Liabilities	$28.8	$52.4	$37.4	$64.8	$81.6
Net Current Assets	$830.2	$1,213.7	$1,303.8	$3,759.3	$1,655.9
Net Assets	$2,506.2	$3,091.0	$3,157.7	$6,531.6	$4,397.7
Capital and Reserves	$659.0	$758.7	$879.7	$1,740.5	$1,614.8
Share Capital	152.7	173.5	194.1	237.3	213.4
Share Premium Account	506.2	404.7	479.7	1,176.3	1,092.6
Profit and Loss	-	180.4	205.9	327.0	308.7
Total Shareholders' Equity	$659.0	$758.7	$879.7	$1,740.5	$1,614.8

Income Statement	1985	1986	1987	1988	1989
Revenue	$4,161.6	$4,877.1	$5,221.3	$5,453.6	$5,394.4
European	3,198.4	3,901.0	4,231.5	4,365.5	4,062.1
International	963.1	976.0	989.8	1,088.0	1,332.3
Cost of Sales	$3,566.8	$4,212.5	$4,472.8	$4,534.6	$4,417.9
SG&A Expense	$415.5	$493.8	$575.2	$599.3	$608.4
Operating Profit	$212.7	$206.2	$284.1	$399.5	$486.2
Pretax Income	$140.6	$154.0	$261.5	$402.3	$473.9
Pretax Margin (%)	3.38	3.16	5.01	7.38	8.79
Effective Tax Rate (%)	0.34	0.37	0.36	0.35	0.33
Net Income	$49.1	$0.6	$122.8	$220.2	$284.6
Shares Outstanding, Millions	-	216.0	218.0	250.6	277.2
Per Share Data					
Earnings	$38.83	$38.97	$71.97	$94.82	$105.25
Dividend	$22.73	$25.74	$30.33	$0.39	$0.44
Book Value	-	$3.51	$4.04	$6.95	$5.83
Exchange Rate (US$1=£)	£0.77	£0.68	£0.61	£0.56	£0.61

Source: THORN EMI Plc
Annual Reports
Dataquest (1990)

Table 4
Comprehensive Financial Statement
Fiscal Year Ending March
(Millions of Pounds, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Fixed Assets	£1,118.9	£872.3	£753.1	£1,193.7	£1,342.8
Tangible Assets	13.7	12.1	24.4	2.6	3.3
Investments	1,105.2	860.2	728.7	1,191.1	1,339.5
Current Assets	£99.7	£436.6	£478.3	£1,122.5	£491.0
Stocks	-	-	-	-	-
Debtors	99.6	414.8	459.4	1,113.0	429.8
Cash	0	22.0	19.0	10.0	61.0
Current Liabilities	£539.6	£388.7	£317.0	£982.7	£519.1
Long-Term Debt	£149.4	£368.7	£355.0	£322.5	£279.9
Other Liabilities	£22.2	£35.6	£22.8	£36.3	£49.8
Net Current Assets	£639.3	£825.3	£795.3	£2,105.2	£1,010.1
Net Assets	£1,929.8	£2,101.9	£1,926.2	£3,657.7	£2,682.6
Capital and Reserves	£507.4	£515.9	£536.6	£974.7	£985.0
Share Capital	117.6	118.0	118.4	132.9	130.2
Share Premium Account	389.8	275.2	292.6	658.7	666.5
Profit and Loss	-	122.7	125.6	183.1	188.3
Total Shareholders' Equity	£507.4	£515.9	£536.6	£974.7	£985.0

Income Statement	1985	1986	1987	1988	1989
Revenue	£3,204.4	£3,316.4	£3,185.0	£3,054.0	£3,290.6
European	2,462.8	2,652.7	2,581.2	2,444.7	2,477.9
International	741.6	663.7	603.8	609.3	812.7
Cost of Sales	£2,746.4	£2,864.5	£2,728.4	£2,539.4	£2,694.9
SG&A Expense	£319.9	£335.8	£350.9	£335.6	£371.1
Operating Profit	£163.8	£140.2	£173.3	£223.7	£296.6
Pretax Income	£108.3	£104.7	£159.5	£225.3	£289.1
Pretax Margin (%)	3.38	3.16	5.01	7.38	8.79
Effective Tax Rate (%)	0.34	0.37	0.36	0.35	0.33
Net Income	£37.8	£0.4	£74.9	£123.3	£173.6
Shares Outstanding, Millions	-	216.0	218.0	250.6	277.2
Per Share Data					
Earnings	£29.90	£26.50	£43.90	£53.10	£64.20
Dividend	£17.50	£17.50	£18.50	£0.22	£0.27
Book Value	-	£2.39	£2.46	£3.89	£3.55
Exchange Rate (US$1=£)	£0.77	£0.68	£0.61	£0.56	£0.61

Source: THORN EMI Plc
Annual Reports
Dataquest (1990)

Three-Five Systems, Inc.

Three-Five Systems, Inc.
10230 S. 50th Place
Tempe, AZ 85044
(602)496-0035

Established 1985
Number of Employees: 300

BACKGROUND

Three-Five Systems, Inc. produces and markets custom and semicustom products that combine silicon and GaAs technologies. The Company was initially formed for the purpose of purchasing and continuing to operate National Semiconductor's optoelectronics business unit. The Company was initially headed by Frank Shroff, who has served as National's Troy, New York, plant manager since March 1984. Three-Five plans a corporate R&D center near Arizona State University under the direction of Dr. Carl Derrington.

COMPANY EXECUTIVES

- Chairman/President/CEO—David R. Buchanan (formerly of Camax)
- Vice President, Finance/CFO—Ken Julien
- Vice President, Marketing and Sales—Norman Clark
- Director of Manufacturing—Dr. Carl Derrington
- Director of European Operations—Martin Woolfenden (formerly marketing manager, NSC)
- Director of Engineering—Mike Petra
- Director of LCD Program—John C. Powers (formerly LCD manager, Alphasil)

FINANCIAL BACKING

- December 1985—Three-Five was acquired by Continental Illinois Venture Corporation of Chicago and Opto-Ven of Phoenix for an undisclosed amount.

Three–Five Systems, Inc.

- September 1987—Round 2 financing of $5.5 million was provided by the original investors plus National Semiconductor Corp.
- Early 1988—Sears Pension Fund provided an unspecified amount.

SERVICES

- Design of custom LED and LCD displays
- Manufacturing

PROCESS TECHNOLOGIES

- GaAs
- LCD and PLCD

PRODUCTS

Family of more than 400 products that include the following:

- Bright GaAs 880nm and 940nm emitters
- Intelligent displays
- Semicustom alphanumeric displays
- Lamps
- Optocouplers
- Custom LED array dice
- Standard and custom optoelectronic LED and LCD products

Future Products

- GaAs materials
- MMICs
- OEICs

Three–Five Systems, Inc.

Applications

- Display for electronic subsystems and systems
- Other optoelectronic hardware for consumer, industrial, telecommunications, and computer markets

FACILITIES

- Tempe, Arizona—40,000–square–foot corporate and manufacturing facilities
- Manila, Philippines—Assembly facilities
- Swindon, England—Manufacturing facilities

III–V Semiconductor, Inc.

III–V Semiconductor, Inc.
4545 Wendler Drive
Tempe, AZ 85282
(602) 431–0431

Established 1985
Number of Employees: 80

BACKGROUND

III–V Semiconductor, Inc., was formed for the purpose of purchasing and continuing to operate National Semiconductor's optoelectronics business unit. The Company is headed by Frank Shroff, who had served as National's Troy, New York, plant manager since March 1984. III–V plans a corporate R&D center near Arizona State University under the direction of Dr. Carl Derrington.

COMPANY EXECUTIVES

- President/CEO—Frank Shroff (formerly director, Operations, NSC)
- Vice President, Finance/COO—Brent R.Fox (formerly president and CEO, Senitron)
- Vice President, Marketing and Sales—Dennis Riccio (formerly vice president, Sales and Semiconductor Equipment, Eaton)
- Vice President, Operations—Joseph Riccio (formerly area sales manager, Motorola)
- Vice President, R&D—Dr. John Gragg (formerly vice president, Operations, Sensym)
- Director of European Operations—Martin Woolfenden (formerly marketing manager, NSC)
- Troy Plant Manager—Dr. Carl Derrington (formerly product manager, Sensors, Motorola)

FINANCIAL BACKING

In December 1985, III–V was acquired by Continental Illinois Venture Corporation of Chicago and Opto–Ven of Phoenix for an undisclosed amount.

III–V Semiconductor, Inc.

SERVICES

The Company provides epitaxial III–V material services.

PROCESS TECHNOLOGY

III–V uses GaAs technology.

PRODUCTS

- Bright GaAs 880nm and 940nm emitters
- Intelligent displays
- Semicustom alphanumeric displays
- Lamps
- Optocouplers
- Custom LED array dice

Future Products

- GaAs materials
- Standard and custom opto
- MMICs
- OEICs

Applications

- Displays for electronic subsystems and systems
- Other electronic hardware

FACILITIES

III–V maintains a crystal–growing and GaAs wafer fab facility at Troy, Michigan.

Tokyo Electron Ltd.

2-30-7, Sumiyoshi-cho
Fuchu City, Tokyo, Japan
Telephone: 0423-33-8111
Fax: 0423-33-8480
Telex: 2832475
Dun's Number: 69-054-9777

Date Founded: 1963

CORPORATE STRATEGIC DIRECTION

Tokyo Electron Ltd. (TEL) was founded in 1963 as an electronic products distributor. Currently, TEL manufactures semiconductor manufacturing equipment and measuring instruments as well as pursuing its original trade. Sales for fiscal year ended September 1990 grew rapidly, led by semiconductor manufacturing equipment.

TEL has three divisions: Semiconductor Equipment, Computer Systems, and Electronic Parts and Components. The Company has formed strategic joint ventures in all three divisions that allow it to trade technologies and products.

Revenue for year ended September 1990 totaled ¥190.0 billion (US$1.3 billion), an increase of 9.7 percent over the previous year's total of ¥173.2 billion (US$1.4 billion). (Percentage changes refer only to ¥ amounts; US$ percentage changes will differ because of fluctuations in Dataquest exchange rates.) Net income for year ended September 1990 totaled ¥11.0 billion (US$77.2 million), an increase of 21.7 percent over the previous year's figure of ¥9.0 billion (US$70.5 million). Sixty-five percent of sales were of semiconductor manufacturing equipment, 22 percent were of electronic components, and the remaining 13 percent were of computer systems. Tokyo Electron's export sales accounted for 52 percent of revenue for fiscal year ended September 1990.

R&D expenditure totaled ¥4.8 billion (US$33.7 million) for year ended September 1990, an increase of 55 percent over the previous year's figure of ¥3.1 billion (US$24.2 million). Capital expenditure for year ended September 1990 totaled ¥6.1 billion (US$42.8 million), an increase of nearly 30 percent over the previous year's figure of ¥4.7 billion (US$36.6 million). Tokyo Electron employed 1,819 people the end of September 1990.

Due to the lack of complete financial information, no financial statements are included in this backgrounder.

BUSINESS SEGMENT STRATEGIC DIRECTION

Semiconductor Equipment

Because the introduction of highly integrated semiconductors requires rapid technological progress, success depends on the timely introduction of advanced processing technology into the market. The Company's strategy is to apply its skills as a trading enterprise with an extensive information network to identify the trends and seize the major portion of the market through the timely introduction of international products. Secondly, the Company plans to improve products to meet user specifications and back them up with reliable after-sales service.

Products in the Semiconductor Equipment division include photolithography/clean, doping/thermal processing, deposition, inspection/measurement/repair, and test equipment produced with various manufacturers through joint ventures.

Computer Systems

TEL offers complete systems of factory automation equipment used in the design, production, and inspection stages of semiconductor manufacturing, printed circuit boards, and machinery/equipment. Products in the Computer Systems Division include mechanical CAE/CAD/CAM/CAT systems, specified application

equipment, scientific and technical computers, and electrical CAE/CAD/CAM/CAT systems.

Electronic Parts and Components

Products in the Electronic Parts and Components Division include semiconductors, integrated circuits, discrete devices, and electronic components such as connectors, IC sockets, and switching power supplies.

Manufacturers of the mentioned electronic components include Advanced Micro Devices, Fujitsu, Western Digital, Winchester Electronics, and VLSI Technology, to name a few.

Further Information

For further information about the Company's business segments, please contact the appropriate Dataquest industry service.

1990 SALES OFFICE LOCATIONS

North America—1
Europe—1
Asia/Pacific—9

MANUFACTURING LOCATIONS

Asia/Pacific

TEL Kyushu Ltd., Japan
Semiconductor production equipment, including coaters/developers and LCD production equipment
TEL Sagami Ltd., Japan
Oxidation/diffusion furnace systems and LP-CVD systems
TEL Tohoku Ltd., Japan
Various semiconductor equipment
TEL Yamanashi Ltd., Japan
Semiconductor production equipment including wafer probers, coater/developers, plasma-etching equipment, and ozone strip equipment

SUBSIDIARIES

North America

TEL America Inc. (United States)

Europe

TEL Service Europe B.V. (Netherlands)

Asia/Pacific

TEL Kyushu Ltd. (Japan)
TEL Sagami Ltd. (Japan)
TEL Tohoku Ltd. (Japan)
TEL Tokyo Electron FE (Japan)
TEL Yamanashi Ltd. (Japan)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

ITR Corporation
TEL is marketing test equipment manufactured by ITR. The CXI-5400 is an automatic system for testing assembled surface-mount technology (SMT)-type printed circuit boards.

Ultra Network Technologies Inc.
TEL will distribute Ultra Network Technologies networking systems to Fujitsu, which will support Ultra's gigabit-per-second network on its M-series mainframes and VP-series supercomputers.

Structural Dynamics Research Corporation
TEL began marketing I-DEAS Level V, an enhanced version of the I-DEAS CAE software, from Structural Dynamics Research.

MERGERS AND ACQUISITIONS

Information is not available.

KEY OFFICERS

Tokuo Kubo
Chairman of the board

Toshio Kodaka
President

Noboru Fuse
Senior managing director

Zenju Kasama
Senior managing director

Akira Inoue
Senior managing director

PRINCIPAL INVESTORS

Information is not available.

FOUNDERS

Information is not available.

Tokyo Ohka Kogyo Co., Ltd.

1-403, Kosugi-cho, Nakahara-ku
Kawasaki City, Kanagawa Prefecture, Japan
Telephone: (044) 722-7181
Fax: (044) 733-0398
Dun's Number: Not Available

Date Founded: 1940

CORPORATE STRATEGIC DIRECTION

Established in 1940, Tokyo Ohka Kogyo Co., Ltd., offers a wide range of products including electronics materials, chemical products, synthetics, photopolymer printing plates, offset printing plates, and related processing equipment. Tokyo Ohka's consolidated revenue was ¥43,914 million (US$342.4 million) for fiscal year ended March 31, 1989. Consolidated net income totaled ¥5,357 million (US$41.8 million) for fiscal 1989. Photoresists accounted for 35 percent of sales, chemical products 28 percent, processing equipment 14 percent, printing materials 14 percent, and other products 9 percent. Expenditure for R&D totaled ¥1,377 million (US$10.7 million) for fiscal 1989.

No financial statements are included in this backgrounder.

BUSINESS SEGMENT STRATEGIC DIRECTION

In 1968, Tokyo Ohka developed the OMR81, the first negative semiconductor photoresist made in Japan. The Company later developed the positive photoresist OFPR series, the electron-beam photoresist OEBR series for VLSI manufacturing, and the ODUR series for deep ultraviolet (UV) irradiation. Currently, Tokyo Ohka offers a full line of negative and positive photoresists for diverse applications. In addition to photoresists, the Company provides developers, strippers, and rinsing solutions as well as processing equipment, which includes etching machines, ashing machines, and photoresist coating machines. Tokyo Ohka developed a fully automatic single-wafer processing plasma etching machine in 1977 and followed this with a full line of semiconductor processing equipment. The Company also offers a wide array of photoresists for use in printed circuit board (PCB) manufacturing and chemical milling applications.

Further Information

For further information about the Company's business segments, please contact the appropriate Dataquest industry service.

1989 SALES OFFICE LOCATIONS

Information is not available.

MANUFACTURING LOCATIONS

Asia/Pacific

Kumagaya Ohka Co., Ltd., Japan
Chemicals
Sudama Denshi Kogyo Co., Ltd., Japan
Materials for the electronics industry
Tokyo Alumetal Kogyo Co., Ltd., Japan
Plates for offset printing
Yamanashi Photopoly Ohka Co., Ltd., Japan
Photopolymer printing plates

SUBSIDIARIES

North America

Ohka America, Inc. (United States)

Europe

Ohka (UK), Ltd. (United Kingdom)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

Information is not available.

MERGERS AND ACQUISITIONS

Information is not available.

KEY OFFICERS

Takeo Ito
Chairman of the board of directors and president

Dr. Hisashi Nakane
Vice president

Hatsuo Matsumoto
Executive director

PRINCIPAL INVESTORS

Information is not available.

FOUNDERS

Information is not available.

Tokyo Sanyo Electric Co., Ltd.

Tokyo Sanyo Electric Co., Ltd.
180, Sakata, Oaza, Oizumi-machi,
Ora-gun, Gumma Prefecture, Japan
Telephone: 0276-63-2111
(Millions of Dollars Except Per Share Data)

Balance Sheet (November 30)

	1979*	1980	1981	1982	1983	1984
Working Capital		$ 106.0	$ 133.9	$ 187.3	$ 180.6	397.6
Long-Term Debt		$ 112.6	$ 86.8	$ 122.2	$ 102.5	223.6
Shareholders' Equity		$ 311.0	$ 438.7	$ 418.7	$ 485.1	706.7
After-Tax Return on Average Equity (%)		N/A	9.3	7.0	8.8	

Operating Performance (Fiscal Year Ending November 30)

	1979*	1980	1981	1982	1983	1984
Sales	$1,029.4	$1,130.1**	$1,213.5**	$1,218.0**	$1,457.0**	1972.1
Japanese Sales		$ 651.3	$ 680.7	$ 665.0#	$ 772.4	1018.9
Non-Japanese Sales		$ 478.8	$ 532.8	$ 553.0#	$ 684.6	953.2
Cost of Revenue		$ 994.3	$1,087.3	$1,081.7	$1,223.9	
R&D Expense		$ 37.2	$ 47.9	$ 52.2	$ 66.4	81.7
SG&A Expense		$ 50.8	$ 57.9	$ 55.0	$ 59.6	
Pretax Income		$ 84.5	$ 61.1	$ 57.0	$ 74.3	
Pretax Margin (%)		7.5	5.0	4.7	5.0	
Effective Tax Rate (%)		54.7	51.0	51.3	51.8	
Net Income	$ 41.8	$ 48.8	$ 35.3	$ 28.3	$ 42.8	74.8
Average Shares Outstanding (Millions)		346	365	375	355	
Per Share						
Earnings		$ 0.13	$ 0.10	$ 0.08	$ 0.11	0.16
Dividends		$ 0.03	$ 0.03	$ 0.03	$ 0.03	0.03
Book Value		$ 0.02	$ 0.03	$ 0.03	$ 1.37	
Price Range		N/A	N/A	N/A	N/A	
Total Employees		N/A	9,436	10,112	11,009	
Capital Expenditures		$ 113.4	$ 123.0	$ 75.6	$ 116.3	
Exchange Rate (Yen per US$)	217.9	228.3	221.1	247.2	238.1	245.0

N/A = Not Available
*The only information available for 1979 is shown in this table.
**In addition, Sanyo had interest and other income of $36.8, $40.3, $27.9, and $37.0 million in 1980, 1981, 1982, and 1983, respectively.
#DATAQUEST estimate

Source: Tokyo Sanyo Electric Co., Ltd.
Annual Reports
DATAQUEST

Tokyo Sanyo Electric Co., Ltd.

Table 1

Tokyo Sanyo Electric Co., Ltd.
SALES BY PRODUCT CATEGORY
(Billions of Yen)

	Fiscal Year Ending November 30					
	1979	1980	1981	1982	1983	1984
Electronic Equipment	¥ 64.6	¥ 89.7	¥ 83.3	¥ 88.1	¥ 117.9	163.3
Household Appliances	71.4	70.7	80.0	96.4	81.9	86.2
Commercial and Industrial Equipment	60.1	59.5	57.2	67.9	81.1	98.3
Semiconductors*	28.2	38.1	47.8	48.7	¥ 66.0	90.5
Total Sales	¥ 224.3	¥ 258.0	¥ 268.3	¥ 301.1	¥ 346.9	
Exchange Rate (Yen per US$)	217.9	228.3	221.1	247.2	238.1	
Total Sales (Millions of US$)	$1,029.4	$1,130.1	$1,213.5	$1,218.0	$1,457.0	

*Includes digital electronic watches

Source: Tokyo Sanyo Electric Co., Ltd.
Annual Reports
DATAQUEST

Tokyo Sanyo Electric Co., Ltd.

Table 2

Sanyo Electric Co., Ltd.
ESTIMATED WORLDWIDE SEMICONDUCTOR REVENUES
(Millions of Dollars)

	1976	1977	1978	1979	1980	1981	1982	1983
Total Semiconductor	–	–	120	154	192	226	241	351
Total Integrated Circuit	–	–	88	111	136	148	146	247
Bipolar Digital (Technology)	–	–	5	6	10	12	12	14
TTL	–	–	–	–	–	–	–	–
DTL	–	–	–	–	–	–	–	–
ECL	–	–	–	–	–	–	–	–
Other Bipolar Digital	–	–	–	–	–	–	–	–
Bipolar Digital (Function)	–	–	5	6	10	12	12	14
Bipolar Digital Memory	–	–	–	–	–	–	–	–
Bipolar Digital Logic	–	–	–	6	10	12	12	14
MOS (Technology)	–	–	13	18	21	23	28	50
NMOS	–	–	–	9	11	12	15	27
PMOS	–	–	–	6	5	4	3	3
CMOS	–	–	–	3	5	7	10	20
MOS (Function)	–	–	13	18	21	23	28	50
MOS Memory	–	–	–	3	4	5	6	12
MOS Microprocessor	–	–	–	–	–	–	5	18
MOS Logic	–	–	–	15	17	18	17	20
Linear	–	–	70	87	105	113	106	183
Total Discrete	–	–	21	28	35	47	64	58
Transistor	–	–	19	23	27	33	46	51
Small Signal Transistor	–	–	14	17	21	26	36	40
Power Transistor	–	–	5	6	6	7	10	11
Diode	–	–	1	3	6	11	15	7
Small Signal Diode	–	–	1	2	4	6	8	–
Power Diode	–	–	–	1	2	5	7	–
Zener Diode	–	–	–	–	–	–	–	–
Thyristor	–	–	–	–	–	–	–	–
Other Discrete	–	–	1	2	2	3	3	–
Total Optoelectronic	–	–	11	15	21	31	31	46
LED Lamps	–	–	–	–	–	–	–	–
LED Displays	–	–	–	–	–	–	–	–
Optical Couplers	–	–	–	–	–	–	–	–
Other Optoelectronics	–	–	–	–	–	–	–	–

Source: DATAQUEST

Tokyo Sanyo Electric Co., Ltd.

(Page intentionally left blank)

Tokyo Sanyo Electric Co., Ltd.

Tokyo Sanyo Electric Co., Ltd.
180, Sakata, Oizumi-machi,
Ora-gun, Gumma Prefecture, Japan
Telephone: 0276-63-2111
(Billions of Yen Except Per Share Data)

Balance Sheet (November 30)

	1981	1982	1983	1984	1985
Working Capital	¥ 29.6	¥ 46.3	¥ 43.0	¥ 97.4	¥105.9
Long-Term Debt	¥ 19.2	¥ 30.2	¥ 24.4	¥ 54.8	¥ 88.0
Shareholders' Equity	¥ 97.0	¥103.5	¥115.5	¥173.1	¥190.8
After-Tax Return on Average Equity (%)	9.3	7.0	8.8	12.7	8.7

Operating Performance (Fiscal Year Ending November 30)

	1981	1982	1983	1984	1985
Sales	¥268.3*	¥301.1*	¥346.9*	¥483.2*	¥548.9*
Japanese Sales	¥150.5	¥164.4**	¥183.9	¥249.6	¥291.8
Non-Japanese Sales	¥117.8	¥136.7**	¥163.0	¥233.6	¥257.1**
Cost of Revenue	¥240.4	¥267.4	¥291.4	¥401.3	¥479.7
R&D Expense	¥ 10.6	¥ 12.9	¥ 15.8	¥ 20.0	¥ 23.6
SG&A Expense	¥ 12.8	¥ 14.9	¥ 15.4	¥ 20.6	¥ 27.1
Pretax Income	¥ 13.5	¥ 14.1	¥ 17.7	¥ 34.5	¥ 34.1
Pretax Margin (%)	5.0	4.7	5.0	7.1	6.2
Effective Tax Rate (%)	51.0	51.3	51.8	54.5	58.1
Net Income	¥ 7.8	¥ 7.0	¥ 10.2	¥ 18.3	¥ 15.8
Average Shares Outstanding (Millions)	365	375	355	413	452
Per Share					
Earnings	¥ 21.3	¥ 18.7	¥ 25.7	¥ 39.4	¥ 30.8
Dividends	¥ 6.4	¥ 6.4	¥ 7.0	¥ 8.0	¥ 8.5
Book Value	¥265.8	¥276.0	¥325.4	¥419.1	¥422.1
Price Range	N/A	N/A	N/A	N/A	N/A
Total Employees	9,436	10,112	11,009	13,259	18,070
Capital Expenditures	¥ 27.2	¥ 18.7	¥ 27.7	¥ 36.4	¥ 73.5
Exchange Rate (Yen per US$)	221.1	247.2	238.1	237.4	241.8

N/A = Not Available
*In addition, Sanyo had interest and other income of ¥8.9 billion, ¥6.9 billion, ¥9.2 billion, ¥12.1 billion, and ¥19.2 billion in 1981, 1982, 1983, 1984, and 1985, respectively.
**Dataquest estimate

Source: Tokyo Sanyo Electric Co., Ltd.
Annual Reports
Dataquest
February 1987

Tokyo Sanyo Electric Co., Ltd.

Tokyo Sanyo Electric Co., Ltd.
180, Sakata, Oizumi-machi,
Ora-gun, Gumma Prefecture, Japan
Telephone: 0276-63-2111
(Millions of Dollars Except Per Share Data)

Balance Sheet (November 30)

	1981	1982	1983	1984	1985
Working Capital	$ 133.9	$ 187.3	$ 180.6	$ 410.3	$ 438.0
Long-Term Debt	$ 86.8	$ 122.2	$ 102.5	$ 230.8	$ 367.7
Shareholders' Equity	$ 438.7	$ 418.7	$ 485.1	$ 729.1	$ 789.1
After-Tax Return on Average Equity (%)	9.3	7.0	8.8	12.7	8.7

Operating Performance (Fiscal Year Ending November 30)

	1981	1982	1983	1984	1985
Sales *	$1,213.5*	$1,218.0*	$1,457.0*	$2,035.4*	$2,270.1*
Japanese Sales	$ 680.7	$ 665.0**	$ 772.4	$1,051.4	$1,206.8
Non-Japanese Sales	$ 532.8	$ 553.0**	$ 684.6	$ 984.0	$1,063.3
Cost of Revenue	$1,087.3	$1,081.7	$1,223.9	$1,690.4	$1,983.9
R&D Expense	$ 47.9	$ 52.2	$ 66.4	$ 84.2	$ 97.6
SG&A Expense	$ 57.9	$ 60.3	$ 64.7	$ 86.8	$ 112.1
Pretax Income	$ 61.1	$ 57.0	$ 74.3	$ 145.3	$ 141.0
Pretax Margin (%)	5.0	4.7	5.0	7.1	6.2
Effective Tax Rate (%)	51.0	51.3	51.8	54.5	58.1
Net Income	$ 35.3	$ 28.3	$ 42.8	$ 77.1	$ 65.3
Average Shares Outstanding (Millions)	365	375	355	413	452
Per Share					
Earnings	$ 0.10	$ 0.08	$ 0.11	$ 0.17	$ 0.13
Dividends	$ 0.03	$ 0.03	$ 0.03	$ 0.03	$ 0.04
Book Value	$ 0.03	$ 0.03	$ 1.37	$ 1.77	$ 1.75
Price Range	N/A	N/A	N/A	N/A	N/A
Total Employees	9,436	10,112	11,009	13,259	18,070
Capital Expenditures	$ 123.0	$ 75.6	$ 116.3	$ 153.3	$ 304.0
Exchange Rate (Yen per US$)	221.1	247.2	238.1	237.4	241.8

N/A = Not Available
*In addition, Sanyo had interest and other income of $40.3 million, $27.9 million, $38.6 million, $51.0 million, and $79.4 million in 1981, 1982, 1983, 1984, and 1985, respectively.
**Dataquest estimate

Source: Tokyo Sanyo Electric Co., Ltd.
Annual Reports
Dataquest
February 1987

Tokyo Sanyo Electric Co., Ltd.

THE COMPANY

Background

Tokyo Sanyo Electric Co., Ltd., was established in 1959 with capital of ¥500 million. The Company began as a producer of black-and-white televisions, but it has since become a manufacturer of a wide range of products, including refrigerators, audio equipment, and electronic devices. Construction of the Company's first semiconductor plant began during the same year the Company was founded. Much of Tokyo Sanyo's technological expertise has been acquired through technical licensing agreements with major world manufacturers; however, today, Tokyo Sanyo itself is imparting technical know-how to other companies.

Tokyo Sanyo believes that creativity and originality are fundamental to the Company's way of doing business. The kanji characters below mean "creativity," the Company's catchword.

Company Organization

In December 1986, Tokyo Sanyo merged with Sanyo Electric Co., Ltd., parent company of the Sanyo Group. The president of Sanyo Electric is Satoshi Iue. Future updates of this company profile will cover Sanyo Electric Co., Ltd.

Until December 1986, Tokyo Sanyo was a member of the Sanyo Electric Group of companies, which includes more than 60 manufacturing and sales subsidiaries throughout the world. The name "Sanyo" means "three oceans" (the Pacific, Atlantic, and Indian) and symbolizes the internationalization of the Group, which has been establishing local distribution companies and plants worldwide. Tokyo Sanyo was the major semiconductor

manufacturing arm of Sanyo Electric. Tottori Sanyo, another Sanyo company, manufactures Sanyo's optoelectronic devices. We have included the sales of all these companies in our semiconductor revenue tables.

Tokyo Sanyo and Sanyo Electric also have ties with the Sumitomo Industrial Group, one of whose major members is NEC Corporation. The Sumitomo Group's influence on both companies has been significant, since 64 percent and 44 percent, respectively, of their shareholders are Sumitomo Group companies.

Investment in the Company

As of March 31, 1986, Tokyo Sanyo's major shareholders were Sanyo Electric (20.1 percent), Sumitomo Life Insurance (4.0 percent), Satoshi Iue--President of the Company--(3.1 percent), Sumitomo Bank (2.8 percent), Nippon Life Insurance (2.6 percent), Kyowa Bank (2.6 percent), Asahi Mutual Life Insurance (2.2 percent), and Dai-ichi Mutual Life Insurance (2.2 percent). Foreign ownership is 3.7 percent. Tokyo Sanyo is listed on the Tokyo, Osaka, Luxembourg, and Frankfurt stock exchanges.

OPERATIONS

Tokyo Sanyo reported consolidated fiscal 1985 (year ending November 30) net earnings of ¥15.8 billion on net sales of ¥548.9 billion. This represents a sales increase of 13.6 percent over fiscal 1984. Net income decreased 13.7 percent from fiscal 1984. Sales showed a compound annual growth rate (CAGR) of 19.6 percent from 1981 to 1985.

Tokyo Sanyo reports sales by five product categories: electronic equipment, household appliances, commercial and industrial equipment, information and factory automation equipment, and semiconductors. Sales for these categories are shown in Table 1.

Figure 1 shows changes in the composition of company sales from 1981 and 1985. The fastest-growing product segments are electronic equipment and information/factory automation equipment, which picked up 7.4 and 2.6 percentage points, respectively.

Tokyo Sanyo Electric Co., Ltd.

Table 1

Tokyo Sanyo Electric Co., Ltd.
SALES BY PRODUCT CATEGORY
(Billions of Yen)

	Fiscal Year Ending November 30				
	1981	1982	1983	1984	1985
Electronic Equipment	¥ 79.2	¥ 84.6	¥ 109.3	¥ 163.3	¥ 202.6
Household Appliances	80.0	96.4	81.9	86.2	103.0
Commercial and Industrial Equipment	48.8	54.3	60.9	98.4	109.0
Information and Factory Automation Equipment	12.5	17.1	28.8	44.8	40.3
Semiconductors*	47.8	48.7	66.0	90.5	94.0
Total Sales	¥ 268.3	¥ 301.1	¥ 346.9	¥ 483.2	¥ 548.9
Exchange Rate (Yen per US$)	221.1	247.2	238.1	237.4	241.8
Total Sales (Millions of US$)	$1,213.5	$1,218.0	$1,457.0	$2,035.4	$2,270.1

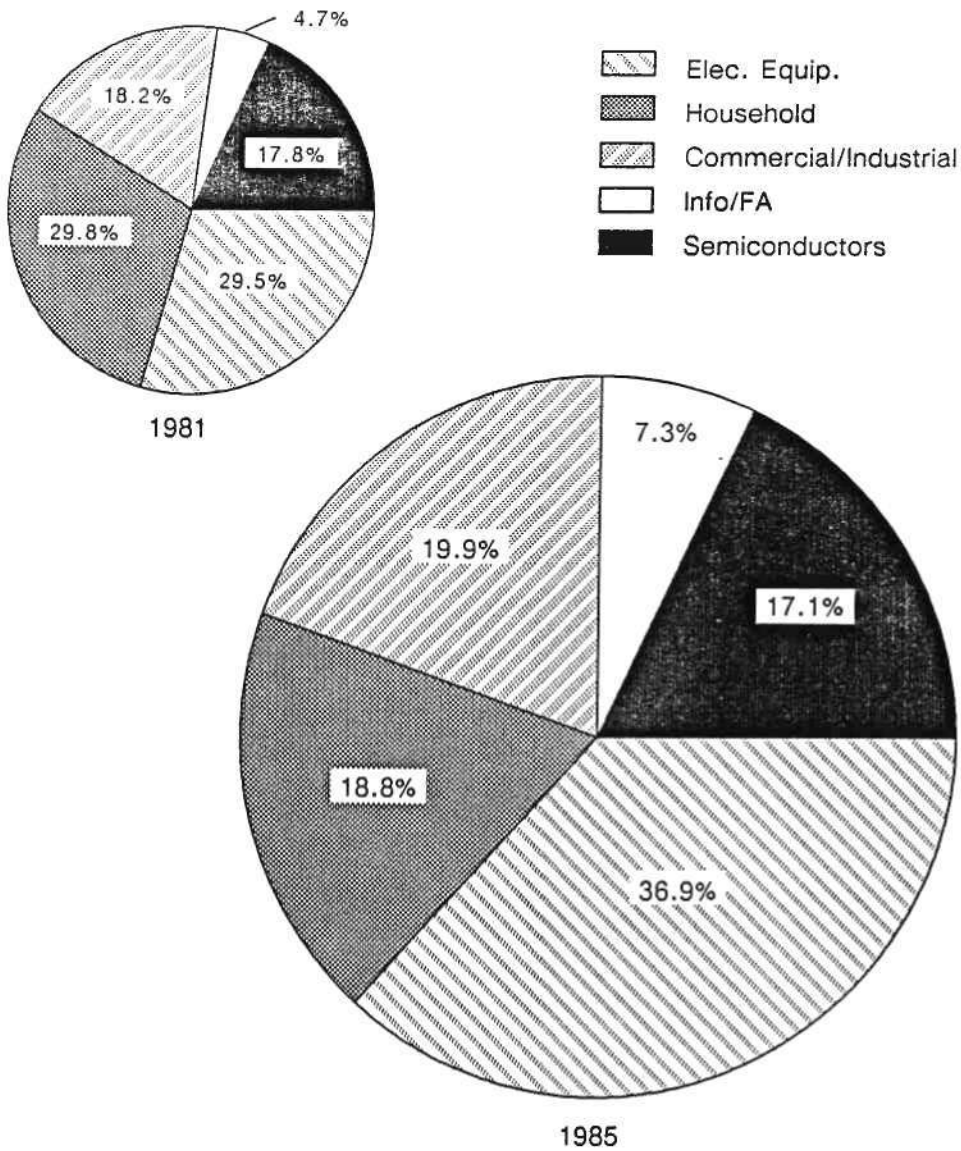
*Includes digital electronic watches

Source: Tokyo Sanyo Electric Co., Ltd.
Annual Reports
Dataquest
February 1987

Tokyo Sanyo Electric Co., Ltd.

Figure 1

Tokyo Sanyo Electric Co., Ltd.
REVENUE BY PRODUCT CATEGORY
1981 AND 1985



Source: Dataquest
February 1987

Tokyo Sanyo Electric Co., Ltd.

SEMICONDUCTORS

Tokyo Sanyo began manufacturing semiconductors in 1962 to supply products for Sanyo Electric's televisions, radios, and tape recorders. As shown in Table 2, the Sanyo Group's estimated 1986 semiconductor revenue was $585 million (¥97.6 billion), a 28 percent increase in dollars over 1985's revenue of $457 million (¥108.8 billion), but a 10.3 percent decrease when measured in yen. Tottori Sanyo's optoelectronic revenue is also included in Table 2. Dataquest estimates that Tokyo Sanyo's capital expenditures for semiconductors were $199 million (¥47 billion) in 1985, and increased to $208 million (¥42 billion) in fiscal 1986. Sanyo is one of the few Japanese companies that increased semiconductor capital spending both in 1985 and 1986.

As Table 2 shows, linear devices accounted for $296 million or 51 percent of Sanyo's 1986 semiconductor sales. Discretes were $129 million or 22 percent, and optoelectronic devices (manufactured by Tottori Sanyo) were $49 million or 8 percent. Only 19 percent of the Company's semiconductor sales were bipolar digital and MOS ICs.

Dataquest believes that in 1986, approximately 3 percent of Sanyo's semiconductor sales were to the United States, 2 percent were to Europe, 9 percent were to Rest of World countries, and the largest segment, 86 percent, were domestic sales. Table 3 shows the estimated geographical distribution of Sanyo's 1986 semiconductor sales.

Semiconductor Products and Technologies

Tokyo Sanyo and Tottori Sanyo semiconductor product lines include the following:

- Bipolar digital--Specialty logic products such as level meters, general-purpose timers, and intermittent wiper controllers
- MOS memory--Small amounts of EPROMs, SRAMs, and DRAMs
- MOS microprocessor and logic--8- and 16-bit microprocessors and microcontrollers; standard MOS logic
- Linear--Mostly for consumer products like watches and clocks, stereos, radios, TVs, and VCRs
- Discrete--Transistors, diodes, and FETs
- Optoelectronic--LEDs

Tokyo Sanyo Electric Co., Ltd.

Table 2

Sanyo Electric Co., Ltd.
ESTIMATED WORLDWIDE SEMICONDUCTOR REVENUE
(Millions of Dollars)

	1979	1980	1981	1982	1983	1984	1985	1986
Total Semiconductor	154	192	226	241	351	455	457	585
Total Integrated Circuit	111	136	148	146	247	305	314	407
Bipolar Digital (Technology)	6	10	12	12	14	18	18	23
TTL						14		
ECL						4		
Other Bipolar Digital							18	23
Bipolar Digital (Function)	6	10	12	12	14	18	18	23
Bipolar Digital Memory								
Bipolar Digital Logic	6	10	12	12	14	18	18	23
MOS (Technology)	18	21	23	28	50	67	68	88
NMOS	9	11	12	15	28	26	26	31
PMOS	6	5	4	3	2	1		
CMOS	3	5	7	10	20	40	42	57
MOS (Function)	18	21	23	28	50	67	68	88
MOS Memory						1	1	5
MOS Micro Devices				5	23	35	36	45
MOS Logic	18	21	23	23	27	31	31	38
Linear	87	105	113	106	183	220	228	296
Total Discrete	28	35	47	64	58	105	103	129
Transistor	23	27	33	46	51	84	84	104
Small Signal Transistor						74	74	71
Power Transistor						10	10	33
Diode	3	6	11	15	7	21	19	25
Small Signal Diode						5	9	13
Power Diode						10	8	11
Zener Diode						6	2	1
Thyristor								
Other Discrete	2	2	3	3				
Total Optoelectronic	15	21	31	31	46	45	40	49
LED Lamps						10	8	11
LED Displays						35	32	38
Optical Couplers								
Other Optoelectronics								
Exchange Rate (Yen/US$)	219	227	221	248	235	237	238	167

Tokyo Sanyo Electric Co., Ltd.

Table 3

Sanyo Electric Co., Ltd.
ESTIMATED 1986 SEMICONDUCTOR REVENUE
BY GEOGRAPHIC REGION
(Millions of Dollars)

	U.S.	Japan	Europe	ROW	Total
Total Semiconductor	15	504	12	54	585
Total Integrated Circuit	12	340	10	45	407
Bipolar	0	22	0	1	23
MOS	1	66	7	14	88
Linear	11	252	3	30	296
Total Discrete	3	117	1	8	129
Total Optoelectronic	0	47	1	1	49

Source: Dataquest
February 1987

The Sanyo Group made no presentations at the 1986 IEEE International Solid-State Circuit Conference. However, the Company has announced several recent semiconductor developments, which include:

- Two series of audio power ICs with oblong substrate structures able to accommodate high pin counts
- A single-chip, signal processing IC for NTSC standard color televisions (The chip integrates 1,900 analog devices and 400 digital gates on a 4.5mm die.)
- A hybrid IC for five-phase unipolar stepping motor drives
- Fifteen ICs for VHS VCR image signal processing (Included are four models of head amplifier IC, seven models of brightness signal processing ICs, and four models of color signal processing ICs.)

Early in 1986, Sanyo Electric announced plans to produce 256K SRAMs at its Gifu Works. During 1986, the Company completed development of 1Mb DRAMs and began sample shipment.

Tokyo Sanyo Electric Co., Ltd.

Alliances

Sanyo Electric and Tokyo Sanyo are involved in the following alliances:

- Sanyo Electric is involved with Matsushita, Sharp, and Mitsubishi in a project to develop microprocessors for parallel-processing computers.
- In 1986, Tokyo Sanyo and NEC signed a five-year second-source contract for television-use linear ICs.
- In August 1983, Sanyo Electric entered into a microprocessor manufacturing and marketing licensing agreement with Intel covering the 8086, 8088, and 8051. The 8088 is used in Sanyo's personal computers, and Sanyo produces it for internal use only.
- Sanyo has had a manufacturing and marketing license with Fairchild for 4-bit microprocessors since 1978.

Previous agreements include a 1968 technical assistance agreement with Texas Instruments for IC production, and a 1969 technical assistance agreement with General Instrument for calculator chips.

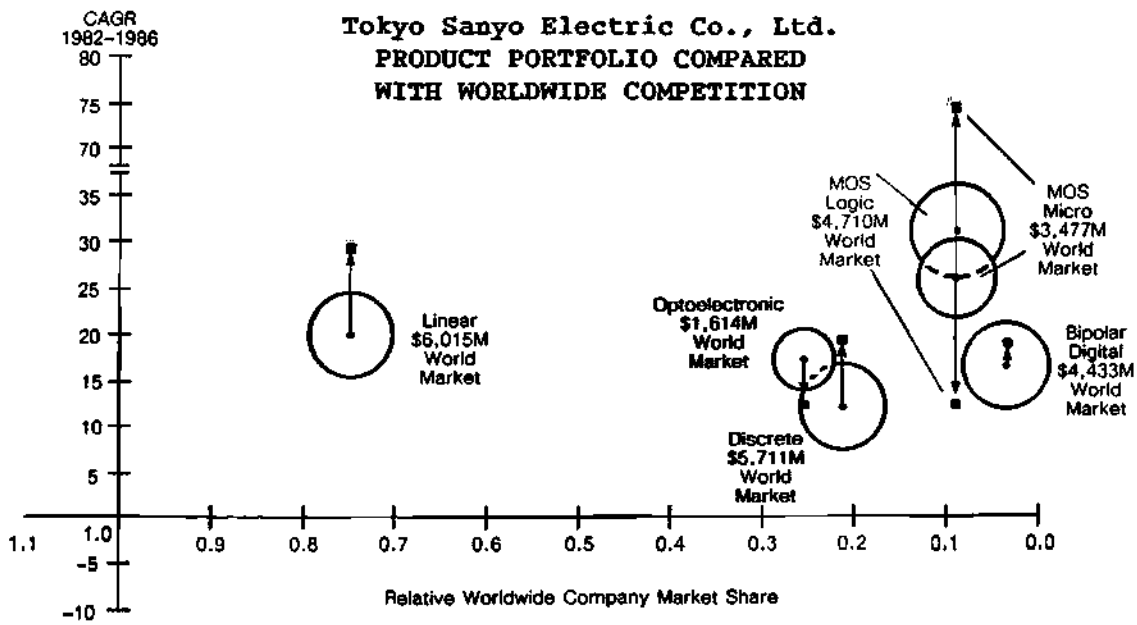
The Sanyo Group acquired 40 percent of U.S. supermicrocomputer maker Icon Systems and Software Corp. in July 1985.

Product Portfolio Analysis

Figure 2 is a graphic analysis of Sanyo's 1986 product portfolio compared with worldwide competition. Figure 3 presents the same analysis applied only to the Company's Japanese competition. These figures show which product areas the Company has chosen to focus on.

The y axis is the historical product compound annual growth rate (CAGR) from 1982 to 1986. Sanyo's CAGR for each product is marked by a dot. In Figure 2, the worldwide product CAGR is marked by a dot surrounded by a circle that represents the total world market for the product. In Figure 3, the total Japanese company CAGR for each product is marked by a dot surrounded by a circle that represents total Japanese company sales for the product.

Figure 2

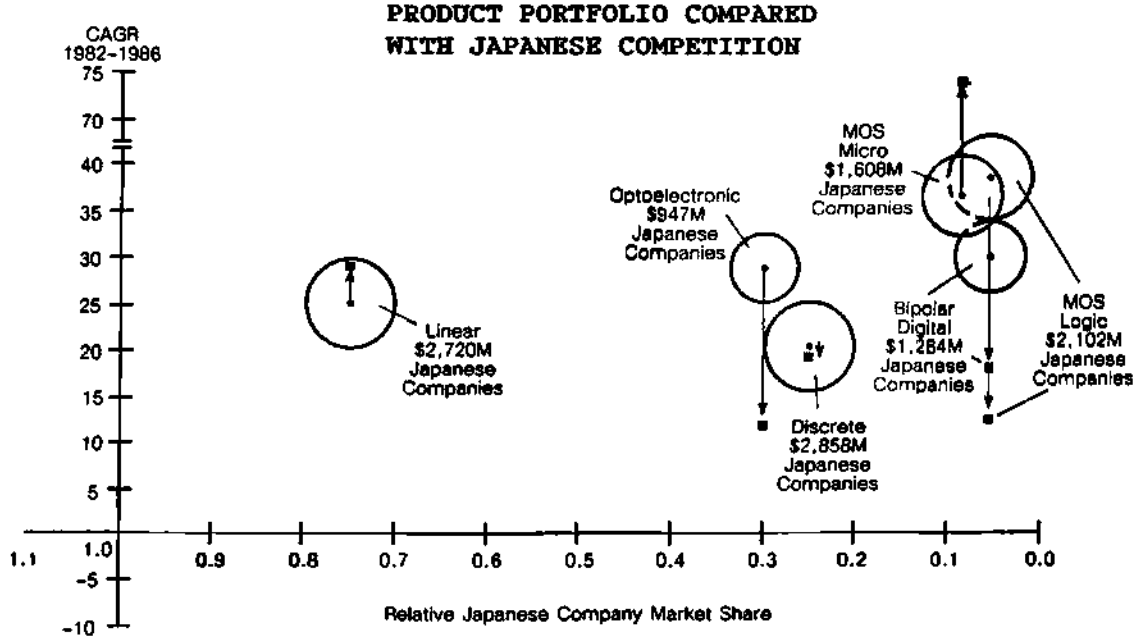


Note: Up arrow indicates growth higher than worldwide industry average; down arrow indicates the opposite.

■ Sanyo

Source: Dataquest February 1987

Figure 3



Note: Up arrow indicates growth higher than Japanese companies' average; down arrow indicates the opposite.

■ Sanyo

Source: Dataquest February 1987

The locations of graph points may be interpreted in the following way:

- Upper right quadrant--These are the "developing products." The Company is not the leading supplier of these products, but the products exhibit positive growth.

- Upper left quadrant--These are the "stars." The Company is the leading supplier of these products, and the products exhibit positive growth.

- Lower left quadrant--These are the "cash cows." The Company is the leading supplier in a declining product segment, but there is generally a high profit margin on these products.

- Lower right quadrant--These are the "dogs." The TAM for this product area is declining and the Company is not the leading supplier.

A worldwide competitive analysis of Sanyo's product portfolio shows that the Company's most successful products are linear ICs. Sanyo is a major consumer electronics manufacturer and 25 percent of its semiconductor sales are captive. The Company also has a fairly high relative market share in optoelectronic products, an area in which it has made significant developments; however, its growth in optoelectronics has been lower than the industry average. Sanyo has shown strong growth in MOS microdevices, refelcting a 73 percent CAGR from 1982 to 1986.

Viewed against its Japanese competition, Sanyo's growth rates have been significantly lower than average for optelectronics, MOS logic, and bipolar digital ICs, and slightly lower for discretes. The Company's most competitive areas are linear ICs, where it enjoys very high relative market share, and MOS microdevices.

Electronic Equipment

Sales in the electronic equipment category totaled ¥202.6 billion in fiscal 1985, an increase of 24 percent over fiscal 1984. This category accounted for 37 percent of Tokyo Sanyo's total sales and is the Company's largest product group. The main products in this category include VCRs, cassette tape recorders, stereo components, and compact disk players.

Household Appliances

Sales in the household appliances category totaled ¥103.0 billion in fiscal 1985, an increase of 19.5 percent from fiscal 1984. This category accounted for 19 percent of Tokyo Sanyo's total sales. The main products in this category include refrigerators, small air conditioners, kerosene heaters, and home solar energy systems.

Commercial and Industrial Equipment

Sales in the commercial and industrial equipment category totaled ¥109.0 billion in 1985, up 10.8 percent from fiscal 1984. This product category has become the Company's second largest, accounting for 20 percent of sales. The main products in this category include refrigerating display cases, prefabricated refrigerator-freezers, large air conditioners, absorption chiller-heaters, solar air conditioning systems, compressors, and vending machines.

Information and Factory Automation Equipment

Sales of information and factory automation equipment were ¥40.3 billion in 1985, down 10 percent from 1984. At only 7 percent of total sales, this is the Company's smallest product area. Major products in this category include medical billing computers, personal computers, word processors, display monitors, factory automation equipment, and telephone-related equipment.

INTERNATIONAL OPERATIONS

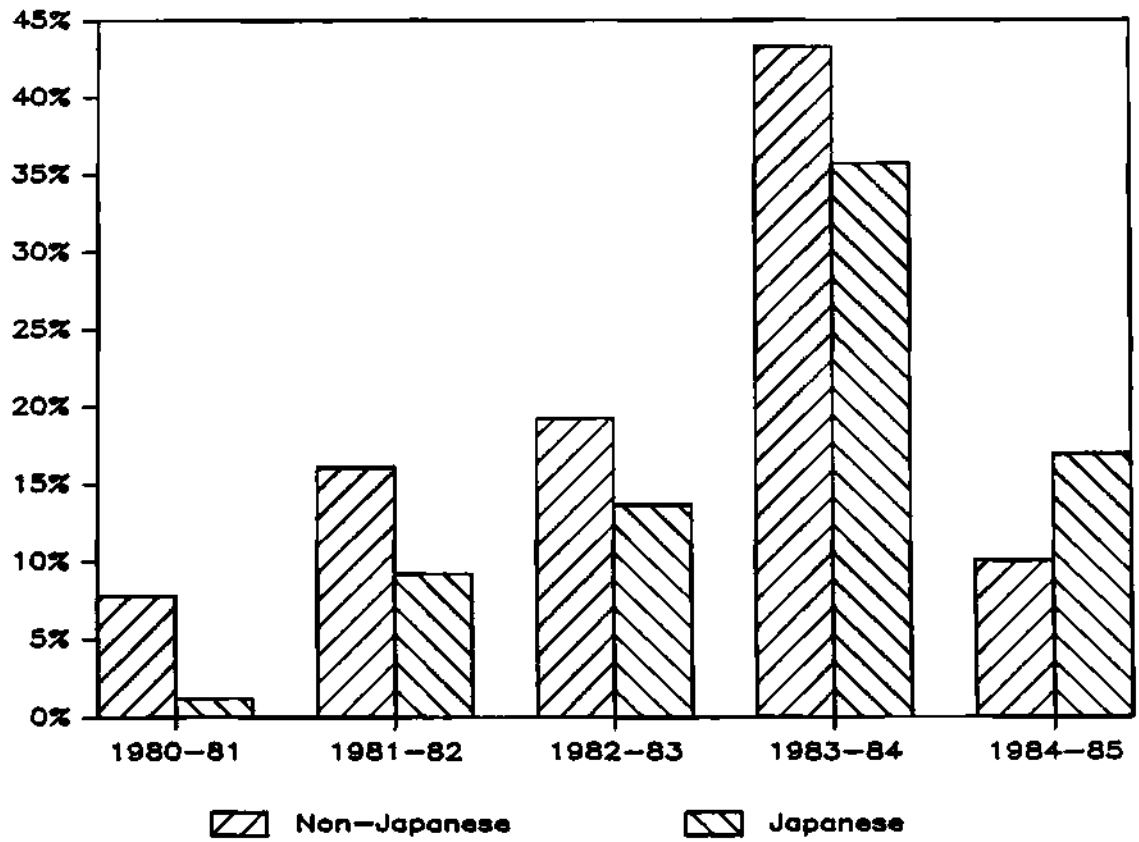
Non-Japanese sales accounted for 47 percent of total Tokyo Sanyo sales in fiscal 1985, compared with 48 percent in fiscal 1984. These figures are comparable to those for Matsushita, and they are significantly higher than the non-Japanese revenue ratios of Fujitsu, Hitachi, Mitsubishi, NEC, and Toshiba.

The compound annual growth rate (CAGR) for non-Japanese sales was 21.5 percent from 1981 to 1985; domestic sales grew at a CAGR of only 18 percent during the same period. Figure 4 shows the year-to-year growth of Tokyo Sanyo's non-Japanese and Japanese sales from 1980 to 1985.

Tokyo Sanyo Electric Co., Ltd.

Figure 4

Tokyo Sanyo Electric Co., Ltd.
GROWTH OF NON-JAPANESE VS. JAPANESE REVENUE



MANUFACTURING FACILITIES

Tokyo Sanyo has 10 semiconductor manufacturing facilities in Japan and two affiliates in Asia. They are listed in Table 4. Figure 5 is a map of Japan showing the factory locations. Production of 64K SRAMs, gate arrays, and CCDs began at the new Gifu Works in January 1985. This represented the first full-scale entry into semiconductor production by the parent company, Sanyo Electric, itself.

Tokyo Sanyo Electric Co., Ltd.

Table 4

Sanyo Electric Co., Ltd.
SEMICONDUCTOR MANUFACTURING LOCATIONS

Map Code	Location	Function and Products
A	Hanyu Sanyo Denshi Saitama Prefecture (est. 1966)	Assembly
B	Miyoshi Denki Gumma Prefecture (est. 1966)	Assembly
C	Sanyo Isesaki Denshi Gumma Prefecture (est. 1967)	Assembly--ICs
D	Sanyo Kaihatsu Laboratory Gifu Prefecture (est. 1979, new lines est. 1985 and 1986)	Fab, assembly, R&D--NMOS, LSI
E	Sanyo Silicon Denshi Tochigi Prefecture (est. 1968)	Assembly--ICs
F	Sumoto Factory Hyogo Prefecture (est. 1964)	Fab--Optoelectronics
G	Tokyo IC Gumma Prefecture (est. 1969, new line est. 1983)	Assembly--hybrid ICs
H	Tokyo Sanyo Denki Gumma Prefecture (est. 1959, new line est. 1984)	Fab--ICs, Discretes
I	Tottori Sanyo Denki Tottori Prefecture (est. 1966)	Fab, assembly--Optoelectronics
J	Niigata Sanyo Denshi (est. 1986)	Fab--Linear ICs
	Taiwan Tokyo Semiconductor Co., Ltd. Taiwan	Assembly--Linear ICs
	Korea Tokyo Silicon Co., Ltd. Korea	N/A

N/A = Not Available

Note: The Company also plans to produce semiconductors in the People's Republic of China.

Source: Dataquest
February 1987

Tokyo Sanyo Electric Co., Ltd.

Figure 5

Tokyo Sanyo Electric Co., Ltd.
SEMICONDUCTOR MANUFACTURING LOCATIONS

In early 1986, Sanyo Electric completed a new factory at Gifu Works, called GII. The new plant will produce gate arrays of up to 10,000-gates, 256K SRAMs, and CCDs for color cameras. Total floor space at Gifu Works is now 28,500 square meters.

Tokyo Sanyo Electric Co., Ltd.

RESEARCH AND DEVELOPMENT

Tokyo Sanyo's total R&D expenditure for fiscal 1985 was ¥23.6 billion ($97.6 million), an increase of 18 percent over fiscal 1983. R&D expenditures have increased from 4.0 percent of sales in fiscal 1981 to 4.3 percent in fiscal 1985. Sanyo is also expanding its VLSI Technology Development Center in Gifu Prefecture. A new R&D center being built at the headquarters location was completed in 1986. The initial research focus will be greater than 4Mb density ICs.

MARKETING

Dataquest believes that approximately 25 percent of Sanyo's semiconductor production is captive and is being used in Sanyo Group consumer and industrial electronic products. This percentage has decreased as Sanyo Electric and Tokyo Sanyo have penetrated more of the merchant semiconductor market.

Sales within Japan are handled through sales offices in Japan. There are also several independent agents who sell Sanyo semiconductor products. Approximately 10 percent of Sanyo's semiconductor products are sold through distribution.

Sales outside Japan are made through Sanyo sales companies in various countries. These companies are:

- Sanyo Semiconductor Sales Corporation (United States)
- Korea Tokyo Silicon Co., Ltd. (Korea)
- Taiwan Tokyo Silicon Co., Ltd. (Taiwan)
- Sanyo Electric (H.K.) Ltd., Sanyo Electronics (H.K.) Ltd., and Sanyo Semiconductor (H.K.) Ltd. (Hong Kong)

In 1985, the Company established sales offices in West Germany and China. Sanyo Semiconductor (Europe) in Eschborn, West Germany, is 90 percent capitalized by Tokyo Sanyo and 10 percent capitalized by the Company's U.S. and Hong Kong subsidiaries. Sanyo Semiconductor (Shekoa) in Guangzhon, China, is affiliated with the Company's Hong Kong subsidiaries.

Toshiba Corporation

1-1 Shibaura 1-chome
Minato-ku, Tokyo 105, Japan
Telephone: (03) 457-4511
Fax: (03) 456-1631
Dun's Number: 06-499-3082

Date Founded: 1875

CORPORATE STRATEGIC DIRECTION

Toshiba Corporation is one of the largest electronics companies in Japan and throughout the world. Its main business activity is the development, manufacturing, and marketing of industrial electronics and electronic components, including personal computers and printers, which account for 48 percent of its total sales. The Company's second most important business segment is consumer products, which contribute 32 percent of its net sales, followed closely by heavy electrical apparatus, which contribute 19 percent of its net sales. The Company's remaining business is realized from machinery and materials.

Toshiba is one of two leaders of the Toshiba-IHI Group; the other is Ishikawajima-Harima Heavy Industries (IHI). These parents have close capital and business connections. Their subsidiaries are engaged in electrical and electronics products, construction, trading and finance, and shipbuilding.

Total revenue for 1989 amounted to ¥3.8 trillion (US$29.6 billion), an increase of 6 percent over 1988 revenue of ¥3.57 trillion (US$25.9 billion). (Percentage changes refer only to ¥ amounts; US$ percentage changes will differ because of fluctuations in Dataquest exchange rates.) Domestic sales increased 5 percent over the past year, while international sales advanced 10 percent. Net income rose dramatically, increasing 97.0 percent from ¥60.7 billion ($440 million) in 1988 to ¥119.4 billion ($931 million) in 1989.

Sales of information systems and electronic devices jumped 22 percent, to ¥1.87 trillion (US$13.5 billion). Toshiba attributes the significant increase to brisk demand and stable prices, which led to higher domestic and international sales of semiconductors, primarily memories. In Japan, sales of industrial systems and computers were firm, reflecting heightened demand from public agencies and growing demand in the distribution and financial services industries. International sales were strong because of increased demand for personal computers.

R&D expenditure increased 6 percent to ¥230.4 billion (US$1.80 billion), and represented 6.1 percent of sales in 1989. This expenditure was concentrated primarily on such information equipment fields as digital communications equipment and artificial intelligence (AI), as well as on semiconductor-related areas, mainly 16M memories. Capital expenditure for the same period amounted to ¥267.6 billion (US$2.09 billion), a 26 percent increase over the previous year. These investments were mainly for strengthening Toshiba's mass production system in response to the appreciation of the yen, facilities for manufacturing new products, and R&D-related equipment.

In July 1990, Toshiba set up the LCD Business Division, which will manage the development and production of liquid crystal displays (LCDs). The Company is attempting to increase production of large LCDs substantially and to increase its presence in the LCD market. In order to begin these activities, Toshiba will invest a total of about ¥40 billion (US$312 million) during fiscal 1990, including the cost of constructing a new plant in Japan. The plant is a joint venture with IBM Japan, and will be called Display Technologies.

More detailed information is available in Tables 1 and 2, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region. Information on revenue by distribution channels is not available. Tables 3 and 4, comprehensive financial statements, are at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Information/Communications Systems and Electronic Devices

Semiconductors

Dataquest believes that Toshiba remained the second-largest semiconductor supplier in 1989, with 8.6 percent of the worldwide market share and revenue of ¥628.4 billion (US$4.9 billion). Toshiba also remained the second-largest semiconductor supplier in Japan. As a world leader in semiconductors, Toshiba's diversified product portfolio emphasizes balance among analog, discrete, bipolar, MOS logic, memory devices, and ASICs. Toshiba uses approximately 15 percent of its semiconductor products internally.

Analog, Discrete, Logic

Dataquest ranked Toshiba as the largest worldwide supplier of discrete devices in both 1988 and 1989. Toshiba has stated its goal to remain number one. In 1989, Toshiba captured 11.2 percent of the market. In the analog semiconductor industry, Toshiba maintained first place, capturing 6.1 percent market share, according to Dataquest estimates. Toshiba ranked second, with 9.4 percent of the market share, in the MOS digital semiconductor segment.

Memory

In the DRAM market, Toshiba may accomplish what has never been done in the semiconductor industry: being the market leader for two consecutive DRAM product generations. The race between Toshiba and Hitachi should be a close one. Toshiba remained the largest supplier of 1Mb DRAMs to worldwide markets in 1989. Toshiba supplied approximately 30 percent of the world's 1Mb DRAMs. It also developed a 4Mb DRAM and began shipping it in spring 1989. In May 1990, Toshiba introduced the industry's first 1Mb DRAM with a 16-word width. Toshiba believes that graphics will become a standard feature on new personal computers, and the new device is designed for such applications as VGA, super-VGA, and 8514/A. The Company introduced four new high-speed 256K CMOS SRAMs in early 1989. Toshiba ranked first in the MOS memory semiconductor arena with ¥243.7 billion (US$1.9 billion) in revenue and 12.3 percent of the market share.

Optoelectronics

Dataquest believes that Toshiba ranked fourth in the worldwide optoelectronic semiconductor industry, with 9.2 percent of the 1989 market share. Toshiba announced that it has manufactured, on an experimental basis, a charge-coupled device (CCD) with 2 million picture elements. The Company plans to use the CCD in high-definition television (HDTV).

Personal Computers

Toshiba is using its technological edge in a drive to develop sophisticated, high-performance PC systems and to position the Company at the forefront of current and emerging high-growth fields. In 1989, Toshiba ranked tenth worldwide and captured 2.7 percent of the market share. Dataquest believes that Toshiba is now the dominant player in the world market for laptops, having carved out a world market share of 26 percent, based on unit shipments of 505,000.

Toshiba is by far the most successful Japanese PC vendor in Europe. The Company initially entered the PC market with a range of desktops. However, it finally specialized in laptops and is currently the laptop leader in Europe with a 38.2 percent market share. Toshiba owes much of its success to its early and well-timed entry into the IBM dealer network, where it practically has established itself as a standard for laptops.

Workstations

Toshiba was the first company to offer a Japanese version of the UNIX operating system developed by AT&T and based on a Sun Microsystems machine. Toshiba's line of UNIX engineering workstations incorporating original hardware and Japanese-version software has been highly evaluated in the Japanese market.

Telecommunications Equipment

Toshiba is a major supplier of facsimile products worldwide. Much of its success stems from the effective diversification of the product line to best suit the trends in market demand. Toshiba meets the high-end demand with products that will transmit a standard document in just 13 seconds. The products feature one-touch dialing and automatic OMR dialing. It also has models that offer an additional electronic memory, which adds such valuable functions as broadcasting, mailbox, and relay transmission. In addition, Toshiba offers compact, entry-level machines with

one-touch dialing and a low price tag. Dataquest estimates that Toshiba ranked sixth worldwide in 1989 with a 5.6 percent market share.

Toshiba is one of the top ten suppliers of key telephone systems. These systems are customer-premises telephone switching systems that allow telephones to interface to the public network without dialing access codes. Competition is stiff in this market segment because the top ten suppliers account for 85 percent of the market, and there is very little differentiation among their technologies. Dataquest estimates that Toshiba is ranked fifth in this area in the United States with a 7.5 percent market share.

In the PBX market segment, Toshiba is a major player in Japan but not worldwide.

Printers

Toshiba manufactures dot matrix, laser, and thermal transfer printers, with the overwhelming majority of business in the first two product areas.

Copiers

Toshiba has advanced and convenient plain paper copiers (PPCs) that are sold and manufactured on a global scale. Dataquest estimates that Toshiba is one of the top ten PPC manufacturers in the United States.

Computer Storage

In 1989, Toshiba ranked fifth in the flexible disk drive market with 7 percent of the worldwide market, based on factory revenue of ¥15.4 billion (US$120 million). Toshiba is one of the leading optical drive suppliers, supplying drives to both Wang and Dun & Bradstreet. Toshiba is also ranked fourth in the CD-ROM market with a 10 percent market share. In the 12- and 5.25-inch WORM drive industry segments, Toshiba commands less than a 1 percent worldwide market share.

Heavy Electrical Apparatus

Toshiba's heavy electrical apparatus field, which accounted for 19 percent of its net sales, recorded sales of ¥705.4 billion (US$5.5 billion) in fiscal 1989, a decline of 17 percent from 1988. This drop reflected the adverse effect of cyclical swings in large orders for power-generation facilities, offsetting healthy sales of industrial apparatus, elevators, escalators, and transportation equipment.

Consumer Products

Fiscal 1989 sales of products in this category rose 3 percent to ¥1.2 trillion (US$9.1 billion), accounting for 32 percent of Toshiba's net sales. Sales in the latter half of the fiscal period were hampered by restrained consumer spending in anticipation of major changes in the Japanese tax system, but were counterbalanced by expanding worldwide sales of color televisions and brisk domestic sales of air conditioners and lighting products. Sales of materials continued their upward trend.

Further Information

For further information about the Company's business segments, please contact the appropriate Dataquest industry service.

Table 1
Five-Year Corporate Highlights (Millions of US Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	$13,339.2	$15,244.5	$20,734.7	$25,881.3	$29,636.6
Percent Change	-	14.28	36.01	24.82	14.51
Capital Expenditure	$115.0	$1,147.1	$1,337.1	$1,359.7	$2,086.5
Percent of Revenue	0.86	7.52	6.45	5.25	7.04
R&D Expenditure	$676.0	$857.4	$1,260.7	$1,575.0	$1,796.5
Percent of Revenue	5.07	5.62	6.08	6.09	6.06
Number of Employees	114,000	120,000	121,000	122,000	125,000
Revenue ($K)/Employee	$117.01	$127.04	$171.36	$212.14	$237.09
Net Income	$343.6	$268.5	$214.4	$439.8	$9,310.0
Percent Change	-	(21.86)	(20.15)	105.13	2,016.87
Exchange Rate (US$1=¥)	¥250.60	¥221.26	¥159.52	¥138.03	¥128.25

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	NA	NA	NA	NA
Quarterly Profit	NA	NA	NA	NA

NA= Not available

Source: Toshiba Corporation Annual Reports
Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
Asia/Pacific	0	68.75	69.14	69.03	67.93
Japan	0	68.75	69.14	69.03	67.93
International	0	31.25	30.86	30.97	32.07

Source: Toshiba Corporation Annual Reports
Dataquest (1990)

1989 SALES OFFICE LOCATIONS

Europe—4
Asia/Pacific—77
Japan—67
ROW—11

MANUFACTURING LOCATIONS

North America

International Fuel Cells
A joint venture with United Technologies to produce fuel cells
Microelectronics Center
256K DRAMs, 1Mb DRAMs, etc.
Toshiba America, Inc.
TVs, microwave ovens, VCRs, toners, telephones, medical equipment
Toshiba International
Motors, circuit boards, control equipment
Toshiba Westinghouse Electronics
A joint venture to produce color CRTs

Europe

Compagnie European Pour La Fabrication D'Enceintes A Micro-Ondes (France)
A joint venture with Thomson of France to produce microwave ovens
Toshiba Consumer Products GmbH (Germany)
VCRs, TVs
Toshiba Consumer Products Ltd. (United Kingdom)
TVs, VCRs, microwave ovens
Toshiba Consumer Products S.A. (France)
Lamps for copiers
Toshiba Semiconductor GmbH (Germany)
256K DRAMs, 64K SRAMs, CMOS, 1Mb DRAMs
Toshiba Systemes S.A. (France)
Joint venture with ROHM Poulanc to produce plain paper copiers

Asia/Pacific

Amori Taic (Japan)
Radio cassette recorders, record players, component stereos
Buzen Toshiba Electronics Co., Ltd. (Japan)
Semiconductors
Hankook Tungsten (South Korea)
Tungsten, molybdenum wires and parts
Harison Denki (Japan)
Electric lamps
Himeji Toshiba Electronics (Japan)
ICs, lead frames for semiconductors
Hokuto Electronics (Japan)
CRTs
Iwate Toshiba Electronics Co., Ltd. (Japan)
Semiconductors
Kaga Toshiba Electronics (Japan)
Semiconductors
Kitashiba Electric Co., Ltd. (Japan)
Transformers, electric motors
Kitsuki Toshiba Electronics (Japan)
Semiconductors
Korea Electronics (South Korea)
Semiconductors, TVs
Kumdong Lighting (South Korea)
Fluorescent lamps
Leechun Electric Mfg. (South Korea)
Generators, motors, transformers, pumps
Marcon Electronics Co., Ltd. (Japan)
Capacitors, hybrid ICs
Nishishiba Electric Co., Ltd. (Japan)
Electric marine equipment
Nougata Toshiba Electronics (Japan)
Semiconductors
Olivetti Corporation of Japan (Japan)
Data communications equipment, computers, word processing systems, typewriters
Onkyo Corporation (Japan)
Audio equipment and parts
Shibaura Engineering Works Co., Ltd. (Japan)
Motors, electric tools
Sord Computer (Japan)
Microcomputer and peripherals
Tatung Co. (Taiwan)
TVs, refrigerators, transformers
Thai Toshiba Electric Industries Co., Ltd. (Thailand)
A joint venture with Siam Cement of Thailand to produce TVs, refrigerators, electric fans, electric rice cookers, motors
Thai Toshiba Fluorescent Lamp Co., Ltd. (Thailand)
Glass tubes for fluorescent lamps

Thai Toshiba Lighting Co., Ltd. (Thailand)
Fluorescent lamps
Tohoku Semiconductor (Japan)
1Mb DRAMs, SRAMs, HPUs
Toki Electric Industrial (Japan)
Electric lamps, lighting equipment
Tokyo Electric Co., Ltd. (Japan)
Business machines, lighting equipment, home appliances
Tokyo Electronic Ind. (Japan)
Industrial video equipment, control equipment
Tokyo Optical (Japan)
Optical instruments
Toshiba Battery (Japan)
Dry batteries, battery applied products
Toshiba Ceramics (Japan)
Ceramics
Toshiba Chemical Corporation (Japan)
Plastic products, insulating materials
Toshiba Cold Chain (Japan)
Freezers, vending machines
Toshiba Components Co., Ltd. (Japan)
Semiconductors
Toshiba Electric Equipment Co., Ltd. (Japan)
Lighting fixtures
Toshiba Electronic Systems Co., Ltd. (Japan)
A joint venture with General Electric to produce and market electronic equipment
Toshiba Electronics Malaysia Snd. Bhd. (Malaysia)
IC memories
Toshiba Engineering & Construction Co., Ltd. (Japan)
Electric facilities
Toshiba Glass Co., Ltd. (Japan)
Glass products
Toshiba Heating Appliances (Japan)
Oil heating equipment
Toshiba Kiki (Japan)
Lighting equipment, etc.
Toshiba Machine (Japan)
Machinery, machine tools
Toshiba Medical Systems Co., Ltd. (Japan)
Medical electronic equipment
Toshiba Seiki (Japan)
Automatic precision apparatus
Toshiba Singapore Pte., Ltd. (Singapore)
Color TVs, TV parts, audio equipment
Toshiba Steel Tube Co., Ltd. (Japan)
Steel tubes, electric conduit tubes
Toshiba Tungaloy (Japan)
Special alloy tools

ROW

Industria Mexicana Toshiba, S.A. (Mexico)
Semiconductors
Semp Toshiba Amazonas S.A. (Brazil)
TVs, audio equipment
Toshiba Electromex S.A. de C.V. (Mexico)
Color TV parts for Toshiba America

SUBSIDIARIES

North America

GE Toshiba Lighting Corporation (United States)
Ottawa Design Center (Canada)
Toshiba America Consumer Products, Inc. (United States)
Toshiba America Electronic Components, Inc. (United States)
Toshiba America, Inc. (United States)
Toshiba America Information Systems, Inc. (United States)
Toshiba America Medical Systems, Inc. (United States)
Toshiba Display Devices Inc. (United States)
Toshiba Hawaii, Inc. (United States)
Toshiba International Corporation (United States)
Toshiba of Canada, Ltd. (Canada)

Europe

Compagnie European Pour La Fabrication D'Enceintes A Micro-Ondes (France)
Toshiba AG (Switzerland)
Toshiba Consumer Products GmbH (Germany)
Toshiba Consumer Products Ltd. (United Kingdom)
Toshiba Consumer Products S.A. (France)
Toshiba Deutschland GmbH (Germany)
Toshiba Electronics Espana S.A. (Spain)
Toshiba Electronics Europe GmbH (Germany)
Toshiba Electronics Italiana S.R.L. (Italy)
Toshiba Electronics Ltd. (United Kingdom)
Toshiba Electronics Scandinavia AB (Sweden)
Toshiba Europa GmbH (Germany)
Toshiba Information Systems (Belgium)
Toshiba Information Systems Ltd. (United Kingdom)
Toshiba Information Systems S.A. (Spain)
Toshiba Information Systems S.p.A. (Italy)
Toshiba Informationssyteme GmbH (Germany)

Toshiba International (Europe) Ltd. (United Kingdom)
Toshiba International Finance Ltd. (United Kingdom)
Toshiba International Finance B.V. (Netherlands)
Toshiba Ltd. (United Kingdom)
Toshiba Medical Systems Europe B.V. (Netherlands)
Toshiba Semiconductor GmbH (Germany)
Toshiba Systemes S.A. (France)

Asia/Pacific

Iwate Toshiba Electronics Co., Ltd. (Japan)
Kitashiba Electric Co., Ltd. (Japan)
Kyodo Building Corporation (Japan)
Man On Toshiba, Ltd. (Hong Kong)
Marcon Electronics Co., Ltd. (Japan)
Minato Building Co., Ltd. (Japan)
Nikko Jitsdugyo Co., Ltd. (Japan)
Nishishiba Electric Co., Ltd. (Japan)
Onkyo Corporation (Japan)
Shibaura Engineering Works Co., Ltd. (Japan)
TDH, Inc. (Japan)
Thai Toshiba Electric Industries Co., Ltd. (Thailand)
Tokyo Electric Co., Ltd. (Japan)
Toshiba Automation Co., Ltd. (Japan)
Toshiba Battery Co., Ltd. (Japan)
Toshiba Builders Appliance Co., Ltd. (Japan)
Toshiba Building Corporation (Japan)
Toshiba Ceramics Co., Ltd. (Japan)
Toshiba Chemical Corporation (Japan)
Toshiba Components Co., Ltd. (Japan)
Toshiba Consumer Products Co., Ltd. (Thailand)
Toshiba Credit Corporation (Japan)
Toshiba Display Devices Co., Ltd. (Thailand)
Toshiba Electric Appliances Co., Ltd. (Japan)
Toshiba Electric Equipment Corp. (Japan)
Toshiba Electronic Systems Co., Ltd. (Japan)
Toshiba Electronics Asia, Ltd. (Hong Kong)
Toshiba Electronics Malaysia Sdn. Bhd. (Malaysia)
Toshiba Electronics Taiwan Corporation (Taiwan)
Toshiba Elevator & Escalator Service Co., Ltd. (Japan)
Toshiba Engineering & Construction Co., Ltd. (Japan)
Toshiba Engineering Co., Ltd. (Japan)
Toshiba Glass Co., Ltd. (Japan)
Toshiba Heating Appliances Co., Ltd. (Japan)
Toshiba Higashinihon Consumer Electronics Co., Ltd. (Japan)
Toshiba Information Equipment Co., Ltd. (Japan)
Toshiba International Corporation Pty. Ltd. (Australia)
Toshiba Lightec Corporation (Japan)
Toshiba Medical Systems Co., Ltd. (Japan)
Toshiba Physical Distribution Co., Ltd. (Japan)
Toshiba Pty. Ltd. (Australia)
Toshiba Sales and Services Sdn. Bhd. (Malaysia)
Toshiba Silicone Co., Ltd. (Japan)
Toshiba Singapore Pte., Ltd. (Singapore)
Toshiba Steel Tube Co., Ltd. (Japan)
Toshiba Thailand Co., Ltd. (Thailand)

ROW

Industria Mexicana Toshiba S.A. (Mexico)
Semp Toshiba Amazonas S.A. (Brazil)
T and S Servicos Industrias S/C Ltda. (Brazil)
Toshiba de Panama S.A. (Panama)
Toshiba de Brasil S.A. (Brazil)
Toshiba Electromex S.A. de C.V. (Mexico)
Toshiba Medical de Brasil Ltda. (Brazil)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

IBM Japan, Ltd.

Toshiba and IBM Japan are jointly constructing a plant that will have a production capability of 50,000 LCD panels a year.

Motorola, Inc.

Toshiba and Motorola reportedly plan to sign an agreement to exchange gate array technology to allow the companies to act as mutual second sources. In the United States, Motorola will produce gate arrays designed and developed by Toshiba, which Motorola intends to market for use in workstations. In Japan, Tohoku Semiconductor Inc., a joint venture of the two companies, will produce gate arrays based on Motorola technology for supply to local companies. Toshiba and Motorola also plan to expand their technological cooperation to include discrete semiconductors.

Businessland

Businessland Japan will be formed by Businessland, Canon, Fujitsu, software distributor Softbank, Sony, and Toshiba to provide systems integration services for international firms. Businessland will have a 54 percent stake in the joint venture, Softbank will have 26 percent, and the other firms will have 5 percent each.

Spectrum Cellular Corp.
Toshiba will market Dallas-based Spectrum Cellular's new cellular/landline modem with its laptop computers as the T24D/X, and Spectrum will also develop five separate versions of its new SmartCable product for sale by Toshiba.

General Electric (GE)
GE and Toshiba have entered into a joint marketing agreement covering the sale of GE's CompuScene PT2000 in Japan. The visual simulation system and other Compu-Scene products will be distributed by Toshiba Electronics Systems, a GE/Toshiba joint venture company.

Echelon Systems Corp.
Motorola and Toshiba have become the first semiconductor makers to license the rights to a new generation of intelligent power-controller chips being developed by Echelon Systems. Under the terms of the agreement, Toshiba's Semiconductor Group will manufacture and market the Echelon-designed ICs. The agreement also permits Toshiba to design, manufacture, and market enhanced versions of the chips.

1989

Integrated CMOS Systems, Inc. (ICS)
Toshiba signed a technological collaboration agreement, including an equity investment, with ICS of Sunnyvale, California. ICS specializes in advanced ASIC technology and its applications in high-performance design. The two companies will codevelop a design and test system for large-scale gate arrays.

EDA Systems Inc.
EDA signed a purchase agreement with Toshiba for its Powerframe product, a design management framework that integrates third-party CAD/CAE tools and speeds the overall electronic design process.

IBM
The two companies agreed to the joint development of a color flat-panel display for computers that is larger and clearer than any demonstrated previously.

Digital Equipment Corporation
The companies have a technology exchange agreement that will ensure the integration of Toshiba's laptop personal computers into Digital's networking environment.

Weitek Corporation
Under a joint development agreement, Weitek will manufacture some of its semiconductors in Toshiba's plant; Toshiba will gain access to some of Weitek's floating-point product technology.

McDonnell Douglas
McDonnell Douglas has agreed to port its PRO-IV application development language to minicomputers manufactured by Toshiba.

Cummins Engine Co.
The companies have undertaken a joint venture to market silicon nitride ceramic components in North America.

Sun Microsystems
The companies signed a worldwide licensing agreement to bundle the SPARC MPU architecture, the SunOS operating system, and the Open Look Graphics interface into a series of small-footprint, low-cost computers.

Siemens
The companies extended their longstanding alliance in ASICs.

Sun Microsystems
Toshiba announced plans to develop a new high-performance computer, based on Sun's SPARC technology, that could be as small as a laptop.

1988

Zoran
The companies agreed to a technology and manufacturing alliance.

Motorola
Under a joint venture, the companies formed Tohoku Semiconductor. Tohoku is using Toshiba's marketing channels to market Motorola's 68000 series MPUs in Japan.

Advanced Silicon Corporation
Toshiba agreed to provide Advanced Silicon Corporation with 6-inch CMOS wafers and jointly develop ASIC software.

Siemens and GE
The companies agreed to jointly develop a common cell library.

SGS-Thomson
The companies extended a six-year agreement to patent cross-licensing related to semiconductor technology.

1987

GRiD
Toshiba agreed to supply GRiD with an IBM PC AT-compatible kneetop computer.

Mitsui Petrochemical
The companies undertook the joint development of a magnetic tape emulator.

Viewlogic Systems
Viewlogic Systems is the principal worldwide supplier of CAE software for Toshiba.

Aida Corporation
Toshiba agreed to provide Aida with its TC17G gate array library models. Toshiba is gaining access to Aida's semicustom IC design equipment.

SGS-ATES
The companies made a five-year technical collaboration agreement allowing Toshiba to use SGS-ATES' semiconductor sales network in Europe and allowing SGS-ATES to receive LSI fab technology and technical training for its engineers from Toshiba.

SDA Systems
The companies undertook a five-year joint venture to cooperatively develop CAD systems for IC design.

MERGERS AND ACQUISITIONS

1990

Toshiba Display Devices, Inc., and Toshiba America Electronic Components, Inc.
These two Toshiba subsidiaries have been merged to complete the consolidation of all of Toshiba's North American components marketing, sales, and manufacturing operations.

Power and Design
Toshiba has acquired Power and Design, a Belgian distributor for Toshiba. The new subsidiary will be renamed Toshiba Information Systems and will deal with marketing and sales for Toshiba-made printers, photocopiers, personal computers, and fax machines. The subsidiary is the seventh sales outlet for Toshiba communications and information equipment in Europe.

Integrated CMOS Systems, Inc.(ICS)
Toshiba has acquired equity stake in ICS. The acquisition will enable Toshiba to use the US firm's design tools with existing customers, and, under its own name, Toshiba will market a new array family that will be developed using submicron CMOS technology.

KEY OFFICERS

Joichi Aoi
President and chief executive officer

Sakakae Shimizu
Senior executive vice president

Fumio Ohta
Senior executive vice president

Kinichi Kadono
Senior executive vice president

Fumio Sato
Senior executive vice president

PRINCIPAL INVESTORS

The Dai-ichi Mutual Life Insurance Company—4.3 percent
Nippon Life Insurance Company—3.6 percent
The Mitsubishi Trust & Banking Corporation—3.1 percent
The Mitsui Bank, Limited—3.1 percent

FOUNDERS

Information is not available.

Table 3
Comprehensive Financial Statement
Fiscal Year Ending March
(Millions of US Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	$7,735.8	$8,686.2	$12,347.7	$17,030.4	$21,232.0
Cash	1,200.3	761.5	1,279.5	3,681.8	4,964.5
Receivables	2,626.1	3,108.6	4212.6	5,223.5	6,885.8
Marketable Securities	1,030.7	1,177.8	1,284.5	1,409.8	1,334.1
Inventory	2,048.7	2,317.6	3,363.8	5,308.7	6,434.3
Other Current Assets	830.0	782.3	1,153.5	1,333.8	1,613.3
Net Property, Plants	$2,431.8	$3,325.0	$4,666.5	$5,346.6	$6,158.3
Other Assets	$1,849.2	$2,305.0	$3,573.2	$4,399.8	$5,402.7
Total Assets	$14,027.5	$14,316.2	$20,587.4	$26,776.8	$32,793.0
Total Current Liabilities	$7,019.2	$8,227.4	$11,500.1	$15,018.5	$19,002.7
Long-Term Debt	$1,765.4	$2,985.6	$4,570.0	$5,642.3	$6,007.0
Other Liabilities	$689.9	$542.2	$800.5	$915.0	$918.6
Total Liabilities	$9,474.9	$11,755.2	$16,870.6	$21,575.8	$25,928.3
Total Shareholders' Equity	$2,186.4	$2,561.0	$3,716.8	$5,201.0	$6,864.7
Common Stock	537.1	632.3	951.6	1,424.3	1,791.0
Other Equity	626.9	654.9	935.3	1,489.5	1,894.0
Retained Earnings	950.5	1,273.8	1,829.7	2,287.2	3,180.0
Total Liabilities and Shareholders' Equity	$14,027.5	$14,316.2	$20,587.4	$26,776.8	$32,793.0
Income Statement	**1985**	**1986**	**1987**	**1988**	**1989**
Revenue	$13,339.2	$15,244.5	$20,734.7	$25,881.3	$29,636.6
Japanese Revenue	NA	10,481.3	14,336.8	17,865.7	20,133.3
Non-Japanese Revenue	NA	4,763.2	6,397.9	8,015.6	9,503.3
Cost of Sales	$9,533.5	$11,046.7	$15,223.8	$18,640.2	$20,150.0
R&D Expense	$676.0	$857.4	$1,260.7	$1,575.0	$1,796.5
SG&A Expense	$3,073.0	$3,648.6	$5,187.4	$6,443.5	$7,553.2
Capital Expense	$115.0	$1,147.1	$1,337.1	$1,359.7	$2,086.5
Pretax Income	$741.0	$589.8	$489.0	$909.2	$1,830.8
Pretax Margin (%)	5.56	3.87	2.36	3.51	6.18
Effective Tax Rate (%)	58.00	58.00	58.00	56.00	56.00
Net Income	$343.6	$268.5	$214.4	$439.8	$9,310.0
Shares Outstanding, Millions	2,672.1	2,675.7	2,732.5	2,939.4	3,074.6
Per Share Data					
Earnings	$0.11	$0.09	$0.07	$0.15	$0.29
Dividend	$0.03	$0.04	$0.05	$0.06	$0.06
Book Value	$0.82	$0.96	$1.36	$1.77	$2.23
Exchange Rate (US$1=¥)	¥250.60	¥221.26	¥159.52	¥138.03	¥128.25

Source: Toshiba Corporation Annual Reports
Dataquest (1990)

Table 4
Comprehensive Financial Statement
Fiscal Year Ending March
(Billions of Yen, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	¥1,938.6	¥1,921.9	¥1,969.7	¥2,350.7	¥2,723.0
Cash	300.8	168.5	204.1	508.2	636.7
Receivables	658.1	687.8	671.9	721.0	883.1
Marketable Securities	258.3	260.6	204.9	194.6	171.1
Inventory	513.4	512.8	536.6	742.7	825.2
Other Current Assets	208.0	173.1	184.0	184.1	206.9
Net Property, Plants	¥609.4	¥735.7	¥744.5	¥737.9	¥789.8
Other Assets	¥967.3	¥510.0	¥569.9	¥607.4	¥692.9
Total Assets	¥3,515.3	¥3,167.6	¥3,284.1	¥3,696.0	¥4,205.7
Total Current Liabilities	¥1,759.0	¥1,820.4	¥1,834.5	¥2,073.0	¥2,437.1
Long-Term Debt	¥442.5	¥660.6	¥729.0	¥778.8	¥770.4
Other Liabilities	¥172.9	¥120.0	¥127.7	¥126.3	¥117.8
Total Liabilities	¥2,967.4	¥2,601.0	¥2,691.2	¥2,978.1	¥3,325.3
Total Shareholders' Equity	¥547.9	¥566.6	¥592.9	¥717.9	¥880.4
Converted Preferred Stock	0	0	0	0	0
Common Stock	134.6	139.9	151.8	196.6	229.7
Other Equity	157.1	144.9	149.2	205.6	242.9
Retained Earnings	238.2	281.8	291.9	315.7	407.8
Total Liabilities and Shareholders' Equity	¥3,515.3	¥3,167.6	¥3,284.1	¥3,696.0	¥4,205.7
Income Statement	**1985**	**1986**	**1987**	**1988**	**1989**
Revenue	¥3,342.8	¥3,373.0	¥3,307.6	¥3,572.4	¥3,800.9
Japanese Revenue	NA	2,319.1	2,287.0	2,466.0	2,582.1
Non-Japanese Revenue	NA	1,053.9	1,020.6	1,106.4	1,218.8
Cost of Sales	¥2,389.1	¥2,444.2	¥2,428.5	¥2,572.9	¥2,584.2
R&D Expense	¥169.4	¥189.7	¥201.1	¥217.4	¥230.4
SG&A Expense	¥770.1	¥807.3	¥827.5	¥889.4	¥968.7
Capital Expense	¥288.2	¥253.8	¥213.3	¥187.7	¥267.6
Pretax Income	¥185.7	¥130.5	¥78.0	¥125.5	¥234.8
Pretax Margin (%)	5.56	3.87	2.36	3.51	6.18
Effective Tax Rate (%)	58.00	58.00	58.00	56.00	56.00
Net Income	¥86.1	¥59.4	¥34.2	¥60.7	¥119.4
Shares Outstanding, Millions	2,672.1	2,675.7	2,732.5	2,939.4	3,074.6
Per Share Data					
Earnings	¥29.63	¥19.24	¥11.86	¥20.37	¥37.27
Dividend	¥8.00	¥8.00	¥8.00	¥8.00	¥8.00
Book Value	¥205.04	¥211.76	¥216.98	¥244.23	¥286.35

Table 4 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending March
(Billions of Yen, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
Liquidity					
Current (Times)	1.10	1.06	1.07	1.13	1.12
Quick (Times)	0.81	0.77	0.78	0.78	0.78
Fixed Assets/Equity (%)	111.22	129.84	125.57	102.79	89.71
Current Liabilities/Equity (%)	321.04	321.28	309.41	288.76	276.82
Total Liabilities/Equity (%)	541.60	459.05	453.90	414.83	377.70
Profitability (%)					
Return on Assets	-	1.78	1.06	1.74	3.02
Return on Equity	-	10.66	5.90	9.26	14.94
Profit Margin	12.58	1.76	1.03	1.70	3.14
Other Key Ratios					
R&D Spending % of Revenue	5.07	5.62	6.08	6.09	6.06
Capital Spending % of Revenue	8.62	7.52	6.45	5.25	7.04
Employees	114,000	120,000	121,000	122,000	125,000
Revenue (¥K)/Employee	¥29.32	¥28.11	¥27.34	¥29.28	¥30.41
Capital Spending % of Assets	8.20	8.01	6.49	5.08	6.36
Exchange Rate (US$1=¥)	¥250.60	¥221.26	¥159.52	¥138.03	¥128.25

NA = Not available

Source: Toshiba Corporation Annual Reports
Dataquest (1990)

Toshiba Corporation

1-1 Shibaura 1-chome
Minato-ku, Tokyo 105, Japan
Telephone: (03) 457-4511
Fax: (03) 456-1631
Dun's Number: 06-499-3082

Date Founded: 1875

CORPORATE STRATEGIC DIRECTION

Toshiba Corporation is one of the largest electronics companies in Japan and throughout the world. Its main business activity is the development, manufacturing, and marketing of industrial electronics and electronic components, including personal computers and printers, which account for 48 percent of its total sales. The Company's second most important business segment is consumer products, which contribute 32 percent of its net sales, followed closely by heavy electrical apparatus, which contribute 19 percent of its net sales. The Company's remaining business is realized from machinery and materials.

Toshiba is one of two leaders of the Toshiba-IHI Group; the other is Ishikawajima-Harima Heavy Industries (IHI). These parents have close capital and business connections. Their subsidiaries are engaged in electrical and electronics products, construction, trading and finance, and shipbuilding.

Toshiba's revenue increased less than 1 percent to $28.8 billion* in fiscal 1989 from $28.6 billion in fiscal 1988. Its net income increased 86 percent to $904.6 million in fiscal 1989 from $485.7 million in fiscal 1988. Toshiba employs approximately 125,000 people worldwide.

Japan's domestic sales contribution to Toshiba's total revenue decreased to $19.6 billion in 1989, or 68 percent of the total, a slight decrease from 1988's 69 percent. Seventy-three percent of the Company's 92 sales offices are in Japan. The Company has manufacturing locations worldwide with an even split between domestic and overseas plants.

*All dollar amounts are in U.S. dollars.

Research and development expenditures totaled $1.7 billion in fiscal 1989, representing 6 percent of Toshiba's revenue. Capital spending totaled $1.8 billion in fiscal 1989, also representing 6 percent of revenue.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Information/Communication Systems and Electronic Devices

Semiconductors

Toshiba remained the second-largest semiconductor supplier in 1988, with 8.5 percent of the worldwide market share and revenue of $4.3 million. Toshiba also remained the second-largest semiconductor supplier in Japan. As a world leader in semiconductors, Toshiba's diversified product portfolio emphasizes balance among discrete, bipolar, MOS logic, memory devices, and ASICs. Toshiba uses approximately 15 percent of its semiconductor products internally.

Analog, Discrete, Logic

Toshiba was the largest worldwide supplier of discrete devices in both 1987 and 1988, according to

Dataquest estimates, and has stated its goal to remain number one. In 1988, Toshiba captured 11.5 percent of the market share. In the analog semiconductor industry, Toshiba moved from third to first place, capturing 6.4 percent market share, according to Dataquest estimates. Toshiba ranked second with 9.5 percent of the market share in the MOS logic semiconductor segment.

Memory

In the DRAM market, Toshiba may accomplish what has never been done in the semiconductor industry: being the market leader for two consecutive DRAM product generations. The race between Toshiba and Hitachi should be a close one. Toshiba remained the largest supplier of 1Mb DRAMs to worldwide markets in 1988. Toshiba supplied approximately 50 to 60 percent of the world's 1Mb DRAMs in 1987 and 1988. It also developed a 4Mb DRAM and began shipping it in spring 1989. In early 1988, Toshiba announced that it had developed a CMOS 16Mb DRAM with an access time of 70ns. Toshiba introduced four new high-speed 256K CMOS SRAMs in early 1989. A second-generation 1Mb video RAM was introduced in 1988. Toshiba ranked second in the MOS memory semiconductor arena with $1.4 billion in revenue and 12.4 percent of the market share.

Optoelectronics

Toshiba ranked third in the worldwide optoelectronic semiconductor industry with 10 percent of the 1988 market share. Toshiba announced that it has manufactured, on an experimental basis, a CCD with 2 million picture elements. The Company plans to use the CCD in high-definition television (HDTV). CCDs were among the most important products in Toshiba's fiscal 1988 semiconductor business.

Personal Computers

Toshiba is using its technological edge in a drive to develop sophisticated, high-performance PC systems and to position the Company at the forefront of current and emerging high-growth fields. In 1988, Toshiba ranked tenth worldwide and captured 1.5 percent of the market share. Toshiba is now the dominant player in the world market for laptops, having carved out a world market share of more than 30 percent.

Toshiba is by far the most successful Japanese PC vendor in Europe. The Company initially entered the PC market with a range of desktops. However, it finally specialized in laptops and is currently the laptop leader in Europe with 38.2 percent of the market share. Toshiba owes much of its success to its early and well-timed entry into the IBM dealer network, where it practically has established itself as a standard for laptops.

Workstations

Toshiba was the first company to offer a Japanese version of the UNIX operating system developed by AT&T and based on a Sun Microsystems machine. Toshiba's line of UNIX engineering workstations incorporating original hardware and Japanese-version software has been highly evaluated in the Japanese market.

Telecommunications Equipment

Toshiba is a major supplier of facsimile products worldwide. Much of its success stems from the effective diversification of the product line to best suit the trends in market demand. Toshiba meets the high-end demand with products that will transmit a standard document in just 13 seconds, and feature one-touch dialing and automatic OMR dialing. It also has models that offer an additional electronic memory, which adds such valuable functions as broadcasting, mailbox, and relay transmission. In addition, Toshiba offers compact, entry-level machines with one-touch dialing and a low price tag. Dataquest estimates that Toshiba ranked sixth worldwide in 1988 with 5.5 percent of the market share.

Toshiba is one of the top 10 suppliers of key telephone systems. These systems are customer-premises telephone switching systems that allow telephones to interface to the public network without dialing access codes. Competition is stiff in this market segment because the top 10 suppliers account for 85 percent of the market, and there is very little differentiation among their technologies. Toshiba is ranked fourth in this area with $145.2 million in revenue and 6.6 percent of the market share.

In the PBX market segment, Toshiba is a major player in Japan but not worldwide.

Printers

Toshiba manufactures dot matrix, laser, and thermal transfer printers, with the overwhelming majority of business in the first two product areas. In 1988, Toshiba ranked in the lower thirtieth percentile worldwide in the serial printer segment; in the page printer segment, Dataquest ranked Toshiba among the lower fifth percentile.

Copiers

Toshiba has advanced and convenient plain paper copiers (PPCs) that are sold and manufactured on a global scale. Dataquest estimates that Toshiba is one of the top 10 PPC manufacturers in the United States.

Computer Storage

In 1988, Toshiba ranked fourth in computer storage with 3.4 percent of the worldwide market share. Toshiba is one of the leading optical drive suppliers, supplying drives to both Wang and Dun & Bradstreet. Toshiba is also ranked fourth in the CD-ROM market with 10 percent of the market share. In the 12- and 5.25-inch WORM drive industry segments, Toshiba commands less than 1 percent of the worldwide market share.

Heavy Electrical Apparatus

Toshiba's heavy electrical apparatus field, which accounted for 19 percent of its net sales, recorded sales of $5.5 billion in fiscal 1989, a decline of 17 percent from 1988. This drop reflected the adverse effect of cyclical swings in large orders for power-generation facilities, offsetting healthy sales of industrial apparatus, elevators, escalators, and transportation equipment.

Consumer Products

Fiscal 1989 sales of products in this category rose 3 percent to $9.1 billion, accounting for 32 percent of Toshiba's net sales. Sales in the latter half of the fiscal period were hampered by restrained consumer spending in anticipation of major changes in the Japanese tax system, but were counterbalanced by expanding worldwide sales of color televisions and brisk domestic sales of air conditioners and lighting products. Sales of materials continued their upward trend.

Further Information

For further information about the Company's business segments, please contact the appropriate industry service.

Table 1
Five-Year Corporate Highlights (Millions of U.S. Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	$13,826.5	$19,422.6	$22,654.8	$28,579.5	$28,794.4
Percent Change	-	40.47	16.64	26.15	0.75
Capital Expenditure	$1,192.0	$1,598.1	$1,400.4	$1,469.9	$1,805.4
Percent of Revenue	8.62	8.23	6.18	5.14	6.27
R&D Expenditure	$700.8	$1,057.1	$1,377.4	$1,738.5	$1,745.1
Percent of Revenue	5.07	5.44	6.08	6.08	6.06
Number of Employees	114,000	120,000	121,000	122,000	125,000
Revenue ($K)/Employee	$121.29	$161.86	$187.23	$234.26	$230.36
Net Income	$344.5	$330.2	$234.1	$485.7	$904.6
Percent Change	-	(4.15)	(29.10)	107.48	86.25

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	N/A	N/A	N/A	N/A
Quarterly Profit	N/A	N/A	N/A	N/A

N/A = Not Available

Source: Toshiba Annual Reports
Dataquest January 1990

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
Japan	N/A	N/A	69.14	69.03	67.93
International	N/A	N/A	30.86	30.97	32.07

N/A = Not Available

Source: Toshiba Annual Reports
Dataquest January 1990

Table 3
Revenue by Distribution Channel (Percent)

Channel	1989
Direct Sales	N/A
Indirect Sales	N/A

N/A = Not Available

Source: Dataquest January 1990

1989 SALES OFFICE LOCATIONS

Japan—67
Europe—4
Asia/Pacific—10
ROW—11

MANUFACTURING LOCATIONS

Japan

Amori Taic
Radio cassette recorders, record players, component stereos
Buzen Toshiba Electronics Co., Ltd.
Semiconductors
Harison Denki
Electric lamps
Himeji Toshiba Electronics
ICs, lead frames for semiconductors
Hokuto Electronics
CRTs
Iwate Toshiba Electronics Co., Ltd.
Semiconductors
Kaga Toshiba Electronics
Semiconductors
Kitashiba Electric Co., Ltd.
Transformers, electric motors
Kitsuki Toshiba Electronics
Semiconductors
Marcon Electronics Co., Ltd.
Capacitors, hybrid ICs
Nishishiba Electric Co., Ltd.
Electric marine equipment
Nougata Toshiba Electronics
Semiconductors
Olivetti Corporation of Japan
Data communications equipment, computers, word processing systems, typewriters
Onkyo Corporation
Audio equipment and parts
Shibaura Engineering Works Co., Ltd.
Motors, electric tools
Sord Computer
Microcomputers and peripherals
Tohoku Semiconductor
1Mb DRAMs, SRAMs, HPUs
Toki Electric Industrial
Electric lamps, lighting equipment
Tokyo Electric Co., Ltd.
Business machines, lighting equipment, home appliances
Tokyo Electronic Ind.
Industrial video equipment, control equipment
Tokyo Optical
Optical instruments
Toshiba Battery
Dry batteries, battery applied products
Toshiba Ceramics
Ceramics
Toshiba Chemical Corporation
Plastic products, insulating materials
Toshiba Cold Chain
Freezers, vending machines
Toshiba Components Co., Ltd.
Semiconductors
Toshiba Electric Equipment Co., Ltd.
Lighting fixtures
Toshiba Electronic Systems Co., Ltd.
A joint venture with General Electric to produce and market electronic equipment
Toshiba Engineering & Construction Co., Ltd.
Electric facilities
Toshiba Glass Co., Ltd.
Glass products
Toshiba Heating Appliances
Oil heating equipment
Toshiba Kiki
Lighting equipment, etc.
Toshiba Machine
Machinery, machine tools
Toshiba Medical Systems Co., Ltd.
Medical electronic equipment
Toshiba Seiki
Automatic precision apparatus
Toshiba Steel Tube Co., Ltd.
Steel tubes, electric conduit tubes
Toshiba Tungaloy
Special alloy tools

North America

International Fuel Cells
A joint venture with United Technologies to produce fuel cells
Microelectronics Center
256K DRAMs, 1Mb DRAMs, etc.
Toshiba America, Inc.
TVs, microwave ovens, VCRs, toners, telephones, medical equipment
Toshiba International
Motors, circuit boards, control equipment
Toshiba Westinghouse Electronics
A joint venture to produce color CRTs

Europe

Compagnie Europeene Pour La Fabrication D'Enceintes A Micro-Ondes (France)
A joint venture with Thomson of France to produce microwave ovens
Toshiba Consumer Products GmbH (West Germany)
VCRs, TVs
Toshiba Consumer Products Ltd. (United Kingdom)
TVs, VCRs, microwave ovens
Toshiba Consumer Products S.A. (France)
Lamps for copiers
Toshiba Semiconductor GmbH (West Germany)
256K DRAMs, 64K SRAMs, CMOS, 1Mb DRAMs
Toshiba Systemes S.A. (France)
Joint venture with ROHM Poulanc to produce plain paper copiers

Asia/Pacific

Hankook Tungsten (South Korea)
Tungsten, molybdenum wires and parts
Korea Electronics (South Korea)
Semiconductors, TVs
Kumdong Lighting (South Korea)
Fluorescent lamps
Leechun Electric Mfg. (South Korea)
Generators, motors, transformers, pumps
Tatung Co. (Taiwan)
TVs, refrigerators, transformers
Thai Toshiba Electric Industries Co., Ltd. (Thailand)
A joint venture with Siam Cement of Thailand to produce TVs, refrigerators, electric fans, electric rice cookers, motors
Thai Toshiba Fluorescent Lamp Co., Ltd. (Thailand)
Glass tubes for fluorescent lamps
Thai Toshiba Lighting Co., Ltd. (Thailand)
Fluorescent lamps
Toshiba Electronics Malaysia Snd. Bhd.
IC memories
Toshiba Singapore Pte., Ltd.
Color TVs, TV parts, audio equipment

ROW

Industria Mexicana Toshiba, S.A. (Mexico)
Semiconductors
Semp Toshiba Amazonas S.A. (Brazil)
TVs, audio equipment
Toshiba Electromex S.A. de C.V. (Mexico)
Color TV parts for Toshiba America

SUBSIDIARIES

Japan

Iwate Toshiba Electronics Co., Ltd.
Kitashiba Electric Co., Ltd.
Kyodo Building Corporation
Marcon Electronics Co., Ltd.
Minato Building Co., Ltd.
Nikko Jitsdugyo Co., Ltd.
Nishishiba Electric Co., Ltd.
Onkyo Corporation
Shibaura Engineering Works Co., Ltd.
TDH, Inc.
Tokyo Electric Co., Ltd.
Toshiba Automation Co., Ltd.
Toshiba Battery Co., Ltd.
Toshiba Builders Appliance Co., Ltd.
Toshiba Building Corporation
Toshiba Ceramics Co., Ltd.
Toshiba Chemical Corporation
Toshiba Components Co., Ltd.
Toshiba Credit Corporation
Toshiba Electric Appliances Co., Ltd.
Toshiba Electric Equipment Corp.
Toshiba Electronic Systems Co., Ltd.
Toshiba Elevator & Escalator Service Co., Ltd.
Toshiba Engineering & Construction Co., Ltd.
Toshiba Engineering Co., Ltd.
Toshiba Glass Co., Ltd.
Toshiba Heating Appliances Co., Ltd.
Toshiba Higashinihon Consumer Electronics Co., Ltd.
Toshiba Information Equipment Co., Ltd.
Toshiba Lightec Corporation
Toshiba Medical Systems Co., Ltd.
Toshiba Physical Distribution Co., Ltd.
Toshiba Silicone Co., Ltd.
Toshiba Steel Tube Co., Ltd.

North America

GE Toshiba Lighting Corporation (United States)
Toshiba America Consumer Products, Inc. (United States)
Toshiba America Electronic Components, Inc. (United States)
Toshiba America, Inc. (United States)
Toshiba America Information Systems, Inc. (United States)
Toshiba America Medical Systems, Inc. (United States)

Toshiba Display Devices, Inc. (United States)
Toshiba Hawaii, Inc. (United States)
Toshiba International Corporation (United States)
Toshiba of Canada, Ltd. (Canada)

Europe

Compagnie Europeene Pour La Fabrication D'Enceintes A Micro-Ondes (France)
Toshiba AG (Switzerland)
Toshiba Consumer Products Ltd. (United Kingdom)
Toshiba Consumer Products GmbH (West Germany)
Toshiba Consumer Products S.A. (France)
Toshiba Deutschland GmbH (West Germany)
Toshiba Electronics Espana S.A. (Spain)
Toshiba Electronics Europe GmbH (West Germany)
Toshiba Electronics Italiana S.R.L. (Italy)
Toshiba Electronics Ltd. (United Kingdom)
Toshiba Electronics Scandinavia AB (Sweden)
Toshiba Europa GmbH (West Germany)
Toshiba Information Systems Ltd. (United Kingdom)
Toshiba Information Systems S.p.A. (Italy)
Toshiba Information Systems S.A. (Spain)
Toshiba Informationssysteme GmbH (West Germany)
Toshiba International (Europe) Ltd. (United Kingdom)
Toshiba International Finance Ltd. (United Kingdom)
Toshiba International Finance B.V. (Netherlands)
Toshiba Ltd. (United Kingdom)
Toshiba Medical Systems Europe B.V. (Netherlands)
Toshiba Semiconductor GmbH (West Germany)
Toshiba Systemes S.A. (France)

Asia/Pacific

Man On Toshiba, Ltd. (Hong Kong)
Thai Toshiba Electric Industries Co., Ltd. (Thailand)
Toshiba Consumer Products Co., Ltd. (Thailand)
Toshiba Display Devices Co., Ltd. (Thailand)
Toshiba Electronics Asia, Ltd. (Hong Kong)
Toshiba Electronics Malaysia Sdn. Bhd. (Malaysia)
Toshiba Electronics Taiwan Corporation (Taiwan)
Toshiba International Corporation Pty. Ltd. (Australia)
Toshiba Pty. Ltd. (Australia)
Toshiba Sales and Services Sdn. Bhd. (Malaysia)
Toshiba Singapore Pte., Ltd. (Singapore)
Toshiba Thailand Co., Ltd. (Thailand)

ROW

Industria Mexicana Toshiba, S.A. (Mexico)
Semp Toshiba Amazonas S.A. (Brazil)
T and S Servicos Industrias S/C Ltda. (Brazil)
Toshiba de Panama, S.A. (Panama)
Toshiba do Brasil S.A. (Brazil)
Toshiba Electromex S.A. de C.V. (Mexico)
Toshiba Medical do Brasil Ltda. (Brazil)

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1989

EDA Systems Inc.
EDA signed a purchase agreement with Toshiba for its Powerframe product, a design management framework that integrates third-party CAD/CAE tools and speeds the overall electronic design process.

IBM
The two companies agreed to the joint development of a color flat-panel display for computers that is larger and clearer than any demonstrated so far.

Digital Equipment Corporation
The companies have a technology exchange agreement that will ensure the integration of Toshiba's laptop personal computers into Digital's networking environment.

Weitek Corporation
Under a joint development agreement, Weitek will manufacture some of its semiconductors in Toshiba's plant; Toshiba will gain access to some of Weitek's floating-point product technology.

McDonnell Douglas
McDonnell Douglas has agreed to port its PRO-IV application development language to minicomputers manufactured by Toshiba.

Cummins Engine Co.
The companies have undertaken a joint venture to market silicon nitride ceramic components in North America.

Sun Microsystems
The companies signed a worldwide licensing agreement to bundle the SPARC MPU architecture, the SunOS operating system, and the Open Look Graphics interface into a series of small-footprint, low-cost computers.

Siemens
The companies extended their longstanding alliance in ASICs.

Sun Microsystems
Toshiba announced plans to develop a new high-performance computer, based on Sun's SPARC technology, that could be as small as a laptop.

1988

Zoran
The companies agreed to a technology and manufacturing alliance.

Motorola
Under a joint venture, the companies formed Tohoku Semiconductor Co. Tohoku is using Toshiba's marketing channels to market Motorola's 68000 series MPUs in Japan.

Advanced Silicon Corporation
Toshiba agreed to provide 6-inch CMOS wafers and jointly develop ASIC software.

Siemens and General Electric Co.
The companies agreed to jointly develop a common cell library.

SGS-Thomson
The companies extended a six-year agreement to patent cross-licensing related to semiconductor technology.

1987

GRiD
Toshiba agreed to supply GRiD with an IBM PC AT-compatible kneetop computer.

Mitsui Petrochemical
The companies undertook the joint development of a magnetic tape emulator.

Viewlogic Systems
Viewlogic Systems is the principal worldwide supplier of CAE software for Toshiba.

Aida Corporation
Toshiba agreed to provide Aida with its TC17G gate array library models. Toshiba is gaining access to Aida's semicustom IC design equipment.

SGS-ATES
The companies made a five-year technical collaboration agreement allowing Toshiba to use SGS-ATES' semiconductor sales network in Europe and allowing SGS-ATES to receive LSI fab technology and technical training for its engineers from Toshiba.

SDA Systems
The companies undertook a five-year joint venture to develop CAD systems for IC design cooperatively.

KEY OFFICERS

Joichi Aoi
President and chief executive officer

Sakakae Shimizu
Senior executive vice president

Fumio Ohta
Senior executive vice president

Kinichi Kadono
Senior executive vice president

Fumio Sato
Senior executive vice president

PRINCIPAL INVESTORS

The Dai-ichi Mutual Life Insurance Company—4.3 percent
Nippon Life Insurance Company—3.6 percent
The Mitsubishi Trust & Banking Corporation—3.1 percent
The Mitsui Bank, Limited—3.1 percent

Table 4
Comprehensive Financial Statement
Fiscal Year Ending March
(Millions of U.S. Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	$8,018.3	$10,677.5	$13,491.4	$16,910.9	$20,629.2
Cash and Time Deposits	1,244.2	1,597.9	2,550.8	3,640.7	4,823.7
Receivables	2,722.0	3,821.0	4,601.7	5,768.5	6,690.5
Marketable Securities	1,068.4	1,448.0	1,403.8	1,980.1	1,296.6
Inventory	2,123.3	2,849.0	3,675.2	4,046.8	6,251.3
Other Current Assets	860.4	961.6	1,259.9	1,474.8	1,567.1
Net Property, Plants	$2,520.6	$4,087.1	$5,098.7	$5,903.4	$5,983.3
Other Assets	$1,916.7	$2,833.5	$3,903.7	$4,858.8	$5,249.1
Total Assets	$12,455.6	$17,598.1	$22,493.8	$27,673.1	$31,861.6
Total Current Liabilities	$7,275.7	$10,113.3	$12,565.3	$14,688.9	$18,463.1
Long-Term Debt	$1,829.9	$2,606.2	$4,993.1	$6,230.3	$5,836.6
Other Liabilities	$715.3	$1,064.1	$874.3	$1,010.3	0
Total Liabilities	$9,820.9	$13,783.6	$18,432.7	$21,929.5	$24,299.7
Minority Interests	$442.9	$667.0	-	-	$892.6
Total Shareholders' Equity	$2,191.8	$3,147.5	$4,061.1	$5,743.6	$6,669.3
Converted Preferred Stock	0	0	0	0	0
Common Stock	556.9	777.1	1,039.6	1,573.1	1,740.4
Other Equity	649.7	864.1	1,022.4	1,550.5	1,839.3
Retained Earnings	985.2	1,506.3	1,999.1	2,620.0	3,089.6
Total Liabilities and Shareholders' Equity	$12,455.6	$17,598.1	$22,493.8	$27,673.1	$31,861.6

Income Statement	1985	1986	1987	1988	1989
Revenue	$13,826.5	$19,422.6	$22,654.8	$28,579.5	$28,794.4
Japanese Revenue	N/A	N/A	15,664.5	19,728.0	19,561.2
Non-Japanese Revenue	N/A	N/A	6,990.3	8,851.5	9,233.2
Cost of Sales	$9,556.2	$13,578.7	$16,633.7	$20,583.3	$19,576.9
R&D Expense	$700.8	$1,057.1	$1,377.4	$1,738.5	$1,745.1
SG&A Expense	$3,080.6	$4,484.9	$5,667.8	$7,115.5	$7,338.5
Capital Expense	$1,192.0	$1,598.1	$1,400.4	$1,469.9	$1,805.4
Pretax Income	$742.9	$725.1	$534.4	$1,003.8	$1,779.0
Pretax Margin (%)	5.37	3.73	2.36	3.51	6.18
Effective Tax Rate (%)	58.00	58.00	58.00	56.00	56.00
Net Income	$344.5	$330.2	$234.1	$485.7	$904.6
Shares Outstanding, Billions	2,672.1	2,675.7	2,732.5	2,939.4	3,074.6
Per Share Data					
Earnings	$0.11	$0.11	$0.08	$0.16	$0.28
Dividends	$0.03	$0.04	$0.05	$0.06	$0.06
Book Value	$0.82	$1.18	$1.49	$1.95	$2.17

Table 4 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending March
(Millions of U.S. Dollars, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
Liquidity					
Current (Times)	1.10	1.06	1.07	1.15	1.12
Quick (Times)	0.81	0.77	0.78	0.88	0.78
Fixed Assets/Equity (%)	115.00	129.85	125.55	102.78	89.71
Current Liabilities/Equity (%)	331.95	321.31	309.41	255.74	276.84
Total Liabilities/Equity (%)	448.07	437.92	453.88	381.81	364.35
Profitability (%)					
Return on Assets	-	2.20	1.17	1.94	3.04
Return on Equity	-	12.37	6.50	9.91	14.58
Profit Margin	2.49	1.70	1.03	1.70	3.14
Other Key Ratios					
R&D Spending % of Revenue	5.07	5.44	6.08	6.08	6.06
Capital Spending % of Revenue	8.62	8.23	6.18	5.14	6.27
Employees	114,000	120,000	121,000	122,000	125,000
Revenue ($K)/Employee	$121.29	$161.86	$187.23	$234.26	$230.36
Capital Spending % of Assets	9.57	9.08	6.23	5.31	5.67

N/A = Not Available

Source: Toshiba Annual Reports
Dataquest
January 1990

Toshiba Corporation

Toshiba Corporation
1-1 Shibaura 1-chome
Minato-ku, Tokyo 105, Japan
(03) 457-4511
(03) 456-1631
(Billions of Yen)

Balance Sheet (March 31)	1984	1985	1986	1987	1988
Total Current Assets	1,715	2,005	1,922	1,970	2,114
Cash	159	174	169	204	181
Receivables	619	681	687	672	722
Inventory	440	531	513	537	506
Other Current Assets	497	619	553	557	705
Net Property, Plant, and Equipment	495	630	736	744	738
Depreciation	635	739	884	1,009	1,128
Other Assets	444	479	510	570	607
Total Assets	2,654	3,114	3,168	3,284	3,459
Total Current Liabilities	1,599	1,819	1,820	1,835	1,836
Long-Term Debt	503	636	661	525	553
Other Liabilities	87	111	120	331	352
Total Liabilities	2,189	2,566	2,601	2,691	2,741
Total Shareholders' Equity	465	548	567	593	718
Conv. Preferred Stock	0	0	0	0	0
Common Stock	132	139	140	152	197
Other Equity	149	162	145	149	193
Retained Earnings	184	247	282	292	328
Total Liability and Total Equity	2,654	3,114	3,168	3,284	3,459

Income Statement (March 31)	1984	1985	1986	1987	1988
Revenue	2,707	3,343	3,373	3,308	3,572
Domestic Sales	1,968	2,297	2,319	2,287	2,466
Overseas Sales	739	1,046	1,054	1,021	1,106
Cost of Sales	1,931	2,389	2,444	2,429	2,573
Gross Margin (%)	29	29	28	27	28
R&D Expense	141	175	190	201	217
SG&A Expense	651	595	617	626	672
Other Operating Expenses		111	115	108	117
Total Operating Expenses	2,582	3,270	3,366	3,364	3,579
Operating Income (Loss)	125	73	7	(56)	(7)
Interest, Net	75	177	124	134	133
Pretax Income	200	250	131	78	126
Provision for Taxes (Credit)	75	99	71	45	65
Effective Tax Rate	38	40	54	58	52
Extraordinary Items, Net	0	0	0	1	0
Net Income	59	86	59	34	61
Avg. Shares Outstanding (M)	2,559	2,652	2,674	2,704	2,939
Employees	105,000	114,000	120,000	121,000	122,000
Capital Expenditures	171	274	288	204	212
Exchange Rate (Yen per US$1)	236	245	221	160	138

Source: Toshiba Corporation
Annual Report
Dataquest
August 1989

Toshiba Corporation

Toshiba Corporation
1-1 Shibaura 1-chome
Minato-ku, Tokyo 105, Japan
(03) 457-4511
(03) 456-1631
(Millions of Dollars)

Balance Sheet (March 31)	1984	1985	1986	1987	1988
Total Current Assets	7,267	8,184	8,697	12,313	15,319
Cash	674	710	765	1,275	1,312
Receivables	2,623	2,780	3,109	4,200	5,232
Inventory	1,864	2,167	2,321	3,356	3,667
Other Current Assets	2,106	2,527	2,502	3,481	5,109
Net Property, Plant, & Eqp.	2,097	2,571	3,330	4,650	5,348
Depreciation	2,691	3,016	4,000	6,306	8,174
Other Assets	1,881	1,955	2,308	3,563	4,399
Total Assets	11,246	12,710	14,335	20,525	25,065
Total Current Liabilities	6,775	7,424	8,235	11,469	13,304
Long-Term Debt	2,131	2,596	2,991	3,281	4,007
Other Liabilities	369	453	543	2,069	2,551
Total Liabilities	9,275	10,473	11,769	16,819	19,862
Total Shareholders' Equity	1,970	2,237	2,566	3,706	5,203
Conv. Preferred Stock	0	0	0	0	0
Common Stock	559	567	633	950	1,428
Other Equity	631	661	656	931	1,399
Retained Earnings	780	1,008	1,276	1,825	2,377
Total Liability and Total Equity	11,246	12,710	14,335	20,525	25,065

Income Statement (March 31)	1984	1985	1986	1987	1988
Revenue	11,470	13,645	15,262	20,675	25,884
Domestic Sales	8,339	9,376	10,493	14,294	17,870
Overseas Sales	3,131	4,269	4,769	6,381	8,014
Cost of Sales	8,182	9,751	11,059	15,181	18,645
Gross Margin (%)	29	29	28	27	28
R&D Expense	597	714	860	1,256	1,572
SG&A Expense	2,758	3,143	3,652	5,169	6,442
Other Operating Expenses	0	453	520	675	848
Total Operating Expenses	10,941	13,347	15,231	21,025	25,935
Operating Income (Loss)	530	298	32	(350)	(51)
Interest, Net	75	177	124	838	964
Pretax Income	200	250	131	488	913
Provision for Taxes (Credit)	75	99	71	281	471
Effective Tax Rate	38	40	54	58	52
Extraordinary Items, Net	0	0	0	6	0
Net Income	250	351	267	213	442
Avg. Shares Outstanding (M)	2,559	2,652	2,674	2,704	2,939
Employees	105,000	114,000	120,000	121,000	122,000
Capital Expenditures	725	1,118	1,303	1,275	1,536
Exchange Rate (Yen per US$1)	236	245	221	160	138

Source: Toshiba Corporation
Annual Report
Dataquest
August 1989

Toshiba Corporation

The following tables are included in this section:

Toshiba Corporation

Table 1

Sales by Product Segment
(Billions of Yen)

	1984	1985	1986	1987	1988
Information/Communication and Electronic Devices	¥ 984	¥1,121	¥1,267	¥1,152	¥1,170
Heavy Electrical Apparatus	675	911	807	827	874
Consumer Products and Other	1,048	1,311	1,299	1,329	1,528
Total	¥2,707	¥3,343	¥3,373	¥3,308	¥3,572
Exchange Rate (Yen per US$1)	236	245	221	160	138

Note: Product segments were reorganized in 1988. All sales have been restated to reflect this change.

Source: Toshiba Corporation Annual Reports

Toshiba Corporation

Table 2

Toshiba Corporation
Estimated Worldwide Semiconductor
Revenue by Calendar Year
(Billions of Yen)

	1981	1982	1983	1984	1985	1986	1987	1988
Total Semiconductor	171	178	233	370	349	383	436	572
Total IC	87	107	145	245	239	271	316	431
Bipolar Digital (Technology)	3	4	5	9	8	22	18	14
MOS (Technology)	55	78	108	182	175	187	229	343
NMOS	18	25	39	55	43	68	75	119
PMOS	4	6	5	0	0	0	0	0
CMOS	33	47	64	128	132	119	154	224
BiCMOS	0	0	0	0	0	0	0	0
MOS (Function)	55	78	108	182	175	187	229	343
MOS Memory	18	35	52	94	71	80	98	197
MOS Microdevices	2	7	11	17	16	30	41	45
MOS Logic	36	35	45	72	88	76	91	101
Analog	29	25	32	54	56	63	69	74
Total Discrete	67	54	64	99	88	93	101	112
Transistor	35	27	32	47	41	55	60	67
Diode	25	20	25	39	34	30	30	33
Thyristor	5	4	5	7	12	8	9	11
Other Discrete	3	3	3	6	0	0	2	2
Total Optoelectronic	17	17	23	26	23	18	19	28
Exchange Rate (Yen per US$1)	221	249	237	237	238	168	144	130

Source: Dataquest
August 1989

Toshiba Corporation

Table 3

Toshiba Corporation
Estimated Worldwide Semiconductor
Revenue by Calendar Year
(Millions of Dollars)

	1981	1982	1983	1984	1985	1986	1987	1988
Total Semiconductor	774	715	983	1,561	1,468	2,281	3,029	4,395
Total IC	394	429	613	1,035	1,004	1,616	2,194	3,316
Bipolar Digital (Technology)	14	16	21	37	33	129	125	108
MOS (Technology)	250	312	458	770	736	1,114	1,593	2,639
NMOS	80	101	165	230	181	404	522	875
PMOS	20	24	21	2	1	0	0	0
CMOS	150	187	272	538	554	710	1,071	1,764
BiCMOS								
MOS (Function)	250	312	458	770	736	1,114	1,593	2,639
MOS Memory	80	142	221	396	297	479	679	1,516
MOS Microdevices	8	30	45	70	69	180	283	346
MOS Logic	162	140	192	304	370	455	631	777
Analog	130	101	134	228	235	373	476	569
Total Discrete	304	217	272	418	368	556	703	864
Transistor	157	108	133	200	173	325	415	512
Diode	112	80	106	163	142	179	211	256
Thyristor	21	16	19	30	51	50	65	80
Other Discrete	14	13	14	25	2	2	12	16
Total Optoelectronic	76	69	98	108	96	109	132	215
Exchange Rate (Yen per US$1)	221	249	237	237	238	168	144	130

Source: Dataquest
August 1989

Toshiba Corporation

Table 4

1988 Percent Change in Worldwide Semiconductor Revenue

	1988 Rank	1987	1988	% Change 1987 - 1988	World Market % Change
Semiconductor		$3,029	$4,395	45%	33%
IC		$2,194	$3,316	51%	37%
Bipolar Digital		$ 125	$ 108	(14%)	9%
MOS (Technology)		$1,593	$2,639	66%	55%
MOS Memory		$ 679	$1,516	123%	93%
MOS Micro		$ 283	$ 346	22%	40%
MOS Logic		$ 631	$ 777	23%	29%
Analog		$ 476	$ 569	20%	16%
Discrete		$ 703	$ 864	23%	14%
Optoelectronics		$ 132	$ 215	63%	28%
Exchange Rate (Yen per US$1)		144	130		

Source: Dataquest
August 1989

Table 5

1988 Estimated Semiconductor Revenue Percent by Region (Millions of Dollars)

Product	United States		Japan		Europe		ROW	
Semiconductor	$968	22%	$2,496	57%	$390	9%	$541	12%
IC	$904	27%	$1,724	52%	$321	10%	$367	11%
Bipolar Digital	$ 3	3%	$ 66	61%	$ 3	3%	$ 36	33%
MOS (Technology)	$886	34%	$1,288	49%	$301	11%	$164	6%
MOS Memory	$661	44%	$ 576	38%	$228	15%	$ 51	3%
MOS Micro	$ 59	17%	$ 244	70%	$ 27	8%	$ 16	5%
MOS Logic	$166	21%	$ 468	60%	$ 46	6%	$ 97	13%
Analog	$ 15	3%	$ 370	65%	$ 17	3%	$167	29%
Discrete	$ 52	6%	$ 630	73%	$ 52	6%	$130	15%
Optoelectronics	$ 12	6%	$ 142	66%	$ 17	8%	$ 44	20%
Exchange Rate (Yen per US$1)							130	

Source: Dataquest
August 1989

Toshiba Corporation

Toshiba Corporation
1-1 Shibaura 1-chome
Minato-ku, Tokyo 105, Japan
(03)457-4511

Established 1875
Number of Employees: 122,000

BACKGROUND

Toshiba Corporation was founded in 1875 as Tanaka Seizo-sho. The Company merged with Tokyo Electric Company in 1939, and changed its English name to Toshiba Corporation in 1978. The Company is one of the two leaders of the Toshiba-IHI Group. Toshiba is focused in electronics and energy; it is targeting AI, next-generation computers, and software as high-growth areas. It is the second-largest semiconductor supplier in the world.

Toshiba's GaAs activities began in 1974. GaAs developments by Toshiba include GaAs Schottky FETs for use in TV tuners, 4 x 4 parallel multiplier with multiply time of 6ns and p_D of 39mW, GaAs MMIC operating at 12 GHz, Pt-gate GaAs FETs with transconductance of 1.8 milliSiemens, and a 1K gate array with 75ps gate delay.

In mid-1983, Toshiba reported developing a twin-mesa substrate laser and a methodology for forming a number of such lasers on the same substrate for use in multiplexing light sources. In late 1983, Toshiba began sampling a GaAlAs/GaAs laser used in optical disks for audio systems at a sample price of $44.00. By 1984, the device was in mass production at an ASP of $13.00, and by 1989, the price had fallen to less than $2.50.

A 6,000-gate GaAs gate array is being developed by Toshiba's VLSI Research Center at Saiwai-ku, Kawasaki, Japan, as a part of the MITI Scientific Computing Systems Program. The array used a conventional SCFL structure to implement 232 rows by 26 columns of cells. A test structure, with serial-parallel-serial registers occupying 80 percent of the die, consumed 952mW when operated at an 850-MHz rate. Die size is 8 x 8 mm^2.

COMPANY EXECUTIVES

- President and CEO—Joichi Aoi
- Senior Manager, Worldwide Business Planning—Takeshi Nakagawa

Toshiba Corporation

STRATEGIC ALLIANCES

Toshiba has electronics technology exchange agreements with Brooktree, GE, Hewlett-Packard, Intel, Korea Electronics Company, Laser Path, LSI Logic, Motorola, Olivetti, Pohang (South Korea), SGS, Siemens, Sun Microsystems, Tokuda Works, Zilog, Zoran, and others.

PROCESS TECHNOLOGY

Toshiba uses GaAs and other III-V compound semiconductor processes.

PRODUCTS

- LEDs, lasers, and other opto devices
- Analog ICs
- MMICs
- Discretes

Applications

- Military electronics
- Commercial electronics

FACILITIES

- Kitayushu plant
- Tamagawa plant
- Korea Electronics—Optoelectronics and discrete production

Toshiba Corporation

Toshiba Corporation
1-6 Uchinisaiwai-cho 1-chome
Chiyoda-Ku, Tokyo 100, Japan
Telephone: 03-501-5411 Telex: J22587
(Billions of Yen except Per Share Data)

Balance Sheet (March 31)

	1982	1983	1984	1985	1986
Working Capital	¥ 95	¥ 132	¥ 116	¥ 186	¥ 102
Long-Term Debt	¥ 242	¥ 247	¥ 339	¥ 457	¥ 469
Shareholders' Equity	¥ 400	¥ 422	¥ 465	¥ 548	¥ 567
After-Tax Return on Average Equity (%)	12.9	9.2	13.3	17.0	10.6

Operating Performance (Fiscal Year Ending March 31)

	1982	1983	1984	1985	1986
Revenue	¥ 2,344	¥ 2,401	¥ 2,707	¥ 3,343	¥ 3,373
Japanese Revenue	¥ 1,804	¥ 1,787	¥ 1,968	¥ 2,297	¥ 2,319
Non-Japanese Revenue	¥ 630	¥ 614	¥ 739	¥ 1,046	¥ 1,054
Cost of Revenue	¥ 1,605	¥ 1,715	¥ 1,931	¥ 2,389	¥ 2,444
R&D Expense	¥ 90	¥ 119	¥ 141	¥ 175	¥ 190
SG&A Expense	¥ 528	¥ 587	¥ 651	¥ 770	¥ 807
Pretax Income	¥ 119	¥ 107	¥ 135	¥ 186	¥ 131
Pretax Margin (%)	4.9	4.5	5.0	5.6	3.9
Effective Tax Rate (%)	62.4	58.3	56.3	53.8	54.1
Net Income	¥ 44	¥ 38	¥ 59	¥ 86	¥ 59
Average Shares Outstanding (Millions)	2,348	2,478	2,559	2,652	2,674
Per Share					
Earnings	¥ 17.9	¥ 14.8	¥ 22.5	¥ 29.6	¥ 19.2
Dividends	¥ 6.7	¥ 6.7	¥ 7.3	¥ 8.0	¥ 8.0
Book Value	¥170.36	¥170.30	¥181.71	¥206.64	¥211.88
Price Range	N/A	N/A	N/A	N/A	N/A
Total Employees	103,000	103,000	105,000	114,000	120,000
Capital Expenditure	¥ 131	¥ 131	¥ 171	¥ 274	¥ 262
Exchange Rate (Yen per US$)	229	249	236	245	221

N/A = Not Available

Source: Toshiba Annual Reports
Dataquest
March 1988

Toshiba Corporation

Toshiba Corporation
1-6 Uchinisaiwai-cho 1-chome
Chiyoda-Ku, Tokyo 100, Japan
Telephone: 03-501-5411 Telex: J22587
(Millions of Dollars except Per Share Data)

Balance Sheet (March 31)

	1982	1983	1984	1985	1986
Working Capital	$ 415	$ 530	$ 492	$ 759	$ 462
Long-Term Debt	$ 1,057	$ 992	$ 1,436	$ 1,865	$ 2,122
Shareholders' Equity	$ 1,747	$ 1,695	$ 1,970	$ 2,237	$ 2,566
After-Tax Return on Average Equity (%)	12.9	9.2	12.7	15.7	10.5

Operating Performance (Fiscal Year Ending March 31)

	1982	1983	1984	1985	1986
Revenue	$10,236	$ 9,643	$11,470	$13,645	$15,262
Japanese Revenue	$ 7,878	$ 7,177	$ 8,339	$ 9,376	$10,493
Non-Japanese Revenue	$ 2,751	$ 2,466	$ 3,131	$ 4,269	$ 4,769
Cost of Revenue	$ 7,009	$ 6,888	$ 8,182	$ 9,751	$11,059
R&D Expense	$ 393	$ 478	$ 597	$ 714	$ 860
SG&A Expense	$ 2,306	$ 2,357	$ 2,758	$ 3,143	$ 3,652
Pretax Income	$ 520	$ 430	$ 572	$ 759	$ 593
Pretax Margin (%)	4.8	4.0	4.8	5.4	3.7
Effective Tax Rate (%)	62.4	58.3	56.3	53.8	54.1
Net Income	$ 192	$ 153	$ 250	$ 351	$ 267
Average Shares Outstanding (Millions)	2,348	2,478	2,559	2,652	2,674
Per Share					
Earnings	$ 0.08	$ 0.06	$ 0.10	$ 0.12	$ 0.09
Dividends	$ 0.03	$ 0.03	$ 0.03	$ 0.03	$ 0.04
Book Value	$ 0.74	$ 0.68	$ 0.77	$ 0.84	$ 0.96
Price Range	N/A	N/A	N/A	N/A	N/A
Total Employees	103,000	103,000	105,000	114,000	120,000
Capital Expenditures	$ 572	$ 526	$ 725	$ 1,118	$ 1,186
Exchange Rate (Yen per US$)	229	249	236	245	221

N/A = Not Available

Source: Toshiba Annual Reports
Dataquest
March 1988

Toshiba Corporation

Table 1

Toshiba Corporation
Revenue by Product Area
(Billions of Yen)

	1982	1983	1984	1985	1986
Consumer Products	¥ 712	¥ 715	¥ 790	¥ 904	¥1,044
Heavy Electrical Apparatus	716	689	724	965	866
Industrial Electronics and Electronic Components	631	725	907	1,151	1,128
Material, Machinery, and Products	285	272	286	323	335
Total	¥2,344	¥2,401	¥2,707	¥3,343	¥3,373
Exchange Rate (Yen per US$)	229	249	236	245	221

Source: Toshiba Annual Reports
Dataquest
March 1988

Toshiba Corporation

Table 2

Toshiba Corporation
Estimated Worldwide Semiconductor Revenue
(Millions of Dollars)

	1982	1983	1984	1985	1986
Total Semiconductor	$715	$983	$1,561	$1,468	$2,261
Total Integrated Circuit	$429	$613	$1,035	$1,004	$1,605
Bipolar Digital (Technology)	$ 16	$ 21	$ 37	$ 33	$ 129
TTL	-	-	30	-	-
ECL	-	-	6	-	-
Other Bipolar Digital	-	-	1	33	129
Bipolar Digital (Function)	$ 16	$ 21	$ 37	$ 33	$ 129
Bipolar Digital Memory	-	-	-	-	-
Bipolar Digital Logic	16	21	37	33	129
MOS (Technology)	$312	$458	$ 770	$ 736	$1,106
NMOS	101	165	230	181	376
PMOS	24	21	2	1	-
CMOS	187	272	538	554	730
MOS (Function)	$312	$458	$ 770	$ 736	$1,106
MOS Memory	142	221	396	297	452
MOS Micro Devices	30	45	70	69	187
MOS Logic	140	192	304	370	467
Linear	$101	$134	$ 228	$ 235	$ 370
Total Discrete	$217	$272	$ 418	$ 368	$ 549
Transistor	$108	$133	$ 200	$ 173	$ 322
Small Signal Transistor	-	-	87	70	138
Power Transistor	-	-	113	103	184
Diode	$ 80	$106	$ 163	$ 142	$ 180
Small Signal Diode	-	-	90	50	63
Power Diode	-	-	53	84	108
Zener Diode	-	-	20	8	9
Thyristor	16	19	30	51	45
Other Discrete	13	14	25	2	2
Total Optoelectronic	$ 69	$ 98	$ 108	$ 96	$ 107
LED Lamps	-	-	25	18	26
LED Displays	-	-	10	21	23
Optical Couplers	-	-	-	35	36
Other Optoelectronics	-	-	73	22	22
Exchange Rate (Yen/US$)	248	235	237	238	167

Source: Dataquest
March 1988

Toshiba Corporation

Toshiba Corporation
1-1 Shibaura 1-chome
Minato-Ku, Tokyo 105, Japan
Telephone: 03-457-4511 Telex: J22587
(Billions of Yen Except Per Share Data)

Balance Sheet (March 31)

	1983	1984	1985	1986	1987
Working Capital	¥ 132	¥ 116	¥ 186	¥ 102	¥ 135
Long-Term Debt	¥ 247	¥ 339	¥ 457	¥ 469	¥ 525
Shareholders' Equity	¥ 422	¥ 465	¥ 548	¥ 567	¥ 593
After-Tax Return on Average Equity (%)	9.2	13.3	17.0	10.6	5.9

Operating Performance (Fiscal Year Ending March 31)

	1983	1984	1985	1986	1987
Revenue	¥ 2,401	¥ 2,707	¥ 3,343	¥ 3,373	¥ 3,308
Japanese Revenue	¥ 1,787	¥ 1,968	¥ 2,297	¥ 2,319	¥ 2,287
Non-Japanese Revenue	¥ 614	¥ 739	¥ 1,046	¥ 1,054	¥ 1,021
Cost of Sales	¥ 1,715	¥ 1,931	¥ 2,389	¥ 2,444	¥ 2,429
R&D Expense	¥ 119	¥ 141	¥ 175	¥ 190	¥ 201
SG&A Expense	¥ 587	¥ 651	¥ 770	¥ 807	¥ 827
Pretax Income	¥ 107	¥ 135	¥ 186	¥ 131	¥ 78
Pretax Margin (%)	4.5	5.0	5.6	3.9	2.4
Effective Tax Rate (%)	58.3	56.3	53.8	54.1	57.6
Net Income	¥ 38	¥ 59	¥ 86	¥ 59	¥ 34
Average Shares Outstanding (Millions)	2,478	2,559	2,652	2,674	2,704
Per Share					
Earnings	¥ 14.8	¥ 22.5	¥ 29.6	¥ 19.2	¥ 11.9
Dividends	¥ 6.7	¥ 7.3	¥ 8.0	¥ 8.0	¥ 8.0
Book Value	¥170.30	¥181.71	¥206.64	¥211.88	¥219.28
Total Employees	103,000	105,000	114,000	120,000	121,000
Capital Expenditure	¥ 131	¥ 171	¥ 274	¥ 288	¥ 204
Exchange Rate (Yen per US$)	249	236	245	221	160

Source: Toshiba Annual Reports
Dataquest
April 1989

Toshiba Corporation

Toshiba Corporation
1-1 Shibaura 1-chome
Minato-Ku, Tokyo 105, Japan
Telephone: 03-457-4511 Telex: J22587
(Millions of Dollars Except Per Share Data)

Balance Sheet (March 31)

	1983	1984	1985	1986	1987
Working Capital	$ 530	$ 492	$ 759	$ 462	$ 844
Long-Term Debt	$ 992	$ 1,436	$ 1,865	$ 2,122	$ 3,281
Shareholders' Equity	$1,695	$ 1,970	$ 2,237	$ 2,566	$ 3,706
After-Tax Return on Average Equity (%)	9.2	12.7	15.7	10.5	5.9

Operating Performance (Fiscal Year Ending March 31)

	1983	1984	1985	1986	1987
Revenue	$9,643	$11,470	$13,645	$15,262	$20,675
Japanese Revenue	$7,177	$ 8,339	$ 9,376	$10,493	$14,294
Non-Japanese Revenue	$2,466	$ 3,131	$ 4,269	$ 4,769	$ 6,381
Cost of Sales	$6,888	$ 8,182	$ 9,751	$11,059	$15,181
R&D Expense	$ 478	$ 597	$ 714	$ 860	$ 1,256
SG&A Expense	$2,357	$ 2,758	$ 3,143	$ 3,652	$ 5,169
Pretax Income	$ 430	$ 572	$ 759	$ 593	$ 488
Pretax Margin (%)	4.0	4.8	5.4	3.7	2.4
Effective Tax Rate (%)	58.3	56.3	53.8	54.1	57.6
Net Income	$ 153	$ 250	$ 351	$ 267	$ 213
Average Shares Outstanding (Millions)	2,478	2,559	2,652	2,674	2,704
Per Share					
Earnings	$ 0.06	$ 0.10	$ 0.12	$ 0.09	$ 0.07
Dividends	$ 0.03	$ 0.03	$ 0.03	$ 0.04	$ 0.05
Book Value	$ 0.68	$ 0.77	$ 0.84	$ 0.96	$ 1.37
Total Employees	103,000	105,000	114,000	120,000	121,000
Capital Expenditures	$ 526	$ 725	$ 1,118	$ 1,303	$ 1,275
Exchange Rate (Yen per US$)	249	236	245	221	160

Source: Toshiba Annual Reports
Dataquest
April 1989

Toshiba Corporation

This section includes the following tables:

Table 1, Toshiba Corporation Revenue by Product Area

Table 2, Toshiba Coportation Estimated Calendar Worldwide Semiconductor Revenue

Table 3, Toshiba Corporation Estimated Semiconductor Revenue by Geographic Region—1987

Table 1

Toshiba Corporation
Revenue by Product Area
(Billions of Yen)

	Fiscal Year Ending March 31				
	1983	1984	1985	1986	1987
Consumer Products	¥ 715	¥ 790	¥ 904	¥1,044	¥ 941
Heavy Electrical Apparatus	689	724	965	866	868
Industrial Electronics and Electronic Components	725	907	1,151	1,128	1,183
Material, Machinery, and Products	272	286	323	335	316
Total	¥2,401	¥2,707	¥3,343	¥3,373	¥3,308
Exchange Rate (Yen per US$)	249	236	245	221	160

Source: Toshiba Annual Reports
Dataquest
April 1989

Toshiba Corporation

Table 2

Toshiba Corporation
Estimated Calendar Worldwide Semiconductor Revenue
(Millions of Dollars)

	1983	1984	1985	1986	1987
Total Semiconductor	983	1,561	1,468	2,281	3,002
Total Integrated Circuit	613	1,035	1,004	1,616	2,167
Bipolar Digital (Technology)	21	37	33	129	125
TTL		30			
ECL		6			
Other Bipolar Digital		1	33	129	125
Bipolar Digital (Function)	21	37	33	129	125
Bipolar Digital Memory					
Bipolar Digital Logic	21	37	33	129	125
MOS (Technology)	458	770	736	1,114	1,566
NMOS	165	230	181	404	533
PMOS	21	2	1		
CMOS	272	538	554	710	1,033
MOS (Function)	458	770	736	1,114	1,566
MOS Memory	221	396	297	479	652
MOS Micro Devices	45	70	69	180	283
MOS Logic	192	304	370	455	631
Linear	134	228	235	373	476
Total Discrete	272	418	368	556	703
Transistor	133	200	173	325	418
Small-Signal Transistor		87	70		
Power Transistor		113	103		
Diode	106	163	142	179	211
Small-Signal Diode		90	50		
Power Diode		53	84		
Zener Diode		20	8		
Thyristor	19	30	51	50	65
Other Discrete	14	25	2	2	9
Total Optoelectronic	98	108	96	109	132
LED Lamps		25	18		
LED Displays		10	21		
Optical Couplers			35		
Other Optoelectronics		73	22		
Exchange Rate (Yen/US$)	235	237	238	167	144

Source: Dataquest
April 1989

Toshiba Corporation

Table 3

Toshiba Corporation
Estimated Semiconductor Revenue by Geographic Region—1987
(Millions of Dollars)

	U.S.	Japan	Europe	ROW	World
Total Semiconductor	474	1,859	191	478	3,002
Total Integrated Circuit	395	1,297	145	330	2,167
Bipolar Digital	3	117	2	3	125
MOS	381	833	126	226	1,566
Linear	11	347	17	101	476
Total Discrete	68	487	33	115	703
Total Optoelectronic	11	75	13	33	132

Source: Dataquest
April 1989

Toshiba Corporation

Toshiba Corporation
1-1 Shibaura 1-chome
Minato-Ku, Tokyo 105, Japan
Telephone: 03-457-4511 Telex: J22587
(Millions of Dollars except Per Share Data)

Balance Sheet (March 31)

	1983	1984	1985	1986	1987
Working Capital	$ 530	$ 492	$ 759	$ 462	$ 844
Long-Term Debt	$ 992	$ 1,436	$ 1,865	$ 2,122	$ 3,281
Shareholders' Equity	$ 1,695	$ 1,970	$ 2,237	$ 2,566	$ 3,706
After-Tax Return on Average Equity (%)	9.2	12.7	15.7	10.5	5.9

Operating Performance (Fiscal Year Ending March 31)

	1983	1984	1985	1986	1987
Sales	$ 9,643	$11,470	$13,645	$15,262	$20,675
Japanese Sales	$ 7,177	$ 8,339	$ 9,376	$10,493	$14,294
Non-Japanese Sales	$ 2,466	$ 3,131	$ 4,269	$ 4,769	$ 6,381
Cost of Sales	$ 6,888	$ 8,182	$ 9,751	$11,059	$15,181
R&D Expense	$ 478	$ 597	$ 714	$ 860	$ 1,256
SG&A Expense	$ 2,357	$ 2,758	$ 3,143	$ 3,652	$ 5,169
Pretax Income	$ 430	$ 572	$ 759	$ 593	$ 488
Pretax Margin (%)	4.0	4.8	5.4	3.7	2.4
Effective Tax Rate (%)	58.3	56.3	53.8	54.1	57.6
Net Income	$ 153	$ 250	$ 351	$ 267	$ 213
Average Shares Outstanding (Millions)	2,478	2,559	2,652	2,674	2,704
Per Share					
Earnings	$ 0.06	$ 0.10	$ 0.12	$ 0.09	$ 0.07
Dividends	$ 0.03	$ 0.03	$ 0.03	$ 0.04	$ 0.05
Book Value	$ 0.68	$ 0.77	$ 0.84	$ 0.96	$ 1.37
Price Range	N/A	N/A	N/A	N/A	N/A
Total Employees	103,000	105,000	114,000	120,000	121,000
Capital Expenditures	$ 526	$ 725	$ 1,118	$ 1,303	$ 1,275
Exchange Rate (Yen per US$)	249	236	245	221	160

N/A = Not Available

Source: Toshiba Annual Reports
Dataquest
November 1987

Toshiba Corporation

Toshiba Corporation
1-1 Shibaura 1-chome
Minato-Ku, Tokyo 105, Japan
Telephone: 03-457-4511 Telex: J22587
(Billions of Yen except Per Share Data)

Balance Sheet (March 31)

	1983	1984	1985	1986	1987
Working Capital	¥ 132	¥ 116	¥ 186	¥ 102	¥ 135
Long-Term Debt	¥ 247	¥ 339	¥ 457	¥ 469	¥ 525
Shareholders' Equity	¥ 422	¥ 465	¥ 548	¥ 567	¥ 593
After-Tax Return on Average Equity (%)	9.2	13.3	17.0	10.6	5.9

Operating Performance (Fiscal Year Ending March 31)

	1983	1984	1985	1986	1987
Sales	¥ 2,401	¥ 2,707	¥ 3,343	¥ 3,373	¥ 3,308
Japanese Sales	¥ 1,787	¥ 1,968	¥ 2,297	¥ 2,319	¥ 2,287
Non-Japanese Sales	¥ 614	¥ 739	¥ 1,046	¥ 1,054	¥ 1,021
Cost of Sales	¥ 1,715	¥ 1,931	¥ 2,389	¥ 2,444	¥ 2,429
R&D Expense	¥ 119	¥ 141	¥ 175	¥ 190	¥ 201
SG&A Expense	¥ 587	¥ 651	¥ 770	¥ 807	¥ 827
Pretax Income	¥ 107	¥ 135	¥ 186	¥ 131	¥ 78
Pretax Margin (%)	4.5	5.0	5.6	3.9	2.4
Effective Tax Rate (%)	58.3	56.3	53.8	54.1	57.6
Net Income	¥ 38	¥ 59	¥ 86	¥ 59	¥ 34
Average Shares Outstanding (Millions)	2,478	2,559	2,652	2,674	2,704
Per Share					
Earnings	¥ 14.8	¥ 22.5	¥ 29.6	¥ 19.2	¥ 11.9
Dividends	¥ 6.7	¥ 7.3	¥ 8.0	¥ 8.0	¥ 8.0
Book Value	¥170.30	¥181.71	¥206.64	¥211.88	¥219.28
Price Range	N/A	N/A	N/A	N/A	N/A
Total Employees	103,000	105,000	114,000	120,000	121,000
Capital Expenditure	¥ 131	¥ 171	¥ 274	¥ 288	¥ 204
Exchange Rate (Yen per US$)	249	236	245	221	160

N/A = Not Available

Source: Toshiba Annual Reports
Dataquest
November 1987

Toshiba Corporation

THE COMPANY

Background

Toshiba Corporation was founded as Tanaka Seizo-sho in 1875 and was renamed Shibaura Engineering Works in 1893. In 1939, the Company merged with Tokyo Electrical Company (founded in 1890 as Hakunetsu-sha) and became Tokyo Shibaura Electric Co., Ltd. In 1978, the Company's English name was changed to Toshiba Corporation.

Toshiba is one of two leaders of the Toshiba-IHI Group; the other is Ishikawajima-Harima Heavy Industries (IHI). These parent companies have close capital and business connections. Their subsidiaries are engaged in electrical and electronics production, construction, trading and finance, and shipbuilding. Figure 1 is a diagram of the Toshiba-IHI Group, and Figure 2 is a diagram of the Toshiba company organization.

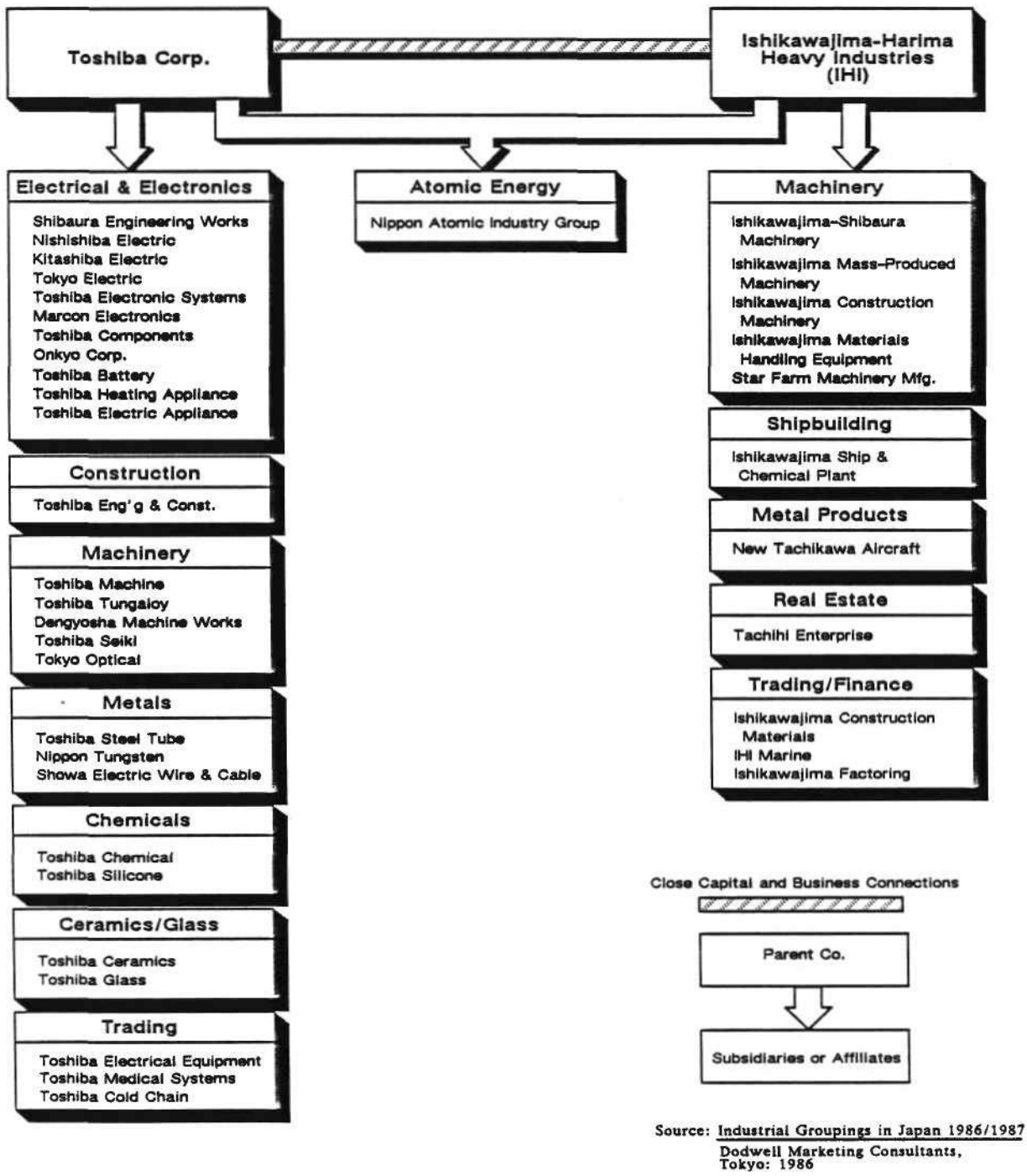
Toshiba has developed the concept of electronics and energy (E&E) as its corporate hallmark. In addition to being a leader in the electronics field, the Company holds 40 percent of the Japanese thermal power plant market and 30 percent of Japan's hydroelectric plant market. Toshiba hopes to integrate E&E by synergistically adopting new technologies, for example, the increasing use of electronics in color televisions, VCRs, and refrigerators, which will lead to more power-efficient products that consume less energy. As a complement to E&E, the Company has implemented a company-wide program called "Project I"; the "I" stands for the three central concepts of information, integration, and intelligence.

Toshiba is targeting AI technologies, next-generation computers, and software as areas of especially high growth.

Toshiba Corporation

Figure 1

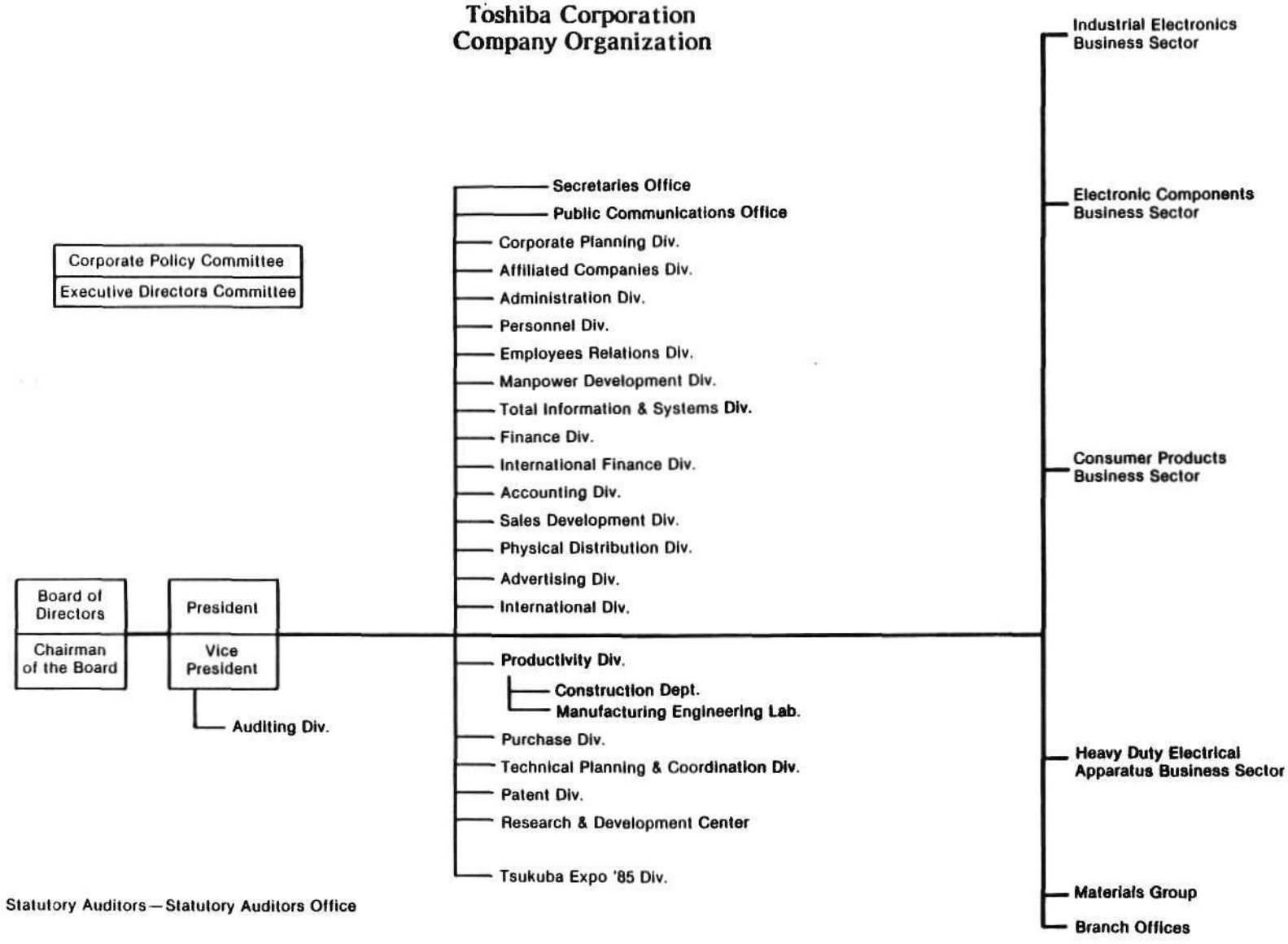
Toshiba–IHI Group



Source: Industrial Groupings in Japan 1986/1987
Dodwell Marketing Consultants, Tokyo: 1986

Figure 2

Toshiba Corporation
Company Organization



Source: Toshiba Corporation

Toshiba Corporation

Highlights

Company highlights include the following:

- Toshiba reported sales of ¥3,380 billion for fiscal 1987, down 2 percent from 1986.
- Toshiba is the third-largest electronics manufacturer in Japan (after Matsushita and Hitachi) and the tenth largest worldwide.
- In calendar 1986, Toshiba became the third-largest semiconductor supplier in the world, with semiconductor revenue of $2,276 million.
- In 1986, Toshiba became the second-largest semiconductor supplier in Japan with sales of $1,572 million.
- Toshiba continues to make substantial semiconductor capital investments and research and development investment.
- Toshiba has had many firsts in its history, including the development of Japan's first radar system in 1942, the production of Japan's first digital computer in 1954, the manufacture of Japan's first transistor radio in 1957, and production of the first transistorized television set and first microwave oven in 1960.
- In 1978, Toshiba invented electron-beam lithography to produce LSI ICs. In the 1980s, Toshiba developed the first GaAs gate-array LSI, the first commercial 1Mb DRAM, and the first prototype 4Mb DRAM.

Investment in the Company

The major shareholders of Toshiba are listed in Table 1.

Toshiba Corporation

Table 1

Toshiba Corporation
Major Shareholders

Shareholders	Percent of Shares
Dai-ichi Mutual Life Insurance Company	4.8%
Nippon Life Insurance Company	3.7%
Mitsui Bank, Limited	3.4%
Mitsui Mutual Life Insurance Company	2.4%
Sumitomo Trust	2.1%
Nippon Fire & Marine Insurance Company, Limited	2.1%
Mitsui Trust & Banking Co., Ltd.	2.3%
Long-Term Credit Bank of Japan, Limited	2.0%

Toshiba is listed on three Japanese stock exchanges, as well as on the Amsterdam, Basle, Dusseldorf, Frankfurt, Geneva, London, Luxembourg, Paris, and Zurich exchanges. Major short- and long-term borrowings are from Mitsui Bank, Tokai Bank, and Sumitomo Bank. Total foreign stock ownership is 5.8 percent.

Source: Toshiba Corporation
Annual Reports

Operations

Toshiba reported sales of ¥3,308 billion for the year ended March 31, 1987, a 2 percent decrease from the previous year. Earnings declined dramatically, down 42 percent from the previous year, to ¥34 billion. The Company attributes the decreases to slow economic growth in the United States, the continuing rise in the value of the yen, and intensified trade friction.

Toshiba's business operations are divided into the following five product areas:

- Electronic components
- Consumer products
- Heavy electrical apparatus
- Industrial electronics
- Materials, machinery, and other products

Toshiba Corporation

Sales by product area are shown in Table 2. (For purposes of public financial reporting, the Company combines the industrial electronics and electronic components groups.) A comparison of product sales in 1983 and 1987 is shown in Figure 3.

Table 2

Toshiba Corporation
Sales by Product Area
(Billions of Yen)

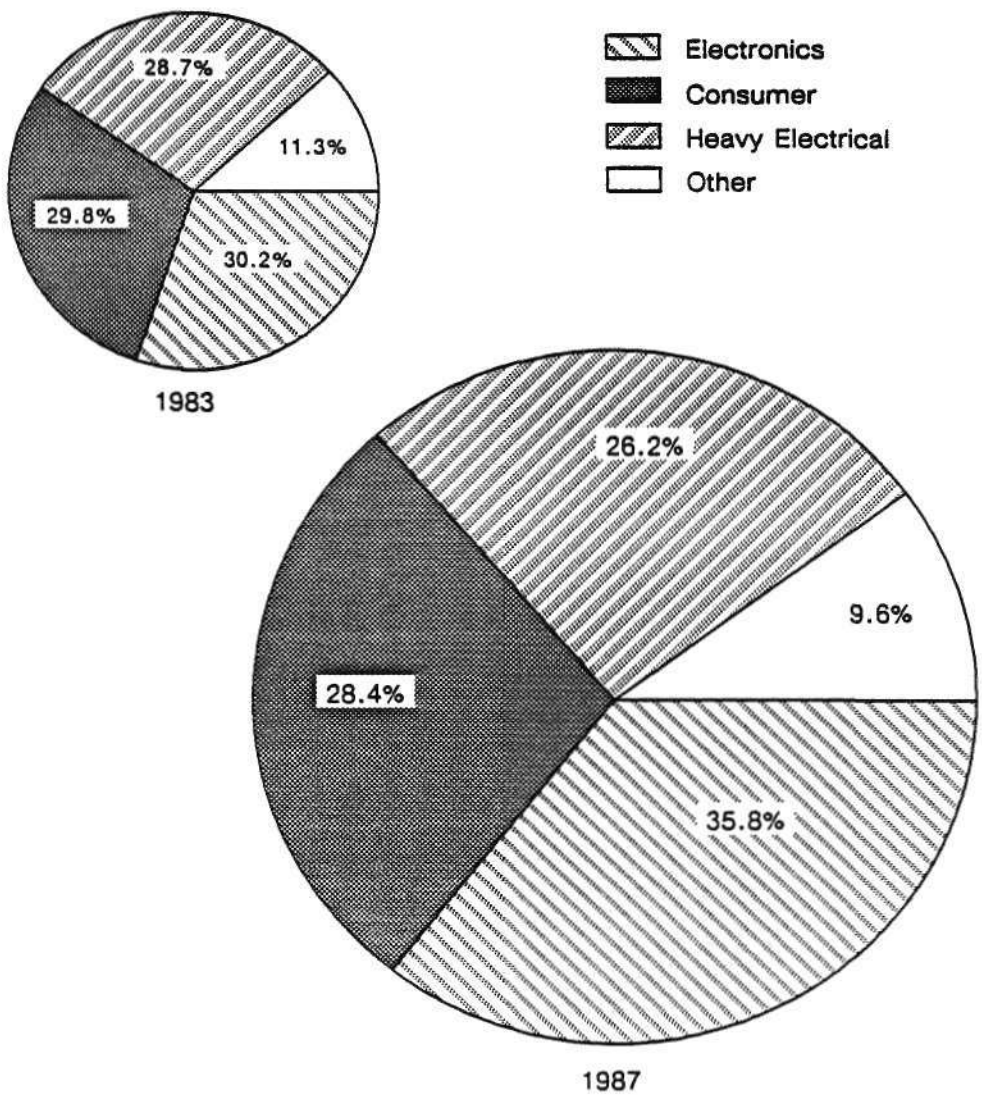
	1983	1984	1985	1986	1987
Consumer Products	¥ 715	¥ 790	¥ 904	¥1,044	¥ 941
Heavy Electrical Apparatus	689	724	965	866	868
Industrial Electronics and Electronic Components	725	907	1,151	1,128	1,183
Material, Machinery, and Products	272	286	323	335	316
Total	¥2,401	¥2,707	¥3,343	¥3,373	¥3,308
Exchange Rate (Yen per US$)	249	236	245	221	160

Source: Toshiba Annual Reports
Dataquest
November 1987

Toshiba Corporation

Figure 3

Toshiba Corporation
Sales by Product Area—1983 and 1987
(Percent of Yen)



Source: Dataquest
November 1987

Toshiba Corporation

International Activities

Toshiba's overseas sales decreased about 3 percent during fiscal 1987 to ¥1,021 billion, representing 31 percent of the Company's revenue. The years 1985, 1986, and 1987 presented international challenges for Toshiba with the appreciation of the yen and the increasing trade friction. Toshiba has taken the following measures for its long-term growth:

- Expanded offshore production
- Entered into joint ventures for overseas production
- Entered into international cooperative programs

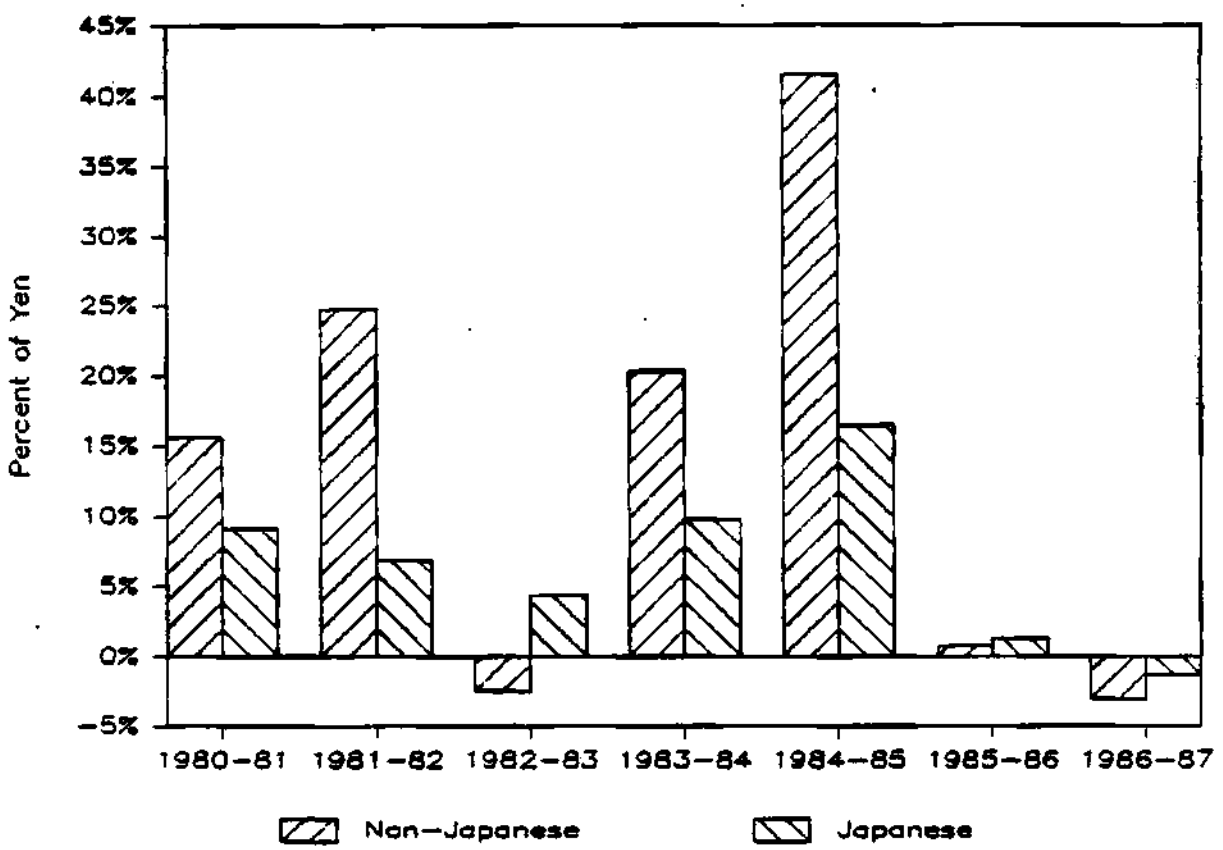
In early 1987, Toshiba agreed to provide the People's Republic of China (PRC) with assembly technology for color television LSIs. It will supply the necessary equipment to the Jiangnan semiconductor device factory in Wuxi.

The Company also plans to double imports within three years.

Figure 4 compares the year-to-year growth of nondomestic and domestic sales from 1980 through 1987.

Figure 4

Toshiba Corporation
Growth of Nondomestic versus Domestic Sales
(Percent of Yen)



Source: Dataquest
November 1987

Table 3 shows Toshiba's estimated calendar 1986 semiconductor revenue by geographic region. Dataquest estimates that approximately 31 percent of Toshiba's semiconductor sales are overseas, an increase of 6 percent from 1985. Revenue in the United States was $294 million, or about 13 percent; $110 million, or 5 percent, in Europe; and $300 million, or 13 percent, in the Rest of World countries. The remaining 69 percent of semiconductor revenue originates in Japan.

Toshiba Corporation

Table 3

Toshiba Corporation
Estimated Calendar 1986 Semiconductor Revenue by Geographic Region
(Millions of Dollars)

	U.S.	Japan	Europe	ROW	Total
Total Semiconductor	$294	$1,572	$110	$300	$2,276
Integrated Circuit	$252	$1,079	$ 82	$197	$1,610
Bipolar Digital	0	129	0	0	129
MOS	242	642	75	147	1,106
Linear	10	308	7	50	375
Discrete	32	428	20	77	$ 557
Optoelectronic	10	65	8	26	$ 109

Source: Dataquest
November 1987

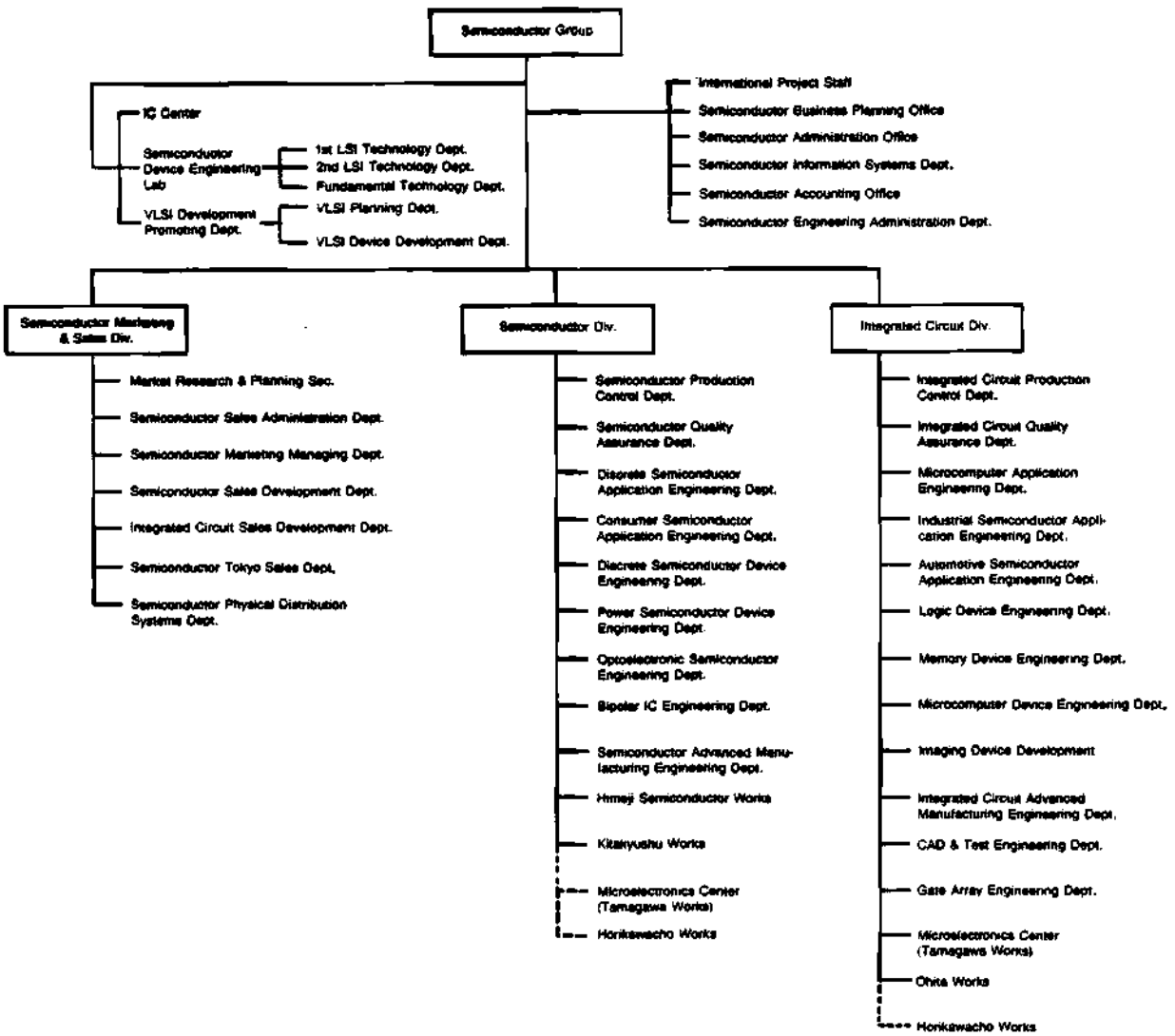
Organization

Toshiba's semiconductor group organization is shown in Figure 5.

Toshiba Corporation

Figure 5

Toshiba Corporation
Semiconductor Group Organization



Source: Toshiba Corporation

Toshiba Corporation

Facilities

Toshiba's semiconductor manufacturing facilities are listed in Table 4. The Japanese facilities are also shown on the map in Figure 6.

Table 4

Toshiba Corporation
Semiconductor Plant Locations

Map Code	Location	Floor Space (square meters)	Functions/Products
A	Buzen Toshiba Electronics	N/A	Fab, Assembly, Test--Optoelectronics
B	Hamaoka Denshi Buhin	N/A	Assembly
C	Himeji Factory	242,413	Fab, Assembly,Test--Discretes
D	Iwate Toshiba Electronics	23,000	Assembly--Linear, Discretes
E	Iwate Toshiba Electronics Kitakami	40,000	Fab, Assembly, Test--MOS
F	Kitakyushu Factory	54,559	Fab, Assembly, Test--Linear
G	Kitsuki Factory	8,300	Assembly--Bipolar, MOS
H	Micro Technology Laboratory	N/A	Fab, Test--Bipolar, MOS
I	Micro-Electronics Center	68,334	Fab, Test--Bipolar, MOS
J	Nohgata Toshiba Electronics	5,000	Fab, Assembly, Test
K	Oita Factory	67,755	Fab, Assembly, Test
L	Toshiba Components	N/A	Assembly--Discretes
M	Kaga Toshiba Electronics	N/A	Assembly, Test--Discretes
	Korea Electronics*	N/A	Assembly, Test--ICs, Discretes, Opto
	Toshiba Electronics Malaysia	N/A	Assembly, Test--ICs, Discretes
	Industria Mexicana Toshiba	N/A	Assembly, Test--ICs, Discretes
	Toshiba Semiconductor (USA)	N/A	Assembly--MOS Memory
	Toshiba Semiconductor GmbH	3,000	Assembly, Test--MOS

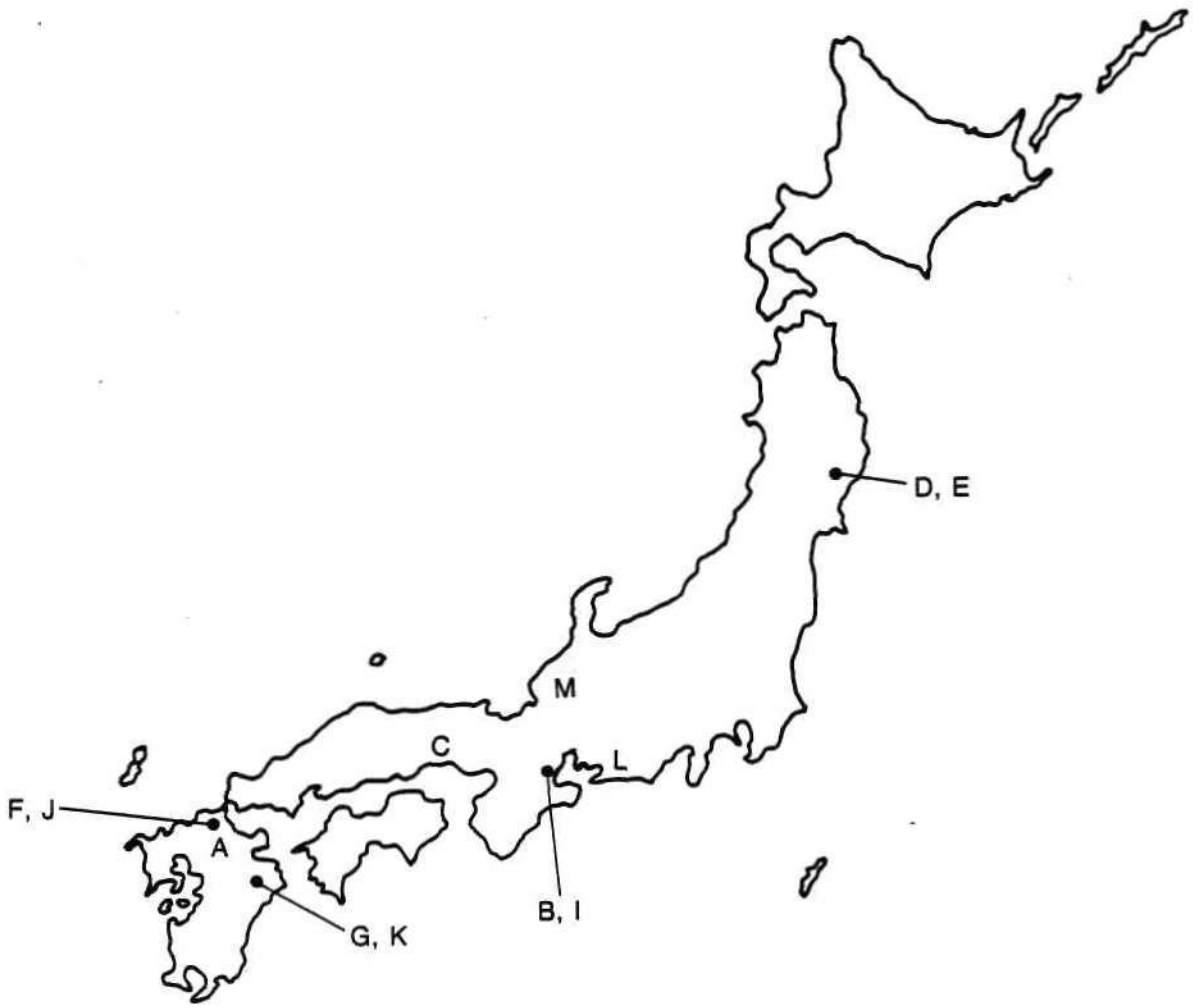
*Joint Venture
N/A = Not Available

Source: Dataquest
November 1987

Toshiba Corporation

Figure 6

Toshiba Corporation
Japanese Semiconductor Plant Locations



Source: Dataquest
November 1987

Toshiba Corporation

Marketing and Sales

Toshiba is the third-largest Japanese semiconductor supplier, after NEC and Hitachi, with estimated calendar 1986 semiconductor revenue of $2,276 million, a 55 percent increase from 1985.

- Toshiba was the largest supplier of CMOS devices in 1986, with sales estimated at $730 million.
- Toshiba's MOS sales, which include NMOS and CMOS processes, were approximately $1,106 million.
- MOS logic sales were an estimated $467 million, an increase of 26 percent.
- MOS memory sales were approximately $452 million, an increase of 52 percent after a decline of 25 percent in calendar 1985.
- MOS microdevice sales were an estimated $187 million, an increase of 171 percent from calendar 1985.

Table 5 shows Toshiba's worldwide semiconductor revenue by product.

Table 6 shows Toshiba's worldwide semiconductor ranking. In addition to MOS devices, Toshiba is a leader in linear, discrete, and optoelectronic devices. The Company also showed an astounding increase in bipolar logic revenue, although it is not a leader in this area.

Toshiba Corporation

Table 5

Toshiba Corporation
Estimated Calendar Year Worldwide Semiconductor Revenue
(Millions of Dollars)

	1982	1983	1984	1985	1986
Total Semiconductor	$715	$983	$1,561	$1,468	$2,276
Total Integrated Circuit	$429	$613	$1,035	$1,004	$1,610
Bipolar Digital (Technology)	$ 16	$ 21	$ 37	$ 33	$ 129
TTL	-	-	30	-	-
ECL	-	-	6	-	-
Other Bipolar Digital	-	-	1	33	129
Bipolar Digital (Function)	$ 16	$ 21	$ 37	$ 33	$ 129
Bipolar Digital Memory	-	-	-	-	-
Bipolar Digital Logic	16	21	37	33	129
MOS (Technology)	$312	$458	$ 770	$ 736	$1,106
NMOS	101	165	230	181	376
PMOS	24	21	2	1	-
CMOS	187	272	538	554	730
MOS (Function)	$312	$458	$ 770	$ 736	$1,106
MOS Memory	142	221	396	297	452
MOS Micro Devices	30	45	70	69	187
MOS Logic	140	192	304	370	467
Linear	$101	$134	$ 228	$ 235	$ 375
Total Discrete	$217	$272	$ 418	$ 368	$ 557
Transistor	$108	$133	$ 200	$ 173	$ 326
Small Signal Transistor	-	-	87	70	141
Power Transistor	-	-	113	103	185
Diode	$ 80	$106	$ 163	$ 142	$ 179
Small Signal Diode	-	-	90	50	63
Power Diode	-	-	53	84	108
Zener Diode	-	-	20	8	8
Thyristor	16	19	30	51	50
Other Discrete	13	14	25	2	2
Total Optoelectronic	$ 69	$ 98	$ 108	$ 96	$ 109
LED Lamps	-	-	25	18	27
LED Displays	-	-	10	21	23
Optical Couplers	-	-	-	35	36
Other Optoelectronics	-	-	73	22	23
Exchange Rate (Yen/US$)	248	235	237	238	167

Source: Dataquest
November 1987

Toshiba Corporation

Table 6

Toshiba Corporation
Worldwide Ranking by Semiconductor Markets
(Millions of Dollars)

	1985 Rank	1986 Rank	1986 Revenue	Revenue % Change 1985-1986	Industry % Change 1985-1986
Total Semiconductor	5	3	$2,276	55%	25%
Total IC	6	4	1,610	60%	24%
Bipolar Digital	16	12	129	291%	14%
MOS Digital	4	3	1,106	50%	25%
Linear	5	3	375	60%	30%
Total Discrete	3	2	557	51%	25%
Total Optoelectronics	3	5	109	14%	36%

Source: Dataquest
November 1987

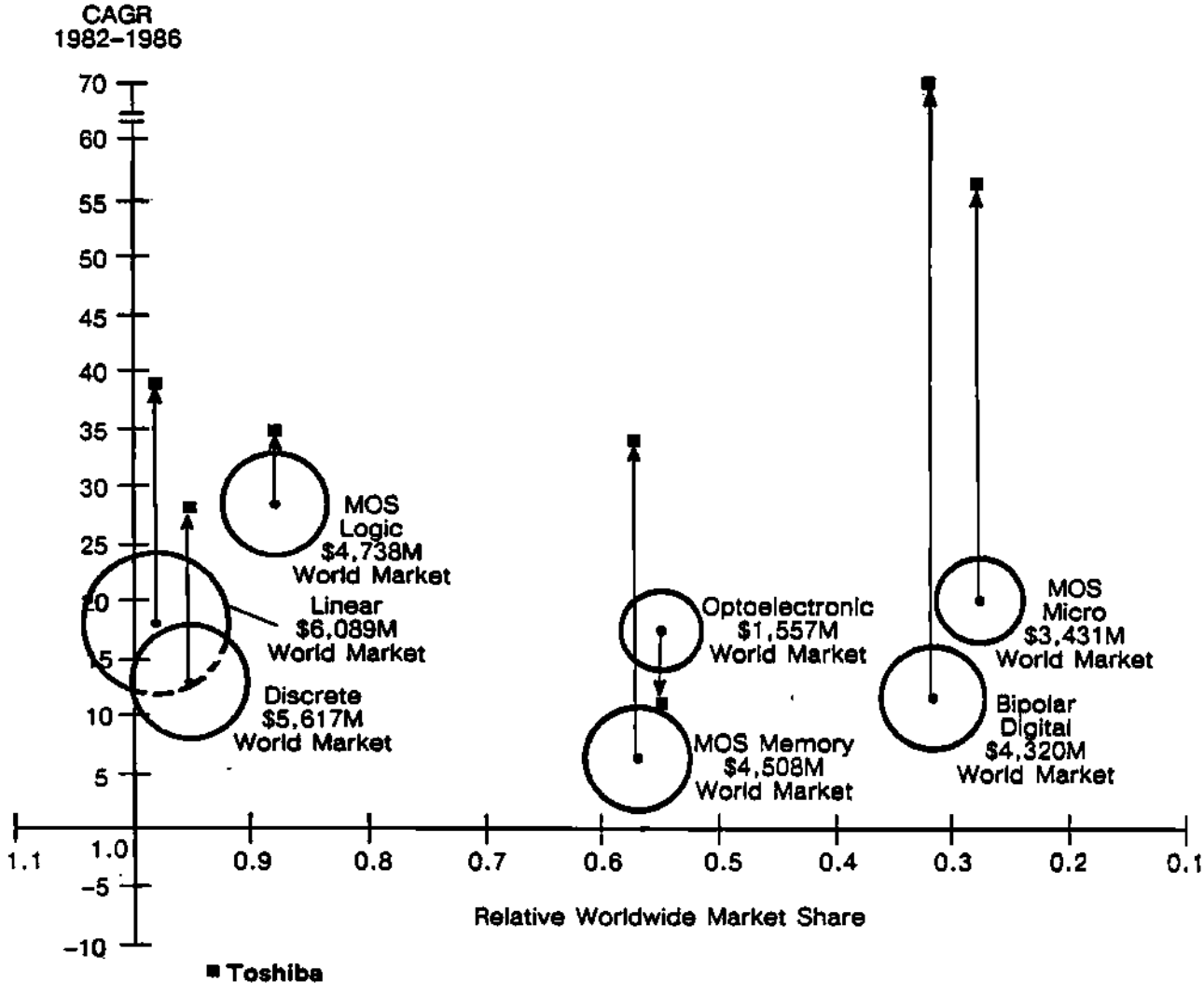
Product Portfolio Analysis

Figure 7 is a graphic analysis of Toshiba's 1986 product portfolio compared with worldwide competition. Figure 8 presents the same analysis applied only to the Company's Japanese competition. These figures show which product areas the Company has chosen to focus on.

The y axis is the historical product CAGR from 1982 to 1986. Toshiba's CAGR for each product is marked by a small square. In Figure 7, the worldwide product CAGR is marked by a dot surrounded by a circle that represents the total world market for the product. In Figure 8, the total Japanese company CAGR for each product is marked by a dot surrounded by a circle that represents total Japanese company sales for the product.

Toshiba Corporation

Figure 7
Toshiba Corporation
1986 Product Portfolio
Compared with Worldwide Competition

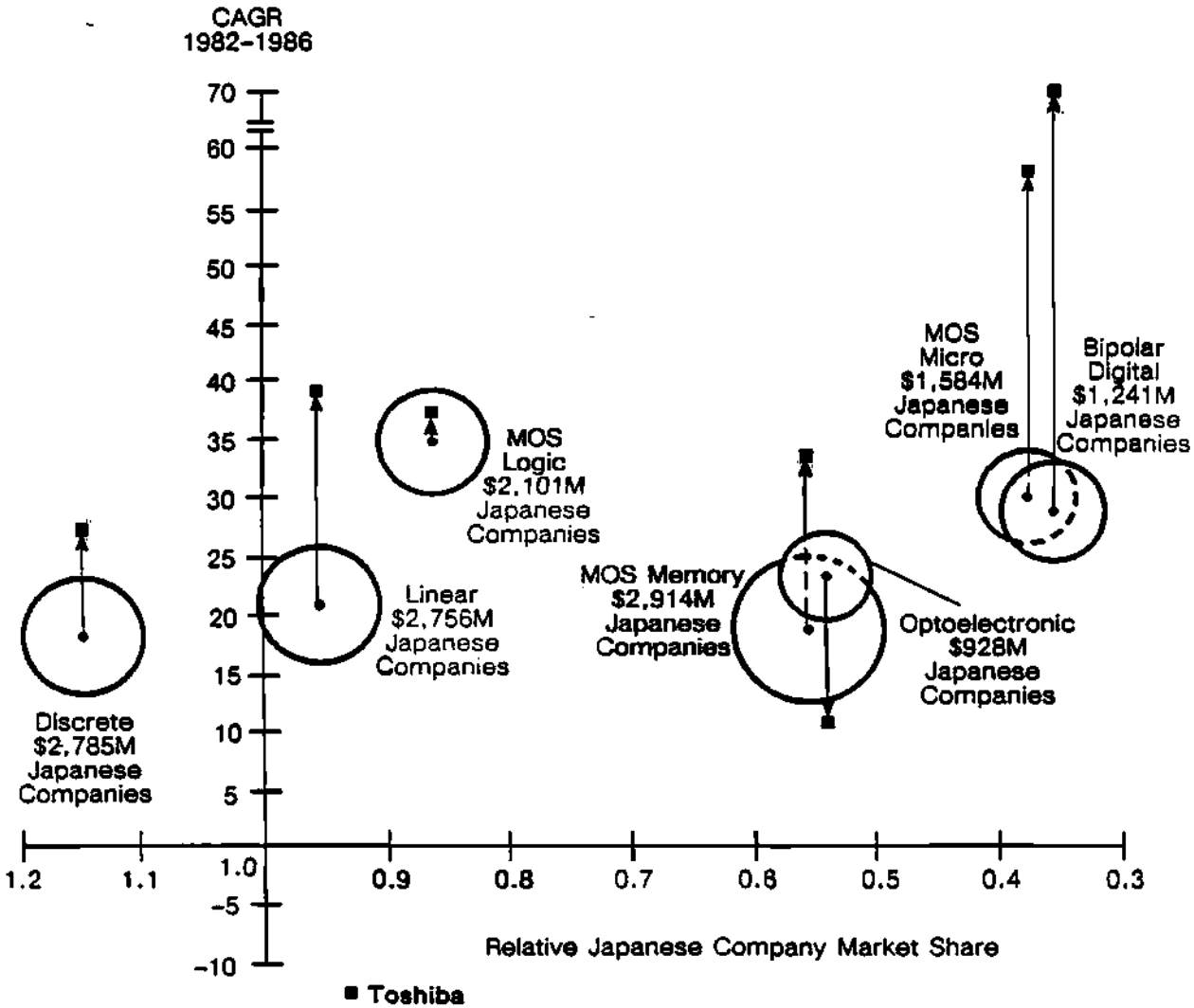


Note: Up arrow indicates growth higher than the industry average; down arrow indicates the opposite.

Source: Dataquest
November 1987

Figure 8

Toshiba Corporation
1986 Product Portfolio
Compared with Japanese Competition



■ **Toshiba**

Note: Up arrow indicates growth higher than the industry average; down arrow indicates the opposite.

Source: Dataquest
November 1987

Toshiba Corporation

The locations of graph points may be interpreted in the following way:

- Upper Right Quadrant—These are the "developing products." The Company is not the leading supplier of these products, but the products exhibit positive growth.
- Upper Left Quadrant—These are the "stars." The Company is the leading supplier of these products, and the products exhibit positive growth.
- Lower Left Quadrant—These are the "cash cows." The Company is the leading supplier of a declining product segment, but there is generally a high profit margin on these products.
- Lower Right Quadrant—These are the "dogs." The TAM for this product area is decreasing, and the Company is not the leading supplier.

A worldwide competitive analysis of Toshiba's product portfolio shows a company that is one of the leaders in sales of MOS logic, discretes, and linear ICs. In each of these product areas, Toshiba has more than 85 percent relative market share and a growth rate higher than the industry average. Toshiba also has relative market share greater than 50 percent in optoelectronics and MOS memory, although its growth rate in optoelectronics is lower than the industry average growth rate. Although the Company's relative market shares in MOS microdevices and bipolar digital ICs are only around 30 percent, its growth rates in those two products have been significantly higher than the industry average growth rates.

Compared with its Japanese competitors, the Company is by far the leader in discrete market share, and also has very high relative market shares in linear and MOS logic. Toshiba's growth rate is higher than the average for all Japanese companies, in all product areas except for optoelectronics.

Distribution

Toshiba's major distributors in Japan are Toshiba Electron Device, Midoriya Electric, Tokyo Shuma, and Kenden Kogyo.

In the United States, Toshiba's products are sold by Toshiba America Ltd., headquartered in Tustin, California. Toshiba's products are also available through several major U.S. distributors.

Toshiba has sales offices throughout Europe and also sells through European distributors.

Capital and R&D Spending

Capital investments, which totaled ¥204 billion for fiscal 1987, were down 21.0 percent from 1986 due to the severe downturn in the semiconductor industry. Research and development expense increased slightly, to 6.1 percent of total sales.

Table 7 shows Toshiba's capital and R&D spending.

Table 7

Toshiba Corporation
Capital and R&D Spending as a Percent of Sales
(Billions of Yen)

	Fiscal Year Ending March 31				
	1983	1984	1985	1986	1987
Sales	¥2,401	¥2,707	¥3,343	¥3,373	¥3,308
Capital Spending	¥ 131	¥ 171	¥ 274	¥ 288	¥ 204
Percent of Sales	5.5%	6.3%	8.2%	8.5%	6.2%
R&D Spending	¥ 119	¥ 141	¥ 175	¥ 190	¥ 201
Percent of Sales	5.0%	5.2%	5.2%	5.6%	6.1%
Combined Capital and R&D Spending	¥ 250	¥ 312	¥ 449	¥ 478	¥ 405
Percent of Sales	10.4%	11.5%	13.4%	14.1%	12.3%
Percent Increase (Decrease)	13.0%	25.0%	42.0%	0.6%	(15.3%)

Source: Toshiba Corporation
Annual Reports
Dataquest
November 1987

Toshiba Corporation

Table 8 shows capital and R&D spending in U.S. dollars.

Table 8

Toshiba Corporation
Capital and R&D Spending in U.S. Dollars
(Millions of Dollars)

	Fiscal Year Ending March 31				
	1983	1984	1985	1986	1987
Sales	$9,643	$11,470	$13,645	$15,262	$20,675
Capital Expenditures	$ 526	$ 725	$ 1,118	$ 1,303	$ 1,275
R&D Expenditures	$ 478	$ 597	$ 714	$ 860	$ 1,256
Exchange Rate (Yen per US$)	249	236	245	221	160

Source: Toshiba Annual Reports
Dataquest
November 1987

Table 9 shows Toshiba's semiconductor capital spending.

Table 9

Toshiba Corporation
Semiconductor Capital Spending by Calendar Year
(Millions of Dollars)

	1982	1983	1984	1985	1986
Semiconductor Revenue	$715	$983	$1,561	$1,468	$2,276
Semiconductor Capital Spending	$113	$366	$ 574	$ 517	$ 389
Percent of Semiconductor Revenue	16%	37%	37%	35%	17%

Source: Dataquest
November 1987

Toshiba Corporation

Research and Development

Toshiba believes that technology is the driving force behind corporate development; thus, the Company has been intensifying its R&D efforts. In fiscal 1987, 6.1 percent of sales—or ¥201 billion—was spent on R&D, compared with 5.0 percent of sales expended in fiscal 1983. R&D emphasis is on semiconductors, factory automation, and new materials.

Toshiba has an R&D center located in Kawasaki, Kanagawa Prefecture, and has seven development laboratories—five in Kawasaki; one in Otawara, Tochigi Prefecture; and one in Yokohama, Kanagawa Prefecture. Semiconductor R&D is conducted in Kawasaki, where a VLSI development center has been built.

In January 1986, a Toshiba R&D scientist, Dr. Yoshio Nishi, undertook the direction of Hewlett-Packard's VLSI Research Center in Palo Alto, California. This assignment is part of a continuing program between the two companies, which have exchanged about six researchers over the past five years. Dataquest believes that this assignment not only will help Hewlett-Packard to design 1Mb DRAMs into its new computer products, but will also give Toshiba valuable computer technology and contacts with IC researchers at Stanford University and Hewlett-Packard.

Employees

Toshiba employs approximately 121,000 people worldwide.

SEMICONDUCTOR PRODUCTS AND TECHNOLOGIES

Toshiba supplies a broad range of semiconductors, including bipolar digital, MOS, and linear ICs; discretes; and optoelectronics. The Company's predominant technology is MOS, particularly CMOS, an area in which it is the world leader. Toshiba's MOS revenue by function consists of the following:

- Memory products—41 percent
- Logic devices—42 percent
- Microdevices—17 percent

Toshiba was the first company to sample 1Mb DRAMs, beginning in February 1985. Volume production began in the third quarter of 1985. The Company is currently producing more than 2 million units a month, and plans to increase production as the 1Mb DRAM market develops. Toshiba was the first to develop a prototype 4Mb DRAM.

Toshiba Corporation

At the 1987 ISSCC, Toshiba announced several new developments, including the following:

- A 7.4ns CMOS 16x16 multiplier using 0.6-micron technology; typical power dissipation is 400mW at 10-MHz operation
- A 120ns 4Mb CMOS EPROM using 0.8-micron N-well double poly technology
- A line-address CCD image sensor for portable video camera use
- A 64K GaAs gate array (part of the National Research and Development Program on Scientific Computing Systems, a MITI-sponsored program)
- A CMOS digital signal processor for Japanese word recognition; on a 31-word vocabulary, recognition accuracy is 93 percent and response time is 0.3 seconds
- A pair of CMOS chips for high picture quality and fine color-tuning of digital televisions
- A 25ns 1Mb CMOS SRAM using a 0.8-micron double poly, double metal process
- A 60ns 4Mb CMOS DRAM with built-in self-test function enabling automatic simultaneous testing of all chips on a computer board

Recent new product technology announcements by Toshiba include the following:

- Toshiba has developed a set of dedicated LSIs for voice recognition. The set consists of an analog signal processor, a digital signal processor, and a system control LSI, and is capable of reorganizing 13 words with 95 percent accuracy.
- Toshiba plans to introduce a 4Mb DRAM, a 4Mb EPROM, and a 1Mb SRAM in 1988. Minimum line widths will be 0.8 to 0.9 micron for all three devices.
- Toshiba has developed a series of BICMOS standard logic ICs with low current (15mA at 20 MHz) and 3ns propagation delay time.
- Toshiba has developed a gallium arsenide multiplexer that is capable of processing data at 2 gigabits per second. The logic IC integrates 500 to 700 elements. The goal is to commercialize the device for use in next-generation optical communication systems.
- Toshiba has developed a 4Mb CMOS mask ROM with 250ns access time, mounted in a 32-pin package.

Toshiba Corporation

- Toshiba has developed six series of high-speed rectifiers that can be used for switching frequencies of up to 500 KHz. Reverse recovery time for the devices is 35ns.

- Toshiba has successfully manufactured a synchrotron radiation stepper on an experimental basis. The stepper has achieved 0.3-micron alignment accuracy.

Since 1984, Toshiba has been operating an IC assembly and test operation in Braunschweig, West Germany. Main products from this factory are 64K dynamic RAMs, 16K static RAMs, 64K static RAMs, and 256K dynamic RAMs. In addition, Toshiba opened an LSI design center in Neuss, West Germany, which has a satellite design link with Toshiba's Japanese facilities. This design center was established to serve the European customers for gate arrays, macrocells, and other custom and semicustom LSIs. Toshiba also opened a design center in the United Kingdom in 1986.

In the first half of 1987, Toshiba completed the Semiconductor System Technology Center in the Technopia Bloc in Kawasaki, Kanagawa Prefecture. The center will become the nucleus of the Company's 10 LSI design centers at home and abroad. The facility currently houses 1,800 staff members.

Semiconductor Agreements

From 1984 to the present, Toshiba has been involved in numerous licensing agreements and joint ventures, as discussed in the following paragraphs.

1987 Agreements

SDA Systems. SDA Systems and Toshiba signed a five-year contract to jointly develop CAD software for LSI development. Toshiba agreed to provide its design technology, and SDA agreed to offer its software know-how.

1986 Agreements

Motorola. Toshiba agreed to provide CMOS memory process technology in exchange for Motorola's 16-bit MPU technology. Toshiba also agreed to produce semiconductors based on Motorola's specifications and supply them to Motorola on an OEM basis. In August 1986, Toshiba began supplying 256K DRAM wafers to Motorola for assembly and sale in the United States.

In December 1986, the two companies formed a joint venture to develop, produce, and sell memories and MPUs. The 50/50 venture was established in Izumi City, where Motorola owns a 60,000-square-meter facility.

Toshiba Corporation

Zilog. Toshiba signed a technology exchange with Zilog of the United States, whereby Toshiba agreed to second-source Zilog's Z80 and Z8000 microprocessors. Additionally, Toshiba agreed to design CMOS versions of these microprocessors for Zilog.

LSI Logic. Toshiba agreed to support LSI Logic's Japanese subsidiary as a second source in gate arrays. In addition, the two companies agreed to jointly promote public relations activities and hold technological seminars. Toshiba agreed to support sales in Japan of LSI's CAD system, the LDS.

Siemens/General Electric. Toshiba entered a five-year agreement with General Electric and Siemens for joint development of a standard cell library using 1.5- to 1.2-micron CMOS technology.

Laser Path. Toshiba and Laser Path signed a joint development, fabrication, and marketing agreement covering Laser Path's gate arrays.

Tokuda Works. Toshiba and Tokuda Works announced a jointly developed, fully automated reactive etching system (the HIRRIE-500) that can handle ultranarrow geometries of less than 0.5 microns. The new etcher can process 8- to 10-inch wafers at a rate of 20 wafers per hour.

1985 Agreements

Olivetti. Toshiba bought 20 percent of Olivetti Japan to become a strategic supplier to Olivetti.

Siemens. Toshiba signed a seven-year agreement with Siemens that includes technology sharing and joint development of new devices. Siemens agreed to second-source Toshiba's CMOS 1Mb DRAM.

Hewlett-Packard. Dr. Yoshio Nishi, manager of Toshiba's 1Mb DRAM team, was assigned to head HP's VLSI Research Center for three years.

Intel. Toshiba signed a contract with Intel to manufacture and market two interface ICs for Intel's MultibusII.

Zilog. Toshiba and Zilog signed a sales contract for the CP/M 8000 operating system (OS) and Z80 MPU. Toshiba agreed to market the OS with a C compiler.

LSI Logic. Toshiba formed a joint venture with LSI Logic to design 20,000+ gate arrays using a 1.5-micron process. The project is referred to as "Sea of Gates."

Pohang. Pohang Jonghup Steel and Toshiba formed a major technology transfer, which was the first with a South Korean Company. The terms were undisclosed.

SGS. Toshiba entered into a technical assistance agreement with SGS of Italy for the joint development of ultrahigh-speed CMOS logic. Previously, an agreement was reached whereby Toshiba would supply SGS-Ates with 16K CMOS static RAM technology. In return, Toshiba could use SGS-Ates' European semiconductor sales network.

VISA International. Toshiba and VISA agreed to jointly develop a multipurpose IC card (Super Smart Card) for sale in 1987.

Sun Microsystems. Sun agreed to supply Toshiba $35 million in CAD workstations.

Brooktree. Toshiba licensed Brooktree's digital/analog converters. The Company planned to use Brooktree's chip architecture to design high-resolution D/A converters for consumer digital audio uses.

1984 Agreements

Zilog. Toshiba agreed to supply Zilog with CMOS 8-bit MPUs on an OEM basis.

KEC. Toshiba signed a five-year technical assistance agreement with Korean Electronics Company (KEC) under which it agreed to supply KEC with technical documents on linear IC design and production, provide consulting services to KEC, and help train KEC engineers.

NONSEMICONDUCTOR PRODUCTS

Other Electronic Components

Other products in the electronic components sector include electron tubes, CRTs, magnetron tubes, and printed circuit boards.

Consumer Products

In fiscal 1987, sales in the consumer products sector decreased 10 percent from fiscal 1986. This sector accounted for ¥941 billion, or 28 percent of Toshiba's total sales. Products in this sector include video equipment, audio equipment, household appliances, and lighting equipment.

Highlights in consumer products during fiscal 1987 include the following:

- Production of VCRs at the Toshiba America television plant in Tennessee began.
- Importation of overseas consumer products for resale in Japan under the Toshiba label began.

Toshiba Corporation

Heavy Electrical Apparatus

During fiscal 1987, sales in the heavy electrical apparatus sector was flat. This sector accounts for 26 percent of Toshiba's total sales. Products in this sector include power plant systems, industrial electric apparatus, transportation equipment, measuring instruments, and factory automation equipment.

Industrial Electronics

Sales in the industrial electronics business sector is reported with the electronic components sector sales. In fiscal 1987, these two sectors combined accounted for 36 percent of Toshiba's total sales. Fiscal 1987 sales represented a 5 percent increase over fiscal 1986 sales. Products in the industrial electronics sector include office automation equipment, medical equipment, telecommunications equipment, airport equipment, aerospace equipment, and labor-saving automation equipment.

Fiscal 1987 highlights for the industrial electronics sector include the following:

- Production of laptop computers in the United States began.
- A major order was received from Tokyo University for a local area network (LAN) system that will incorporate 600 computer terminals of 70 different types into a signal network.

Materials, Machinery, and Other Products

Fiscal 1987 sales in the materials, machinery, and other products sector decreased 6 percent from fiscal 1986. This sector accounts for only 10 percent of Toshiba's total sales. Products in this sector include steel tubing, alloys, ceramics, optical equipment, chemical materials, semiconductor manufacturing equipment, prefabricated housing, and insulating materials.

Fiscal 1987 highlights for materials, machinery, and other products include new joint venture company, Akashi Beam Technology Corporation, which was established with Akashi Seisakusho Ltd., a major manufacturer of electronic microscopes.

Toshiba Corporation

Toshiba Corporation
1-6 Uchinisaiwai-cho 1-chome
Chiyoda-Ku, Tokyo 100, Japan
Telephone: 03-501-5411 Telex: J22587
(Billions of Yen except Per Share Data)

Balance Sheet (March 31)

	1982	1983	1984	1985	1986
Working Capital	¥ 95	¥ 132	¥ 116	¥ 186	¥ 102
Long-Term Debt	¥ 242	¥ 247	¥ 339	¥ 457	¥ 469
Shareholders' Equity	¥ 400	¥ 422	¥ 465	¥ 548	¥ 567
After-Tax Return on Average Equity (%)	12.9	9.2	13.3	17.0	10.6

Operating Performance (Fiscal Year Ending March 31)

	1982	1983	1984	1985	1986
Revenue	¥ 2,344	¥ 2,401	¥ 2,707	¥ 3,343	¥ 3,373
Japanese Revenue	¥ 1,804	¥ 1,787	¥ 1,968	¥ 2,297	¥ 2,319
Non-Japanese Revenue	¥ 630	¥ 614	¥ 739	¥ 1,046	¥ 1,054
Cost of Revenue	¥ 1,605	¥ 1,715	¥ 1,931	¥ 2,389	¥ 2,444
R&D Expense	¥ 90	¥ 119	¥ 141	¥ 175	¥ 190
SG&A Expense	¥ 528	¥ 587	¥ 651	¥ 770	¥ 807
Pretax Income	¥ 119	¥ 107	¥ 135	¥ 186	¥ 131
Pretax Margin (%)	4.9	4.5	5.0	5.6	3.9
Effective Tax Rate (%)	62.4	58.3	56.3	53.8	54.1
Net Income	¥ 44	¥ 38	¥ 59	¥ 86	¥ 59
Average Shares Outstanding (Millions)	2,348	2,478	2,559	2,652	2,674
Per Share					
Earnings	¥ 17.9	¥ 14.8	¥ 22.5	¥ 29.6	¥ 19.2
Dividends	¥ 6.7	¥ 6.7	¥ 7.3	¥ 8.0	¥ 8.0
Book Value	¥170.36	¥170.30	¥181.71	¥206.64	¥211.88
Price Range	N/A	N/A	N/A	N/A	N/A
Total Employees	103,000	103,000	105,000	114,000	120,000
Capital Expenditure	¥ 131	¥ 131	¥ 171	¥ 274	¥ 262
Exchange Rate (Yen per US$)	229	249	236	245	221

N/A = Not Available

Source: Toshiba Annual Reports
Dataquest
August 1987

Toshiba Corporation

Toshiba Corporation
1-6 Uchinisaiwai-cho 1-chome
Chiyoda-Ku, Tokyo 100, Japan
Telephone: 03-501-5411 Telex: J22587
(Millions of Dollars except Per Share Data)

Balance Sheet (March 31)

	1982	1983	1984	1985	1986
Working Capital	$ 415	$ 530	$ 492	$ 759	$ 462
Long-Term Debt	$ 1,057	$ 992	$ 1,436	$ 1,865	$ 2,122
Shareholders' Equity	$ 1,747	$ 1,695	$ 1,970	$ 2,237	$ 2,566
After-Tax Return on Average Equity (%)	12.9	9.2	12.7	15.7	10.5

Operating Performance (Fiscal Year Ending March 31)

	1982	1983	1984	1985	1986
Revenue	$10,236	$ 9,643	$11,470	$13,645	$15,262
Japanese Revenue	$ 7,878	$ 7,177	$ 8,339	$ 9,376	$10,493
Non-Japanese Revenue	$ 2,751	$ 2,466	$ 3,131	$ 4,269	$ 4,769
Cost of Revenue	$ 7,009	$ 6,888	$ 8,182	$ 9,751	$11,059
R&D Expense	$ 393	$ 478	$ 597	$ 714	$ 860
SG&A Expense	$ 2,306	$ 2,357	$ 2,758	$ 3,143	$ 3,652
Pretax Income	$ 520	$ 430	$ 572	$ 759	$ 593
Pretax Margin (%)	4.8	4.0	4.8	5.4	3.7
Effective Tax Rate (%)	62.4	58.3	56.3	53.8	54.1
Net Income	$ 192	$ 153	$ 250	$ 351	$ 267
Average Shares Outstanding (Millions)	2,348	2,478	2,559	2,652	2,674
Per Share					
Earnings	$ 0.08	$ 0.06	$ 0.10	$ 0.12	$ 0.09
Dividends	$ 0.03	$ 0.03	$ 0.03	$ 0.03	$ 0.04
Book Value	$ 0.74	$ 0.68	$ 0.77	$ 0.84	$ 0.96
Price Range	N/A	N/A	N/A	N/A	N/A
Total Employees	103,000	103,000	105,000	114,000	120,000
Capital Expenditures	$ 572	$ 526	$ 725	$ 1,118	$ 1,186
Exchange Rate (Yen per US$)	229	249	236	245	221

N/A = Not Available

Source: Toshiba Annual Reports
Dataquest
August 1987

Toshiba Corporation

THE COMPANY

Background

Toshiba Corporation was founded as Tanaka Seizo-sho in 1875 and was renamed Shibaura Engineering Works in 1893. In 1939, the Company merged with Tokyo Electrical Company (founded in 1890 as Hakunetsu-sha) and became Tokyo Shibaura Electric Co., Ltd. In 1978, the Company's English name was changed to Toshiba Corporation.

Toshiba is one of two leaders of the Toshiba-IHI Group; the other is Ishikawajima-Harima Heavy Industries (IHI). These parent companies have close capital and business connections. Their subsidiaries are engaged in electrical and electronics products, construction, trading and finance, and shipbuilding.

Toshiba has developed the concept of electronics and energy (E&E) as its corporate hallmark. In addition to being a leader in the electronics field, the Company holds 40 percent of the Japanese thermal power plant market and 30 percent of Japan's hydroelectric plant market. Toshiba hopes to integrate E&E by synergistically adopting new technologies, for example, the increasing use of electronics in color televisions, VCRs, and refrigerators that will lead to more power-efficient products that consume less energy. As a complement to E&E, the Company has implemented a company-wide program called "Project I"; the "I" stands for the three central concepts of information, integration, and intelligence.

Toshiba is targeting AI technologies, next-generation computers, and software as areas of especially high growth.

Highlights

Company highlights include the following:

- Toshiba reported revenue of ¥3,373 billion for fiscal 1986, up slightly from 1985.
- Toshiba is the third-largest electronics manufacturer in Japan (after Matsushita and Hitachi) and the tenth largest worldwide.
- In 1986, Toshiba became the third-largest semiconductor supplier in the world with semiconductor revenue of $2,261 million.
- In 1986, Toshiba became the second-largest semiconductor supplier in Japan with sales of $1,572 million.
- Toshiba continues to make substantial investments in semiconductor capital and research and development.

Toshiba Corporation

- Toshiba has had many firsts in its history, including the development of Japan's first radar system in 1942, the production of Japan's first digital computer in 1954, the manufacturing of Japan's first transistor radio in 1957, and the first transistorized television set and first microwave oven in 1960.

- In 1978, Toshiba invented electron-beam lithography to produce LSI ICs. In the 1980s, Toshiba developed the first GaAs gate-array LSI, the first commercial 1Mb DRAM, and the first prototype 4Mb DRAM.

Investment in the Company

The major shareholders of Toshiba are listed in Table 1.

Table 1

Toshiba Corporation
MAJOR SHAREHOLDERS

Shareholders	Percent of Shares
Dai-ichi Mutual Life Insurance Company	4.7%
Nippon Life Insurance Company	3.9%
Mitsui Bank, Limited	3.5%
Mitsui Mutual Life Insurance Company	2.4%
Nippon Fire & Marine Insurance Company, Limited	2.2%
Mitsui Trust & Banking Co., Ltd.	2.0%
Long-Term Credit Bank of Japan, Limited	2.0%
General Electric Company (United States)	2.0%
Toshiba Employees' Shareholding Association	1.8%
Tokai Bank, Ltd.	1.8%

Toshiba is listed on three Japanese stock exchanges, as well as on the Amsterdam, Basle, Dusseldorf, Frankfurt, Geneva, London, Luxembourg, Paris, and Zurich exchanges. Major short- and long-term borrowings are from Mitsui Bank, Tokai Bank, and Dai-Ichi Kangyo Bank.

Source: Toshiba Corporation
Annual Reports

Toshiba Corporation

Operations

Toshiba reported revenue of ¥3,373 billion for the year ended March 31, 1986, a slight increase over the previous year. Earnings declined for the first time in three years--31 percent from the previous year to ¥59 billion. The Company attributed the increase in revenue to a substantial increase in sales of some electronic products and systems, including computers, office automation equipment, medical equipment, VCRs, and color televisions. The decline in earnings was due to the decreased demand for semiconductors and large-scale power plant systems and the appreciation of the yen against the dollar in the second half of 1985.

Toshiba's business operations are divided into the following five sectors:

- Electronic components
- Consumer products
- Heavy electrical apparatus
- Industrial electronics
- Materials, machinery, and other products

Each sector is led by a sector chief, who monitors business performance.

Revenue by product area is shown in Table 2. (For purposes of public financial reporting, the Company combines the industrial electronics and electronic components sectors.)

International Activities

Toshiba's overseas sales increased about 1 percent during fiscal 1986 to ¥1,054 billion, representing 31 percent of the Company's revenue. The years 1985 and 1986 presented international challenges for Toshiba with the appreciation of the yen and the increasing trade friction. Toshiba has taken the following measures for its long-term growth:

- Expanded offshore production
- Entered into joint ventures for overseas production
- Entered into international cooperative programs

The Company also plans to double imports within three years by importing approximately ¥140 billion of foreign products by 1987.

Toshiba Corporation

Table 2

Toshiba Corporation
REVENUE BY PRODUCT AREA
(Billions of Yen)

	1982	1983	1984	1985	1986
Consumer Products	¥ 712	¥ 715	¥ 790	¥ 904	¥1,044
Heavy Electrical Apparatus	716	689	724	965	866
Industrial Electronics and Electronic Components	631	725	907	1,151	1,128
Material, Machinery, and Products	285	272	286	323	335
Total	¥2,344	¥2,401	¥2,707	¥3,343	¥3,373
Exchange Rate (Yen per US$)	229	249	236	245	221

Source: Toshiba Annual Reports
Dataquest
August 1987

Table 3 shows Toshiba's estimated 1986 semiconductor revenue by geographic region. Dataquest estimates that approximately 30 percent of Toshiba's semiconductor sales are overseas, an increase of 5 percent from 1985. Revenue in the United States was $294 million, or about 13 percent; $95 million, or 4 percent, in Europe; and $300 million, or 13 percent, in the Rest of World countries. The remaining 70 percent of semiconductor revenue originates in Japan.

Toshiba Corporation

Table 3

Toshiba Corporation
ESTIMATED 1986 SEMICONDUCTOR REVENUE BY GEOGRAPHIC REGION
(Millions of Dollars)

	U.S.	Japan	Europe	ROW	Total
Total Semiconductor	$294	$1,572	$95	$300	$2,261
Integrated Circuit	$252	$1,079	$77	$197	$1,605
Bipolar Digital	0	129	0	0	$ 129
MOS	242	642	75	147	$1,106
Linear	10	308	2	50	$ 370
Discrete	32	428	12	77	$ 549
Optoelectronic	10	65	6	26	$ 107

Source: Dataquest
August 1987

Facilities

Toshiba's semiconductor manufacturing facilities are listed in Table 4.

Marketing and Sales

Toshiba is the third-largest Japanese semiconductor supplier, after NEC and Hitachi, with estimated 1986 semiconductor revenue of $2,261 million, a 54 percent increase from 1985.

- Toshiba was the largest supplier of CMOS devices in 1986, with sales estimated at $730 million.
- Toshiba's MOS sales, which include NMOS and CMOS processes, were approximately $1,106 million.
- MOS logic sales were an estimated $467 million, an increase of 26 percent.
- MOS memory sales were approximately $452 million, an increase of 52 percent after a decline of 25 percent in 1985.
- MOS microdevice sales were an estimated $187 million, an increase of 171 percent from 1985.

Toshiba Corporation

Table 4

Toshiba Corporation
SEMICONDUCTOR PLANT LOCATIONS

Location	Floor Space (square meters)	Functions/Products
Buzen Toshiba Electronics	N/A	Fab, Assembly, Test--Optoelectronics
Hamaoka Denshi Buhin	N/A	Assembly
Himeji Factory	242,413	Fab, Assembly,Test--Discretes
Iwate Toshiba Electronics	23,000	Assembly--Linear, Discretes
Iwate Toshiba Electronics Kitakami	40,000	Fab, Assembly, Test--MOS
Kitakyushu Factory	54,559	Fab, Assembly, Test--Linear
Kitsuki Factory	8,300	Assembly--Bipolar, MOS
Micro Technology Laboratory	N/A	Fab, Test--Bipolar, MOS
Micro-Electronics Center	68,334	Fab, Test--Bipolar, MOS
Nohgata Toshiba Electronics	5,000	Fab, Assembly, Test
Oita Factory	67,755	Fab, Assembly, Test
Toshiba Components	N/A	Assembly--Discretes
Kaga Toshiba Electronics	N/A	Assembly, Test--Discretes
Korea Electronics*	N/A	Assembly, Test--ICs, Discretes, Opto
Toshiba Electronics Malaysia	N/A	Assembly, Test--ICs, Discretes
Industria Mexicana Toshiba	N/A	Assembly, Test--ICs, Discretes
Toshiba Semiconductor (USA)	N/A	Assembly--MOS Memory
Toshiba Semiconductor GmbH	3,000	Assembly, Test--MOS

*Joint Venture
N/A = Not Available

Source: Dataquest
August 1987

Toshiba Corporation

Table 5 shows Toshiba's semiconductor revenue.

Table 5

Toshiba Corporation
WORLDWIDE SEMICONDUCTOR REVENUE
(Millions of Dollars)

	1982	1983	1984	1985	1986
Total Semiconductor	$715	$983	$1,561	$1,468	$2,261
Total Integrated Circuit	$429	$613	$1,035	$1,004	$1,605
Bipolar Digital (Technology)	$ 16	$ 21	$ 37	$ 33	$ 129
TTL	-	-	30	-	-
ECL	-	-	6	-	-
Other Bipolar Digital	-	-	1	33	129
Bipolar Digital (Function)	$ 16	$ 21	$ 37	$ 33	$ 129
Bipolar Digital Memory	-	-	-	-	-
Bipolar Digital Logic	16	21	37	33	129
MOS (Technology)	$312	$458	$ 770	$ 736	$1,106
NMOS	101	165	230	181	376
PMOS	24	21	2	1	-
CMOS	187	272	538	554	730
MOS (Function)	$312	$458	$ 770	$ 736	$1,106
MOS Memory	142	221	396	297	452
MOS Micro Devices	30	45	70	69	187
MOS Logic	140	192	304	370	467
Linear	$101	$134	$ 228	$ 235	$ 370
Total Discrete	$217	$272	$ 418	$ 368	$ 549
Transistor	$108	$133	$ 200	$ 173	$ 322
Small Signal Transistor	-	-	87	70	138
Power Transistor	-	-	113	103	184
Diode	$ 80	$106	$ 163	$ 142	$ 180
Small Signal Diode	-	-	90	50	63
Power Diode	-	-	53	84	108
Zener Diode	-	-	20	8	9
Thyristor	16	19	30	51	45
Other Discrete	13	14	25	2	2
Total Optoelectronic	$ 69	$ 98	$ 108	$ 96	$ 107
LED Lamps	-	-	25	18	26
LED Displays	-	-	10	21	23
Optical Couplers	-	-	-	35	36
Other Optoelectronics	-	-	73	22	22
Exchange Rate (Yen/US$)	248	235	237	238	167

Source: Dataquest
August 1987

Toshiba Corporation

Table 6 shows Toshiba's worldwide semiconductor ranking. In addition to MOS devices, Toshiba is a leader in linear, discrete, and optoelectronic devices. The Company also showed an astounding increase in bipolar logic revenue, although it is not a leader in this area.

Table 6

Toshiba Corporation
WORLDWIDE RANKING BY SEMICONDUCTOR MARKETS
(Millions of Dollars)

	1985 Rank	1986 Rank	1986 Revenue	Revenue % Change 1985-1986	Industry % Change 1985-1986
Total Semiconductor	5	3	$2,261	54%	25%
Total IC	6	4	1,605	60%	24%
Bipolar Digital	16	12	129	291%	14%
MOS Digital	4	3	1,106	50%	25%
Linear	5	3	370	57%	30%
Total Discrete	3	2	549	49%	25%
Total Optoelectronics	3	5	107	12%	36%

Source: Dataquest
August 1987

Distribution

Toshiba's major distributors in Japan are Toshiba Electron Device, Midoriya Electric, Tokyo Shuma, and Kenden Kogyo.

In the United States, Toshiba's products are sold by Toshiba America Ltd., headquartered in Tustin, California. Toshiba's products are also available through several major U.S. distributors.

Toshiba has sales offices throughout Europe and also sells through European distributors.

Capital and R&D Spending

Capital investments for fiscal 1986, which totaled ¥262 billion, were down 4 percent from 1985 due to the postponement of planned expansions of semiconductor production facilities. Research and development investments remained at the same level.

Toshiba Corporation

Table 7 shows Toshiba's capital and R&D spending for 1986.

Table 7

Toshiba Corporation
CAPITAL AND R&D SPENDING AS A PERCENT OF SALES
(Billions of Yen)

	1982	1983	1984	1985	1986
Revenue	¥2,344	¥2,401	¥2,707	¥3,343	¥3,373
Capital Spending	¥ 131	¥ 131	¥ 171	¥ 274	¥ 262
Percent of Revenue	5.5%	5.5%	6.3%	8.2%	7.8%
R&D Spending	¥ 90	¥ 119	¥ 141	¥ 175	¥ 190
Percent of Sales	3.8%	5.0%	5.2%	5.2%	5.6%
Combined Capital and R&D Spending	¥ 221	¥ 250	¥ 312	¥ 449	¥ 452
Percent of Revenue	9.4%	10.4%	11.5%	13.4%	13.4%
Percent Increase		13.0%	25.0%	42.0%	0.7%

Source: Toshiba Corporation
Annual Reports
Dataquest
August 1987

Table 8 shows 1986 capital and R&D spending in U.S. dollars.

Table 8

Toshiba Corporation
CAPITAL AND R&D SPENDING IN U.S. DOLLARS
(Millions of Dollars)

	1982	1983	1984	1985	1986
Revenue	$10,236	$9,643	$11,470	$13,645	$15,262
Capital Expenditures	$ 572	$ 526	$ 725	$ 1,118	$ 1,186
R&D Expenditures	$ 393	$ 478	$ 597	$ 714	$ 860
Exchange Rate (Yen per US$)	229	249	236	245	221

Source: Toshiba Annual Reports
Dataquest
August 1987

Toshiba Corporation

Table 9 shows Toshiba's semiconductor capital spending.

Table 9

Toshiba Corporation
SEMICONDUCTOR CAPITAL SPENDING BY CALENDAR YEAR
(Millions of Dollars)

	1982	1983	1984	1985	1986
Semiconductor Revenue	$715	$983	$1,561	$1,468	$2,261
Semiconductor Capital Spending	$113	$366	$ 574	$ 517	$ 389
Percent of Semiconductor Revenue	16%	37%	37%	35%	17%

Source: Dataquest
August 1987

Research and Development

Toshiba believes that technology is the driving force of corporate development, and thus the Company has been intensifying its R&D efforts. In fiscal 1986, 6 percent of sales--or ¥190 billion--was spent on R&D, compared with 4 percent of sales expended in fiscal 1982. R&D emphasis is on semiconductors, factory automation, and new materials.

Toshiba has an R&D center located in Kawasaki, Kanagawa Prefecture, and has seven development laboratories--five in Kawasaki; one in Otawara, Tochigi Prefecture; and one in Yokohama, Kanagawa Prefecture. Semiconductor R&D is conducted at the Kawasaki site, where a VLSI development center has been built.

In January 1986, a Toshiba R&D scientist, Dr. Yoshio Nishi, undertook the direction of Hewlett-Packard's VLSI Research Center in Palo Alto, California. This assignment is part of a continuing program between the two companies, which have exchanged about six researchers over the past five years. Dataquest believes that this assignment not only will help Hewlett-Packard to design 1Mb DRAMs into its new computer products, but will also give Toshiba valuable computer technology and contacts with IC researchers at Stanford University and Hewlett-Packard.

Toshiba Corporation

Employees

Toshiba employs approximately 120,000 people worldwide.

SEMICONDUCTOR PRODUCTS AND TECHNOLOGIES

Toshiba supplies a broad range of semiconductors, including bipolar digital, MOS, and linear ICs; discretes; and optoelectronics. The Company's predominant technology is MOS, particularly CMOS, an area in which it is the world leader. Toshiba's MOS revenue by function consists of the following:

- Memory products--41 percent
- Logic devices--42 percent
- Microdevices--17 percent

Toshiba was the first company to sample 1Mb DRAMs, beginning in February 1985. Volume production began in the third quarter of 1985. The Company is currently producing about 300,000 units a month, with plans to increase production as the 1Mb DRAM market develops. Toshiba was the first to develop a prototype 4Mb DRAM.

At the 1986 ISSCC, Toshiba announced several new developments, including the following:

- A 70ns 2Mb mask ROM with a through-hole programmed memory cell
- A 20-MHz 32-bit pipelined CMOS image processor
- An 18ns 8Kx9 NMOS SRAM in 1.5 micron double poly/double aluminum NMOS
- A 1Mb virtual static RAM (VSRAM) employing dynamic RAM cells
- A standby 1Mbx1 and 256Kx1 CMOS DRAM
- An experimental 4Mb CMOS DRAM, 4Mbx1 and 1Mbx4

Recent new product and technology announcements by Toshiba include the following:

- Toshiba has succeeded in drawing 0.35 micron wide lines on silicon using an excimer laser.
- Toshiba has developed an ultrasmall semiconductor laser compatible with standard models from Sharp and Sony.
- The Company has developed two models of infrared LEDs for auto-focusing cameras.

Toshiba Corporation

- Toshiba is now marketing 1Mb DRAMs in SOJ (small outline J-lead) and PLCC (plastic leaded chip carrier) packages, in addition to the standard DIP.

- Toshiba has developed a new method of pulling gallium arsenide crystals, called Super MLEC. The new method uses a strong magnetic field and a fine ceramic melting pot.

- Toshiba has developed an ultrahigh-speed CMOS standard logic family with 3ns propagation delay time.

- Toshiba unveiled in May 1986 a series of original 4-bit CMOS microcontrollers with ROM and RAM and A-D converters.

- Toshiba has developed a CMOS standard cell series that is capable of including RAM and ROM.

- Toshiba has developed two models of high-withstand-voltage, high-current, bipolar MOSFETs.

Since 1984, Toshiba has been operating a new IC assembly and test operation in Braunschweig, West Germany. Main products from this factory are 64K dynamic RAMs, 16K static RAMs, 64K static RAMs, and 256K dynamic RAMs. In addition, Toshiba opened an LSI design center in Neuss, West Germany, which has a satellite design link with its Japanese facilities. This design center was established to serve the European customers for gate arrays, macrocells, and other custom and semicustom LSIs. Toshiba is also planning to open a design center in the United Kingdom in 1986.

In the first half of 1987, Toshiba completed the Semiconductor System Technology Center in the Technopia Bloc in Kawasaki, Kanagawa Prefecture. The center will become the nucleus of the Company's 10 LSI design centers at home and abroad. The facility currently houses 1,800 staff members.

Semiconductor Agreements

From 1984 to the present, Toshiba has been involved in numerous licensing agreements and joint ventures, as discussed in the following paragraphs.

1987 Agreements

SDA Systems - SDA Systems and Toshiba have signed a five-year contract to jointly develop CAD software for LSI development. Toshiba will provide its design technology and SDA will offer its software know-how.

Toshiba Corporation

1986 Agreements

Motorola - Toshiba agreed to provide CMOS memory process technology in exchange for Motorola's 16-bit MPU technology. Toshiba will also produce semiconductors based on Motorola's specifications and supply them to Motorola on an OEM basis. In August 1986, Toshiba began supplying 256K DRAM wafers to Motorola for assembly and sale in the United States.

In December 1986, the two companies formed a joint venture to develop, produce, and sell memories and MPUs. The 50/50 venture will be established in Izumi City, where Motorola owns a 60,000-square-meter facility.

Zilog - Toshiba signed a technology exchange with Zilog of the United States, whereby Toshiba will second-source Zilog's Z80 and Z8000 microprocessors. Additionally, Toshiba will design CMOS versions of these microprocessors for Zilog.

LSI Logic - Toshiba will support LSI Logic's Japanese subsidiary as a second source in gate arrays. In addition, the two companies will jointly promote PR activities and hold technological seminars. Toshiba will support sales in Japan of LSI's CAD system, the LDS.

Siemens/General Electric - Toshiba entered a five-year agreement with General Electric and Siemens for joint development of a standard cell library using 1.5- to 1.2-micron CMOS technology.

Laser Path - Toshiba and Laser Path signed a joint development, fabrication, and marketing agreement covering Laser Path's gate arrays.

Tokuda Works - Toshiba and Tokuda Works announced a jointly developed, fully automated reactive etching system (the HIRRIE-500) that can handle ultranarrow geometries of less than 0.5 microns. The new etcher can process 8- to 10-inch wafers at a rate of 20 wafers per hour.

1985 Agreements

Olivetti - Toshiba bought 20 percent of Olivetti Japan to become a strategic supplier to Olivetti.

Siemens - Toshiba signed a seven-year agreement with Siemens that includes technology sharing and joint development of new devices. Siemens will second-source Toshiba's CMOS 1Mb DRAM.

Hewlett-Packard - Dr. Yoshio Nishi, manager of Toshiba's 1Mb DRAM team, is assigned to head HP's VLSI Research Center for three years.

Intel - Toshiba has signed a contract with Intel to manufacture and market two interface ICs for Intel's MultibusII.

Toshiba Corporation

Zilog - Toshiba and Zilog signed a sales contract for the CP/M 8000 operating system (OS) and Z80 MPU. Toshiba will market the OS with a C compiler.

LSI Logic - Toshiba formed a joint venture with LSI Logic to design 20,000+ gate arrays using a 1.5-micron process. The project is referred to as "Sea of Gates."

Pohang - Pohang Jonghup Steel and Toshiba formed a major technology transfer, which is the first with a South Korean Company. The terms were undisclosed.

SGS - Toshiba entered into a technical assistance agreement with SGS of Italy for the joint development of ultrahigh-speed CMOS logic. Previously, an agreement was reached whereby Toshiba would supply SGS-Ates with 16K CMOS static RAM technology. In return, Toshiba could use SGS-Ates' European semiconductor sales network.

VISA International - Toshiba and VISA agreed to jointly develop a multipurpose IC card (Super Smart Card) for sale in 1987.

Sun Microsystems - Sun agreed to supply Toshiba $35 million in CAD workstations.

Brooktree - Toshiba licensed Brooktree's digital/analog converters. The Company will use Brooktree's chip architecture to design high-resolution D/A converters for consumer digital audio uses.

1984 Agreements

Zilog - Toshiba agreed to supply Zilog with CMOS 8-bit MPUs on an OEM basis.

KEC - Toshiba signed a five-year technical assistance agreement with Korean Electronics Company (KEC) under which it will supply KEC with technical documents on linear IC design and production, provide consulting services to KEC, and help train KEC engineers.

NONSEMICONDUCTOR PRODUCTS

Other Electronic Components

Other products in the electronic components sector include electron tubes, CRTs, magnetron tubes, and printed circuit boards.

Toshiba Corporation

Consumer Products

In fiscal 1986, revenue in the consumer products sector increased 15 percent over fiscal 1985. This sector accounted for ¥1,044 billion, or 31 percent of Toshiba's total sales. Products in this sector include video equipment, audio equipment, household appliances, and lighting equipment.

Highlights in consumer products during fiscal 1986 include the following:

- The expansion of compact disk player sales as a result of the introduction of inexpensive models
- The introduction of the Rupo series of portable Japanese word processors for home use

Heavy Electrical Apparatus

During fiscal 1986, revenue in the heavy electrical apparatus sector decreased 10 percent over fiscal 1985. This sector accounts for 26 percent of Toshiba's total sales. Products in this sector include power plant systems, industrial electric apparatus, transportation equipment, measuring instruments, and factory automation equipment.

Fiscal 1986 highlights for the heavy-duty electrical apparatus market include the completion of boiling water reactors for two of Tokyo Electric Power's electrical plants. Toshiba now has an installed base of 12 BWR plants generating a total of 9,473 megawatts of electricity.

Industrial Electronics

Revenue in the industrial electronics business sector is reported with the electronic components sector revenue. In fiscal 1986, these two sectors combined accounted for 33 percent of Toshiba's total sales. Fiscal 1986 sales represented a 2 percent decrease over fiscal 1985 sales. Products in the industrial electronics sector include office automation equipment, medical equipment, telecommunications equipment, airport equipment, aerospace equipment, and labor-saving automation equipment.

Fiscal 1986 highlights for the industrial electronics sector include the following:

- A 30 percent increase in sales of the Company's 32-bit distributed data processing computers, the DP9000 series.
- Development of a simplified computer language, "Super PIPS," in collaboration with Sord Computer Corporation.

Toshiba Corporation

Materials, Machinery, and Other Products

Fiscal 1986 revenue in the materials, machinery, and other products sector increased 4 percent over fiscal 1985. This sector accounts for only 10 percent of Toshiba's total sales. Products in this sector include steel tubing, alloys, ceramics, optical equipment, chemical materials, semiconductor manufacturing equipment, prefabricated housing, and insulating materials.

Fiscal 1986 highlights for materials, machinery, and other products include the following:

- Commencement of R&D on ceramic materials for a diesel engine component joint venture with Cummins Engine Company of the United States.

Toshiba Corporation

Toshiba Corporation
1-6 Uchinisaiwai-cho 1-chome
Chiyoda-Ku, Tokyo 100, Japan
Telephone: 03-501-5411 Telex: J22587
(Millions of Dollars Except Per Share Data)

Balance Sheet (March 31)

	1981	1982	1983	1984	1985
Working Capital	$ 278	$ 415	$ 530	$ 492	$ 759
Long-Term Debt	$ 1,167	$ 1,057	$ 992	$ 1,436	$ 1,865
Shareholders' Equity	$ 1,301	$ 1,747	$ 1,695	$ 1,970	$ 2,237
After-Tax Return on Average Equity (%)	19.4	12.9	9.2	12.7	15.7

Operating Performance (Fiscal Year Ending March 31)

	1981	1982	1983	1984	1985
Revenue	$10,167	$10,642	$10,040	$11,903	$14,110
Japanese Revenue	$ 7,829	$ 7,891	$ 7,574	$ 8,771	$ 9,841
Non-Japanese Revenue	$ 2,338	$ 2,751	$ 2,466	$ 3,132	$ 4,269
Cost of Revenue	$ 6,514	$ 7,009	$ 6,888	$ 8,182	$ 9,751
R&D Expense	$ 356	$ 393	$ 478	$ 597	$ 714
SG&A Expense	$ 2,069	$ 2,140	$ 2,177	$ 2,758	$ 3,143
Pretax Income	$ 569	$ 489	$ 406	$ 572	$ 759
Pretax Margin (%)	5.9	4.8	4.0	4.8	5.4
Effective Tax Rate (%)	59.6	62.4	58.3	56.3	53.8
Net Income	$ 227	$ 192	$ 153	$ 250	$ 351
Average Shares Outstanding (Millions)	2,226	2,348	2,478	2,559	2,652
Per Share					
Earnings	$ 0.10	$ 0.08	$ 0.06	$ 0.10	$ 0.12
Dividend	$ 0.03	$ 0.03	$ 0.03	$ 0.03	$ 0.03
Book Value	$ 0.58	$ 0.74	$ 0.68	$ 0.77	$ 0.84
Price Range	N/A	N/A	N/A	N/A	N/A
Total Employees	99,000	103,000	103,000	105,000	114,000
Capital Expenditures	$ 454	$ 611	$ 526	$ 780	$ 1,216
Exchange Rate (Yen per US$)	216	229	249	236	245

N/A = Not Available

Source: Toshiba Annual Reports
Dataquest
August 1986

Toshiba Corporation

Table 1

Toshiba Corporation
REVENUES BY PRODUCT AREA
(Billions of Yen)

	Fiscal Year Ending March 31				
	1981	1982	1983	1984	1985
Consumer Products	¥ 693	¥ 712	¥ 715	¥ 790	¥ 904
Heavy-Duty Electrical Apparatus	588	716	689	724	965
Electronic Components and Industrial Electronic Business	567	631	725	907	1,151
Other Products	252	285	272	286	323
Total Sales	¥2,100	¥2,344	¥2,401	¥2,707	¥3,343
Other Income	96	93	99	102	114
Total Revenues	¥2,196	¥2,437	¥2,500	¥2,809	¥3,457
Exchange Rate (Yen per US$)	216	229	249	236	245
Total Revenues (Millions of US$)	$10,167	$10,642	$10,040	$11,903	$14,110

Source: Toshiba Annual Reports
Dataquest
August 1986

Toshiba Corporation

Table 2

Toshiba Corporation
ESTIMATED SEMICONDUCTOR REVENUES
(Millions of Dollars)

	1978	1979	1980	1981	1982	1983	1984	1985
Total Semiconductor	401	442	629	774	715	983	1,561	1,468
Total Integrated Circuit	189	220	332	394	429	613	1,035	1,004
Bipolar Digital (Technology)	8	9	12	14	16	21	37	33
TTL	0	0	0	0	0	0	30	26
ECL	0	0	0	0	0	0	6	6
Other Bipolar Digital	0	0	0	0	0	0	1	1
Bipolar Digital (Function)	8	9	12	14	16	21	37	33
Bipolar Digital Memory	0	0	0	0	0	0	0	0
Bipolar Digital Logic	8	9	12	14	16	21	37	33
MOS (Technology)	88	135	219	250	312	458	770	736
NMOS	0	30	66	80	101	165	230	181
PMOS	0	15	18	20	24	21	2	1
CMOS	0	90	135	150	187	272	538	554
MOS (Function)	88	135	219	250	312	458	770	736
MOS Memory	0	50	75	80	142	221	396	297
MOS Micro Devices	0	0	0	8	30	45	70	69
MOS Logic	0	85	144	162	140	192	304	370
Linear	93	76	101	130	101	134	228	235
Total Discrete	192	187	241	304	217	272	418	368
Transistor	110	87	122	157	108	133	200	173
Small Signal Transistor	0	0	0	0	0	0	87	70
Power Transistor	0	0	0	0	0	0	113	103
Diode	62	65	88	112	80	106	163	142
Small Signal Diode	0	0	0	0	0	0	90	76
Power Diode	0	0	0	0	0	0	53	49
Zener Diode	0	0	0	0	0	0	20	17
Thyristor	14	17	19	21	16	19	30	29
Other Discrete	6	18	12	14	13	14	25	24
Total Optoelectronic	20	35	56	76	69	98	108	96
LED Lamps	0	0	0	0	0	0	25	20
LED Displays	0	0	0	0	0	0	10	10
Optical Couplers	0	0	0	0	0	0	0	1
Other Optoelectronics	0	0	0	0	0	0	73	65

Source: Dataquest
August 1986

Toshiba Corporation

Toshiba Corporation
1-6 Uchinisaiwai-cho 1-chome
Chiyoda-Ku, Tokyo 100, Japan
Telephone: 03-501-5411 Telex: J22587
(Billions of Yen Except Per Share Data)

Balance Sheet (March 31)

	1982	1983	1984	1985	1986
Working Capital	¥ 95	¥ 132	¥ 116	¥ 186	¥ 102
Long-Term Debt	¥ 242	¥ 247	¥ 339	¥ 457	¥ 469
Shareholders' Equity	¥ 400	¥ 422	¥ 465	¥ 548	¥ 567
After-Tax Return on Average Equity (%)	12.9	9.2	12.7	15.7	10.5

Operating Performance (Fiscal Year Ending March 31)

	1982	1983	1984	1985	1986
Revenue	¥ 2,437	¥ 2,500	¥ 2,809	¥ 3,457	¥ 3,496
Japanese Revenue	¥ 1,807	¥ 1,886	¥ 2,070	¥ 2,411	¥ 2,442
Non-Japanese Revenue	¥ 630	¥ 614	¥ 739	¥ 1,046	¥ 1,054
Cost of Revenue	¥ 1,605	¥ 1,715	¥ 1,931	¥ 2,389	¥ 2,444
R&D Expense	¥ 90	¥ 119	¥ 141	¥ 175	¥ 190
SG&A Expense	¥ 490	¥ 542	¥ 651	¥ 770	¥ 807
Pretax Income	¥ 112	¥ 101	¥ 135	¥ 186	¥ 131
Pretax Margin (%)	4.8	4.0	4.8	5.4	3.7
Effective Tax Rate (%)	62.4	58.3	56.3	53.8	54.1
Net Income	¥ 44	¥ 38	¥ 59	¥ 86	¥ 71
Average Shares Outstanding (Millions)	2,348	2,478	2,559	2,652	2,674
Per Share					
Earnings	¥ 18.9	¥ 15.5	¥ 22.5	¥ 29.6	¥ 19.2
Dividends	¥ 7.0	¥ 7.0	¥ 7.3	¥ 8.0	¥ 8.0
Book Value	¥170.36	¥170.30	¥181.71	¥206.64	¥211.88
Price Range	N/A	N/A	N/A	N/A	N/A
Total Employees	103,000	103,000	105,000	114,000	120,000
Capital Expenditure	¥ 140	¥ 131	¥ 184	¥ 298	¥ 288
Exchange Rate (Yen per US$)	229	249	236	245	221

N/A = Not Available

Source: Toshiba Annual Reports
Dataquest
November 1986

Toshiba Corporation

Toshiba Corporation
1-6 Uchinisaiwai-cho 1-chome
Chiyoda-Ku, Tokyo 100, Japan
Telephone: 03-501-5411 Telex: J22587
(Millions of Dollars Except Per Share Data)

Balance Sheet (March 31)

	1982	1983	1984	1985	1986
Working Capital	$ 415	$ 530	$ 492	$ 759	$ 462
Long-Term Debt	$ 1,057	$ 992	$ 1,436	$ 1,865	$ 2,122
Shareholders' Equity	$ 1,747	$ 1,695	$ 1,970	$ 2,237	$ 2,566
After-Tax Return on Average Equity (%)	12.9	9.2	12.7	15.7	10.5

Operating Performance (Fiscal Year Ending March 31)

	1982	1983	1984	1985	1986
Revenue	$10,642	$10,040	$11,903	$14,110	$15,819
Japanese Revenue	$ 7,891	$ 7,574	$ 8,771	$ 9,841	$11,050
Non-Japanese Revenue	$ 2,751	$ 2,466	$ 3,132	$ 4,269	$ 4,769
Cost of Revenue	$ 7,009	$ 6,888	$ 8,182	$ 9,751	$11,059
R&D Expense	$ 393	$ 478	$ 597	$ 714	$ 860
SG&A Expense	$ 2,140	$ 2,177	$ 2,758	$ 3,143	$ 3,652
Pretax Income	$ 489	$ 406	$ 572	$ 759	$ 593
Pretax Margin (%)	4.8	4.0	4.8	5.4	3.7
Effective Tax Rate (%)	62.4	58.3	56.3	53.8	54.1
Net Income	$ 192	$ 153	$ 250	$ 351	$ 321
Average Shares Outstanding (Millions)	2,348	2,478	2,559	2,652	2,674
Per Share					
Earnings	$ 0.08	$ 0.06	$ 0.10	$ 0.12	$ 0.09
Dividends	$ 0.03	$ 0.03	$ 0.03	$ 0.03	$ 0.04
Book Value	$ 0.74	$ 0.68	$ 0.77	$ 0.84	$ 0.96
Price Range	N/A	N/A	N/A	N/A	N/A
Total Employees	103,000	103,000	105,000	114,000	120,000
Capital Expenditures	$ 611	$ 526	$ 780	$ 1,216	$ 1,303
Exchange Rate (Yen per US$)	229	249	236	245	221

N/A = Not Available

Source: Toshiba Annual Reports
Dataquest
November 1986

Toshiba Corporation

THE COMPANY

Background

Toshiba Corporation was founded in 1875 by Hisashige Tanaka. Originally called Tanaka Seizo-sho, it was renamed Shibaura Engineering Works in 1893. In 1939, the Company merged with Tokyo Electrical Company (founded in 1890 as Hakunetsu-sha) and became Tokyo Shibaura Electric Co., Ltd. In 1978, the Company's English name was changed to Toshiba Corporation.

Originally a producer of telegraph apparatus, Toshiba has grown to become the third largest Japanese electrical equipment manufacturer (after Matsushita and Hitachi), and the tenth largest worldwide. Among Toshiba's many milestones are the following:

- Production of Japan's first vacuum cleaner--1931
- Development of Japan's first radar system--1942
- Production of Japan's first digital computer--1954
- Manufacture of Japan's first transistor radio--1957
- Creation of Japan's first transistorized television set and first microwave oven--1960
- Invention of electron-beam lithography to produce LSI ICs--1978
- Development of the world's first GaAs gate array LSI--1982
- Development of the world's first commercial 1Mb DRAM--1985
- Development of the world's first prototype 4Mb DRAM--1986

Company Organization

Toshiba is one of two leaders of the Toshiba-IHI Group; the other is Ishikawajima-Harima Heavy Industries (IHI). These parent companies have close capital and business connections. Their subsidiaries are engaged in electrical and electronics products, construction, trading, finance, machinery, metals, chemicals, ceramics and glass, real estate, and shipbuilding. Toshiba Corporation also has close financial ties with Mitsui Bank.

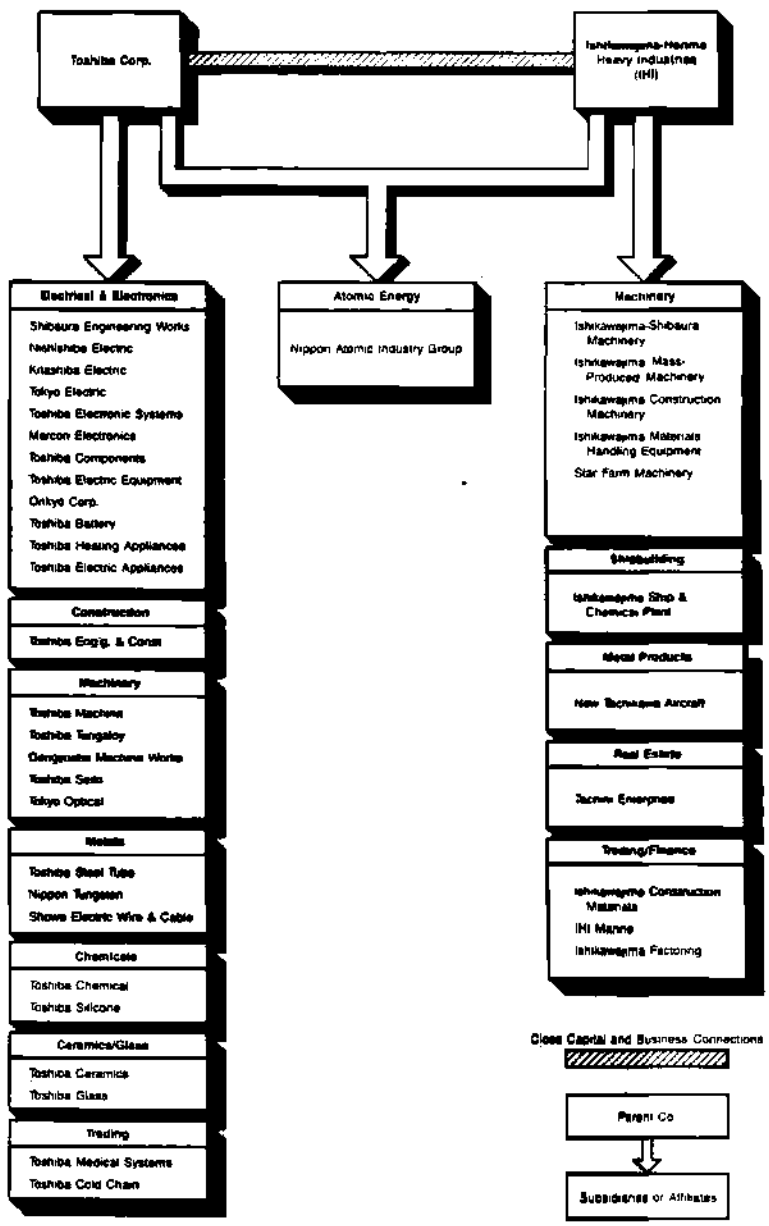
Toshiba employs 120,000 people under the leadership of its chairman, Shoichi Saba, and its president and chief executive officer, Sugiichiro Watari.

Toshiba Corporation

Figure 1 is a diagram of the Toshiba-IHI Group. Figure 2 is a diagram of Toshiba's company organization.

Figure 1

TOSHIBA-IHI GROUP

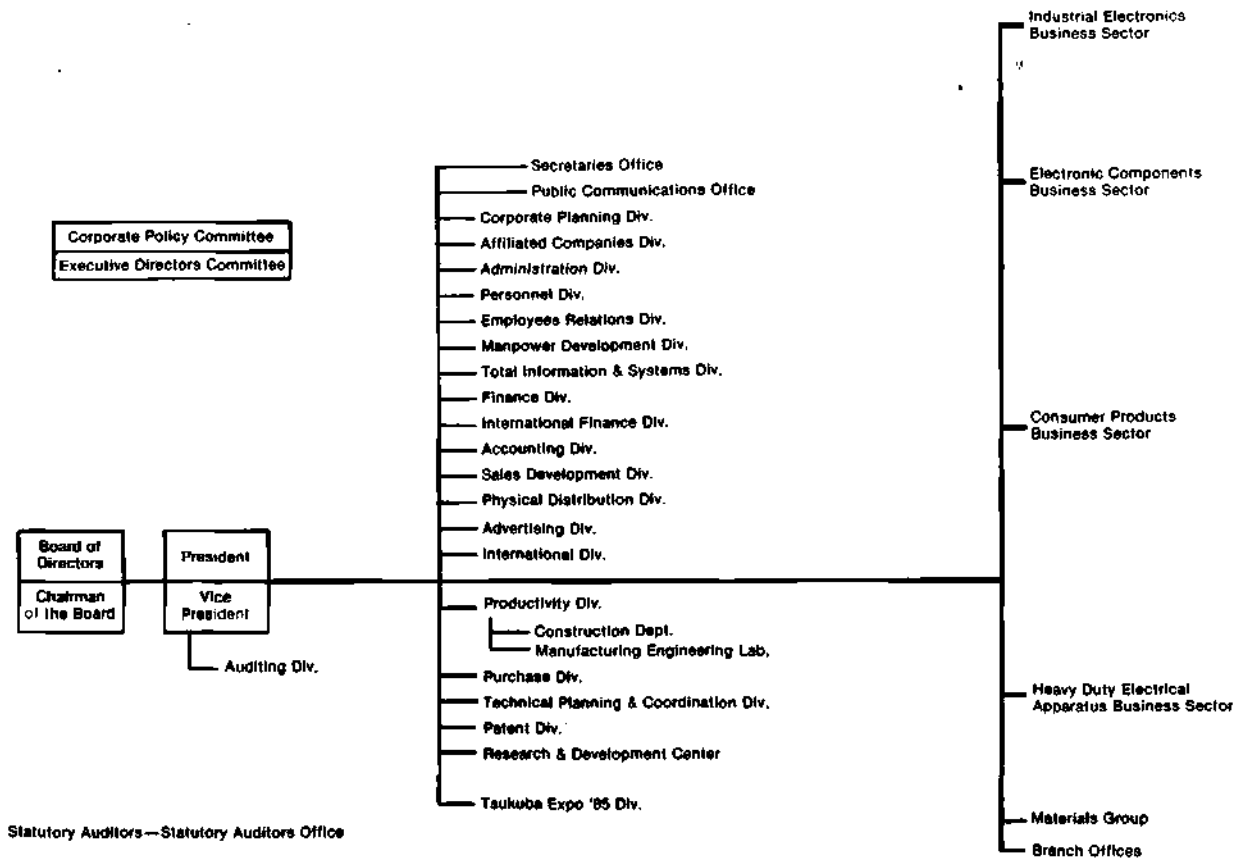


Source: Industrial Groupings in Japan 1984/85
Dodwell Marketing Consultants,
Tokyo: 1984

Toshiba Corporation

Figure 2

Toshiba Corporation
COMPANY ORGANIZATION



Source: Toshiba Corporation

Investment in the Company

The major shareholders of Toshiba are Dai-Ichi Mutual Life Insurance (4.7 percent), Nippon Life Insurance (3.9 percent), Mitsui Bank (3.5 percent), Mitsui Mutual Life Insurance (2.4 percent), Nippon Fire and Marine Insurance (2.2 percent), Mitsui Trust (2.0 percent), LTCB (2.0 percent), and General Electric of the United States (2.0 percent). Toshiba is listed on three Japanese stock exchanges, as well as on the Amsterdam, Basle, Dusseldorf, Frankfurt, Geneva, London, Luxembourg, Paris, and Zurich exchanges.

Major short- and long-term borrowings are from Mitsui Bank, Tokai Bank, and Dai-Ichi Kangyo Bank.

Toshiba Corporation

OPERATIONS

Toshiba reported consolidated net earnings of ¥71 billion on sales of ¥3,496 billion for the year ended March 31, 1986. Earnings fell 17.4 percent from fiscal 1985. The compound annual growth rate (CAGR) in earnings from 1982 to 1986 was 12.7 percent, although earnings declined 13.6 percent from fiscal 1982 to fiscal 1983 and 17.4 percent from fiscal 1984 to fiscal 1985.

Toshiba's business operations are divided into five sectors:

- Electronic components
- Consumer products
- Heavy electrical apparatus
- Industrial electronics
- Materials, machinery, and other products

Each sector is led by a Sector Chief, who monitors business performance.

Revenue by product area is shown in Table 1. (For purposes of public financial reporting, the Company combines the electronic components and industrial electronics sectors.) Figure 3 graphically shows the large increases in the electronics sector from fiscal 1982 to fiscal 1986.

Toshiba is targeting AI technologies, next-generation computers, and software as areas of especially high growth.

Toshiba has developed the concept of Electronics and Energy (E&E) as its corporate hallmark. In addition to being a leader in the electronics field, the Company holds 40 percent of the Japanese thermal power plant market and 30 percent of Japan's hydroelectric plant market.

Toshiba hopes to integrate E&E by synergistically adopting new technologies. For example, the increasing use of electronics in color televisions, VCRs, and refrigerators will lead to more power-efficient products that consume less energy.

As a complement to E&E, the Company has implemented a company-wide program called "Project I," wherein the "I" stands for the three central concepts of Information, Integration, and Intelligence.

Toshiba Corporation

Table 1

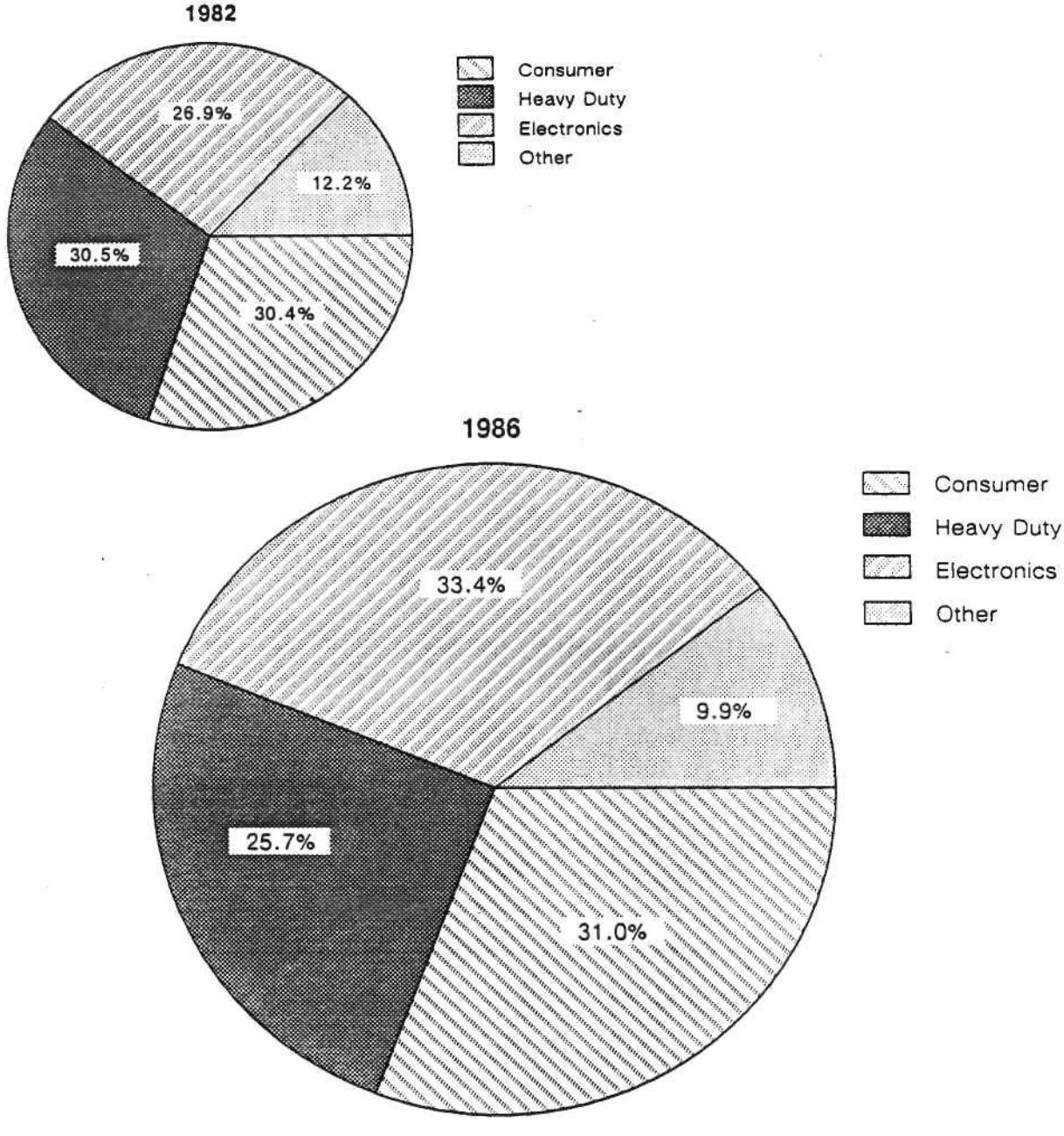
Toshiba Corporation
REVENUE BY PRODUCT AREA
(Billions of Yen)

	Fiscal Year Ending March 31				
	1982	1983	1984	1985	1986
Consumer Products	¥ 712	¥ 715	¥ 790	¥ 904	¥1,044
Heavy Electrical Apparatus	716	689	724	965	866
Electronics and Electronic Components Industrial	631	725	907	1,151	1,128
Material, Machinery, and Products	285	272	286	323	335
Total Sales	¥2,344	¥2,401	¥2,707	¥3,343	¥3,373
Other Income	93	99	102	114	123
Total Revenue	¥2,437	¥2,500	¥2,809	¥3,457	¥3,496
Exchange Rate (Yen per US$)	229	249	236	245	221
Total Revenue (Millions of US$)	$10,642	$10,040	$11,903	$14,110	$15,819

Source: Toshiba Annual Reports
Dataquest
November 1986

Figure 3

Toshiba Corporation
REVENUE BY PRODUCT AREA--1982 AND 1986
(Percent of Yen)



Source: Dataquest
November 1986

Toshiba Corporation

Semiconductors

Toshiba is the third largest Japanese semiconductor supplier, after NEC and Hitachi, with estimated 1985 semiconductor revenue of $1,468 million (see Table 2). In 1985, the Company spent ¥520 million in capital investments, down 10 percent from 1984. The Company's greatest strength is in CMOS logic and memory. Although MOS memory sales dropped 25 percent in 1985, MOS logic sales grew 22 percent, fueled by the growing ASIC market. Total 1985 semiconductor revenue was down by 6 percent, from $1,561 million to $1,468 million. In 1985, Toshiba was the third largest worldwide producer of optoelectronics (after Sharp and Hewlett-Packard), with sales of $96 million. Figure 4 is a diagram of Toshiba's semiconductor group organization.

Table 3 shows Toshiba's estimated 1985 semiconductor revenue by geographic region. Dataquest estimates that approximately 25 percent of Toshiba's semiconductor sales are overseas, with about 15 percent, or $221 million, in the United States; 5 percent in Europe; and 5 percent in the Rest of World countries. The remaining 75 percent of semiconductor revenue originates in Japan.

Toshiba Corporation

Table 2

WORLDWIDE SEMICONDUCTOR REVENUE
(Millions of Dollars)

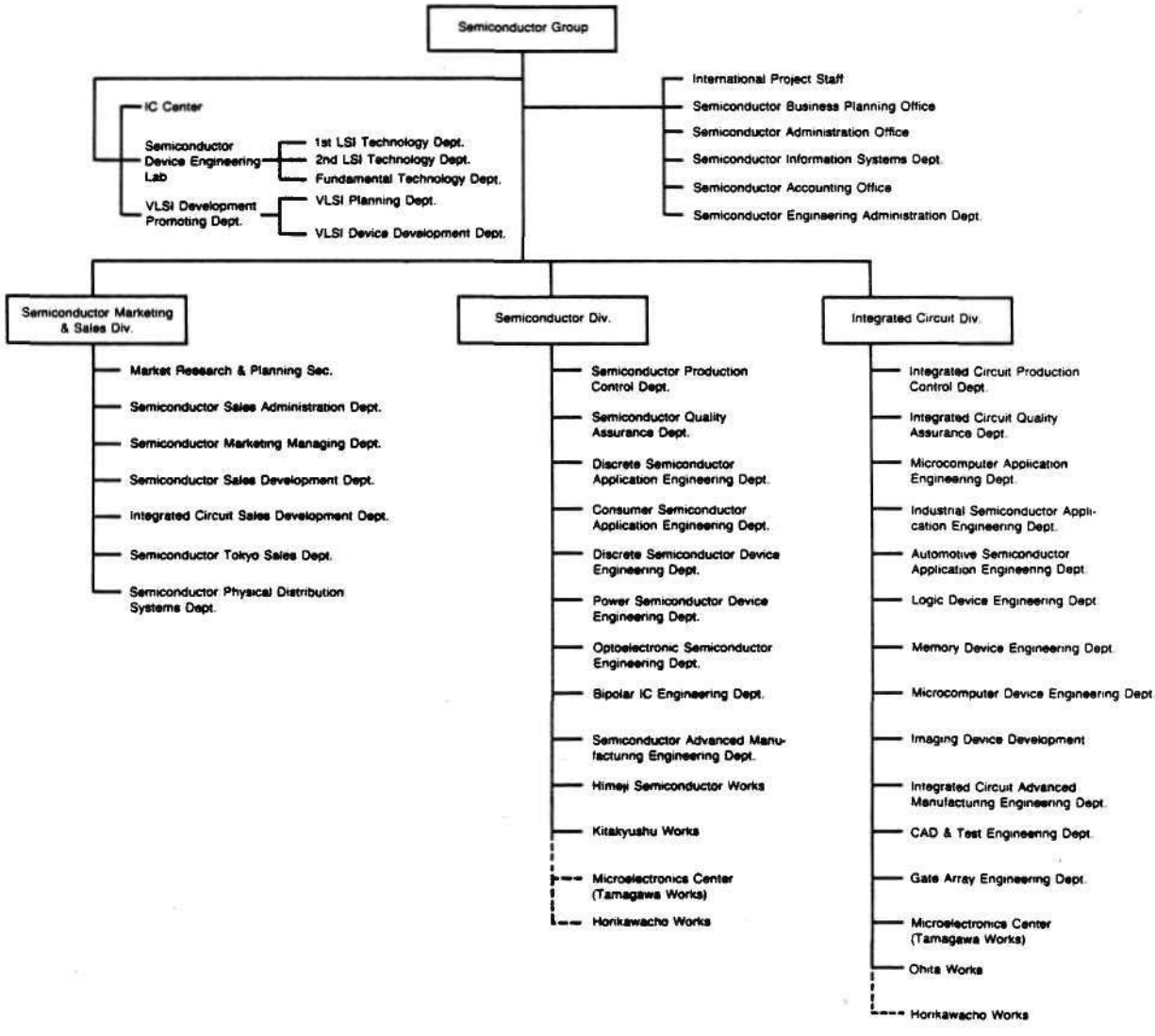
	1978	1979	1980	1981	1982	1983	1984	1985
Total Semiconductor	401	442	629	774	715	983	1,561	1,468
Total Integrated Circuit	189	220	332	394	429	613	1,035	1,004
Bipolar Digital (Technology)	8	9	12	14	16	21	37	33
TTL							30	26
ECL							6	6
Other Bipolar Digital							1	1
Bipolar Digital (Function)	8	9	12	14	16	21	37	33
Bipolar Digital Memory								
Bipolar Digital Logic	8	9	12	14	16	21	37	33
MOS (Technology)	88	135	219	250	312	458	770	736
NMOS		30	66	80	101	165	230	181
PMOS		15	18	20	24	21	2	1
CMOS		90	135	150	187	272	538	554
MOS (Function)	88	135	219	250	312	458	770	736
MOS Memory		50	75	80	142	221	396	297
MOS Micro Devices				8	30	45	70	69
MOS Logic		85	144	162	140	192	304	370
Linear	93	76	101	130	101	134	228	235
Total Discrete	192	187	241	304	217	272	418	368
Transistor	110	87	122	157	108	133	200	173
Small Signal Transistor							87	70
Power Transistor							113	103
Diode	62	65	88	112	80	106	163	142
Small Signal Diode							90	76
Power Diode							53	49
Zener Diode							20	17
Thyristor	14	17	19	21	16	19	30	29
Other Discrete	6	18	12	14	13	14	25	24
Total Optoelectronic	20	35	56	76	69	98	108	96
LED Lamps							25	20
LED Displays							10	10
Optical Couplers								1
Other Optoelectronics							73	65
Exchange Rate (Yen/US$)	210	219	227	221	248	235	237	238

Source: Dataquest
November 1986

Toshiba Corporation

Figure 4

Toshiba Corporation
SEMICONDUCTOR GROUP ORGANIZATION



Source: Toshiba Corporation

Toshiba Corporation

Table 3

Toshiba Corporation
ESTIMATED 1985 SEMICONDUCTOR REVENUE BY GEOGRAPHIC REGION
(Millions of Dollars)

	U.S.	Japan	Europe	ROW	Total
Total Semiconductor	$221	$1,096	$72	$79	$1,468
Integrated Circuit	176	773	53	2	1,004
Bipolar Digital	0	33	0	0	33
MOS	167	516	51	2	736
Linear	9	224	2	0	235
Discrete	30	270	13	55	368
Optoelectronic	15	53	6	22	96

Source: Dataquest
November 1986

Semiconductor Products and Technologies

Toshiba supplies a broad range of semiconductors, including bipolar digital, MOS, and linear ICs; discretes; and optoelectronics. The Company's predominant technology is MOS, especially CMOS, in which it is a world leader. Toshiba MOS products are mainly memory and logic devices, while microdevices represent only 9 percent of total MOS sales ($69 million).

Toshiba was the first company to sample 1Mb DRAMs, beginning in February 1985. Volume production began in the third quarter of 1985. The Company is currently producing about 300,000 units a month, and it will increase production as the 1Mb DRAM market develops. Toshiba was the first to develop a prototype 4Mb DRAM.

At the 1986 ISSCC, Toshiba announced several new developments, including the following:

- A 70ns 2Mb mask ROM with a through-hole programmed memory cell
- A 20-MHz 32-bit pipelined CMOS image processor
- An 18ns 8Kx9 NMOS SRAM in 1.5μ double poly/double aluminum NMOS

Toshiba Corporation

- A 1Mb virtual static RAM (VSRAM) employing dynamic RAM cells
- A 50 μA standby 1Mbx1 and 256Kx1 CMOS DRAM
- An experimental 4Mb CMOS DRAM, 4Mbx1 and 1Mbx4

Recent new product and technology announcements by Toshiba include the following:

- Toshiba has succeeded in drawing 0.35μ wide lines on silicon using an excimer laser.
- Toshiba has developed an ultrasmall semiconductor laser compatible with standard models from Sharp and Sony.
- The Company has developed two models of infrared LEDs for auto focusing cameras.
- Toshiba is now marketing 1Mb DRAMs in SOJ (small outline J-lead) and PLCC (plastic leaded chip carrier) packages, in addition to the standard DIP.
- Toshiba has developed a new method of pulling gallium arsenide crystals, called Super MLEC. The new method uses a strong magnetic field and a fine ceramic melting pot.
- Toshiba has developed an ultrahigh-speed CMOS standard logic family with 3ns propagation delay time.
- Toshiba unveiled in May 1986 a series of original 4-bit CMOS microcontrollers, one with ROM and RAM, the other with A-D converter.
- Toshiba has developed a CMOS standard cell series that is capable of including RAM and ROM.
- Toshiba has developed two models of high withstand voltage, high-current bipolar MOSFETs.

Since 1984, Toshiba has been operating a new IC assembly and test operation in Braunschweig, West Germany. Main products from this factory are 64K dynamic RAMs, 16K static RAMs, 64K static RAMs, and 256K dynamic RAMs.

In addition, Toshiba opened an LSI design center in Neuss, West Germany, which has a satellite design link with its Japanese facilities. This design center is to serve the European customers for gate arrays, macrocells, and other custom and semicustom LSIs. Toshiba is also planning to open a design center in the United Kingdom in 1986.

Toshiba Corporation

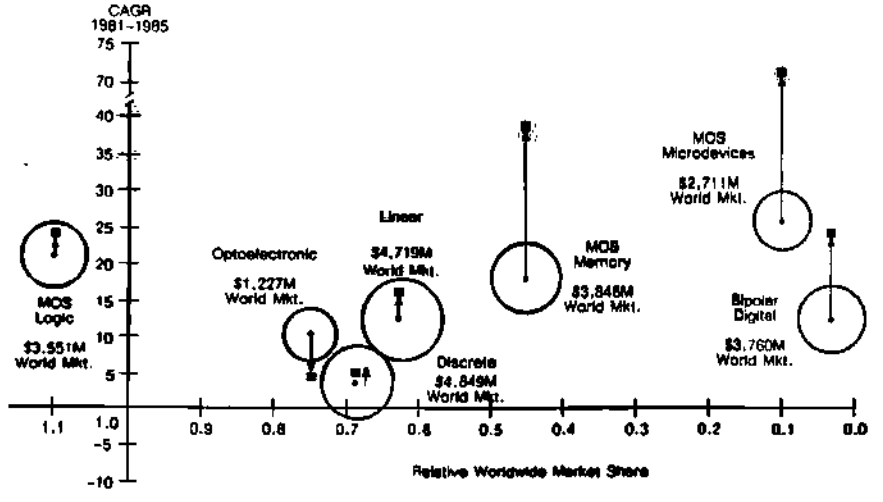
Product Portfolio Analysis

Semiconductor Product Portfolio Analysis - Figure 5 is a graphic analysis of Toshiba's 1985 product portfolio compared with worldwide competition. Figure 6 presents the same analysis applied only to the Company's Japanese competition. These figures show which product areas the Company has chosen to focus on.

The y axis is the historical product CAGR from 1981 to 1985. Toshiba's CAGR for each product is marked by a dot. In Figure 5, the worldwide product CAGR is marked by a dot surrounded by a circle that represents the total world market for the product. In Figure 6, the total Japanese company CAGR for each product is marked by a dot surrounded by a circle that represents total Japanese company sales for the product.

Figure 5

Toshiba Corporation
1985 PRODUCT PORTFOLIO
COMPARED TO WORLDWIDE COMPETITION



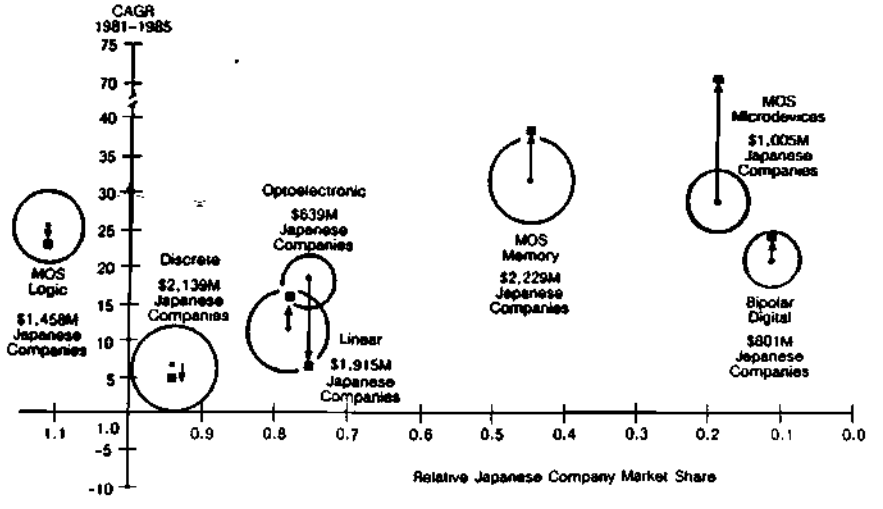
Note: Up arrow indicates growth higher than industry average; down arrow indicates the opposite.

Source: Dataquest
November 1986

Toshiba Corporation

Figure 6

Toshiba Corporation
1985 PRODUCT PORTFOLIO
COMPARED TO JAPANESE COMPETITION



Note: Up arrow indicates growth higher than Japanese companies' average; down arrow indicates the opposite.

Source: Dataquest
November 1986

The locations of graph points may be interpreted in the following way:

- Upper Right Quadrant--These are the "developing products." The Company is not the leading supplier of these products, but the products exhibit positive growth.

- Upper Left Quadrant--These are the "stars." The Company is the leading supplier of these products, and the products exhibit positive growth.

- Lower Left Quadrant--These are the "cash cows." The Company is the leading supplier of a declining product segment, but there is generally a high profit margin on these products.

- Lower Right Quadrant--These are the "dogs." The TAM for this product area is decreasing, and the Company is not the leading supplier.

Viewed against worldwide competition, it is clear that Toshiba is number one in MOS logic. The Company is also a leader in optoelectronic, discrete, and linear ICs. Although its relative market shares in MOS memory, microdevices, and bipolar digital ICs are low, it has grown at a much faster rate than the market. Compared to its Japanese competitors, Toshiba also enjoys above-average growth in MOS memory, microdevices, bipolar digital, and linear ICs.

Toshiba Corporation

Semiconductor Licensing and Joint Ventures

Toshiba is involved in the following licensing agreements and joint ventures:

- A technology exchange with Zilog of the United States--Toshiba second-sources Zilog's Z80 and Z8000 microprocessors; Toshiba will design CMOS versions of these for Zilog.

- A technical assistance agreement with SGS-Ates of Italy--This is for joint development of ultrahigh-speed CMOS logic. Previously an agreement was reached whereby Toshiba supplied SGS-Ates with 16K CMOS static RAM technology; in return, Toshiba may use SGS-Ates' European semiconductor sales network.

- A technical assistance agreement with Korean Electronics Company (KEC)--This is a five-year agreement under which Toshiba will supply KEC with technical documents on linear IC design and production, provide consulting services to KEC, and help to train KEC engineers.

- An agreement with Siemens--Under this agreement, Toshiba has licensed its CMOS 1Mb DRAM technology to Siemens.

- A joint venture with LSI Logic for 20,000+ gate arrays, using a 1.5-micron process--The project is referred to as "Sea of Gates."

- Toshiba has entered an agreement with General Electric and Siemens for joint development of a standard cell library using 1.5μ CMOS technology; 1.2μ standard will be developed later in the five-year agreement.

- Toshiba has agreed to produce ASICs and DRAMs on an OEM basis for Motorola.

- Toshiba has signed a contract with Intel to manufacture and market two interface ICs for Intel's MultibusII.

- Toshiba will support LSI Logic's Japanese subsidiary as a second source in gate arrays. In addition, the two companies will jointly promote PR activities and hold technological seminars. Toshiba will support sales in Japan of LSI's CAD system, the LDS.

In January 1986, a Toshiba R&D scientist, Dr. Yoshio Nishi, undertook the direction of Hewlett-Packard's VLSI Research Laboratory in Palo Alto, California. This is part of a continuing program between the two companies, which have exchanged about six researchers over the past five

years. Dataquest believes that this assignment will not only help Hewlett-Packard to design 1Mb DRAMs into its new computer products, but will also give Toshiba valuable computer technology and contacts with IC researchers at Stanford University and Hewlett-Packard.

Other Electronic Components

Other products in the electronic components sector include electron tubes, CRTs, magnetron tubes, and printed circuit boards.

Consumer Products

In fiscal 1986, revenue in the consumer products sector increased 15 percent over fiscal 1985. This sector accounted for ¥1,044 billion, or 31 percent of Toshiba's total sales. Products in this sector include video equipment, audio equipment, household appliances, and lighting equipment.

Highlights in consumer products during fiscal 1986 include:

- Expansion of compact disk player sales due to the introduction of inexpensive models
- Introduction of "Rupo" series of portable Japanese word processors for home use

Heavy Electrical Apparatus

During fiscal 1986, revenue in the heavy electrical apparatus sector decreased 10 percent over fiscal 1985. This sector accounts for 26 percent of Toshiba's total sales. Products in this sector include power plant systems, industrial electric apparatus, transportation equipment, measuring instruments, and factory automation equipment.

Fiscal 1986 highlights for the heavy-duty electrical apparatus market include:

- The completion of boiling water reactors for two of Tokyo Electric Power's electrical plants. Toshiba now has an installed base of 12 BWR plants generating a total of 9,473 megawatts of electricity.

Industrial Electronics

Revenue in the industrial electronics business sector is reported with the electronic components sector revenue. In fiscal 1986, these two sectors combined accounted for 33 percent of Toshiba's total sales. Fiscal 1986 sales represented a 2 percent decrease over fiscal 1985 sales. Products in the industrial electronics sector include office automation equipment, medical equipment, telecommunications equipment, airport equipment, aerospace equipment, and labor-saving automation equipment.

Fiscal 1986 highlights for the industrial electronics sector include:

- A 30 percent increase in sales of the Company's 32-bit distributed data processing computers, the DP9000 Series.
- Development of a simplified computer language, "Super PIPS," in collaboration with Sord Computer Corporation.

Materials, Machinery, and Other Products

Fiscal 1986 revenue in the materials, machinery, and other products sector increased 4 percent over fiscal 1985. This sector accounts for only 10 percent of Toshiba's total sales. Products in the sector include steel tubing, alloys, ceramics, optical equipment, chemical materials, semiconductor manufacturing equipment, prefabricated housing, and insulating materials.

Fiscal 1986 highlights for materials, machinery, and other products include:

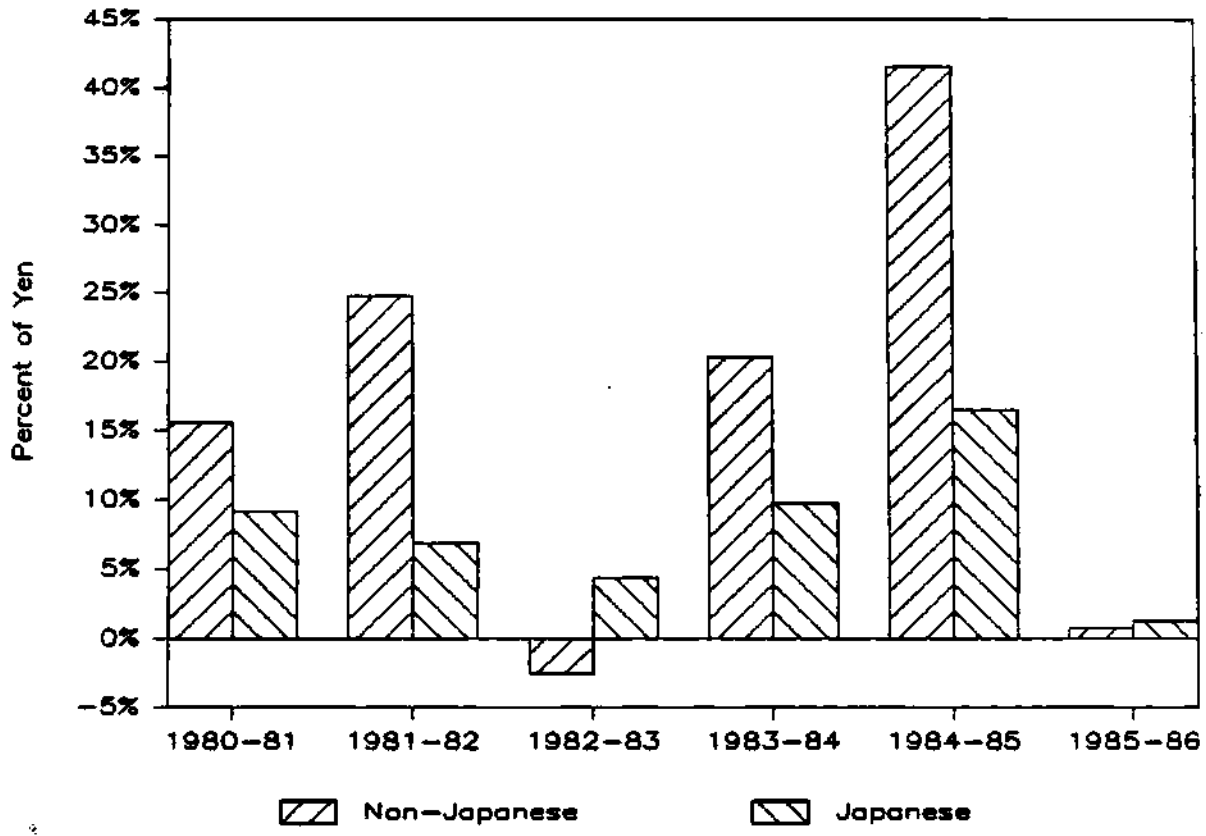
- Commencement of R&D on ceramic materials for a diesel engine component joint venture with Cummins Engine Company of the United States.

INTERNATIONAL OPERATIONS

Toshiba's overseas sales increased less than 1 percent during fiscal 1986, to ¥1,054 billion, representing 30 percent of the Company's total revenue. Figure 7 shows the relative growth of the Company's nondomestic versus domestic revenue from 1980 through 1986. Toshiba has worldwide sales presence and overseas factories in Africa, Asia, Europe, the Middle East, North America, Oceania, and South America.

Figure 7

Toshiba Corporation
GROWTH OF NONDOMESTIC VERSUS DOMESTIC REVENUE
(Percent of Yen)



Source: Dataquest
November 1986

Toshiba Corporation

FACILITIES

Toshiba's semiconductor manufacturing facilities are listed in Table 4, and the domestic facilities are shown on the map in Figure 8.

Table 4

Toshiba Corporation
SEMICONDUCTOR PLANT LOCATIONS

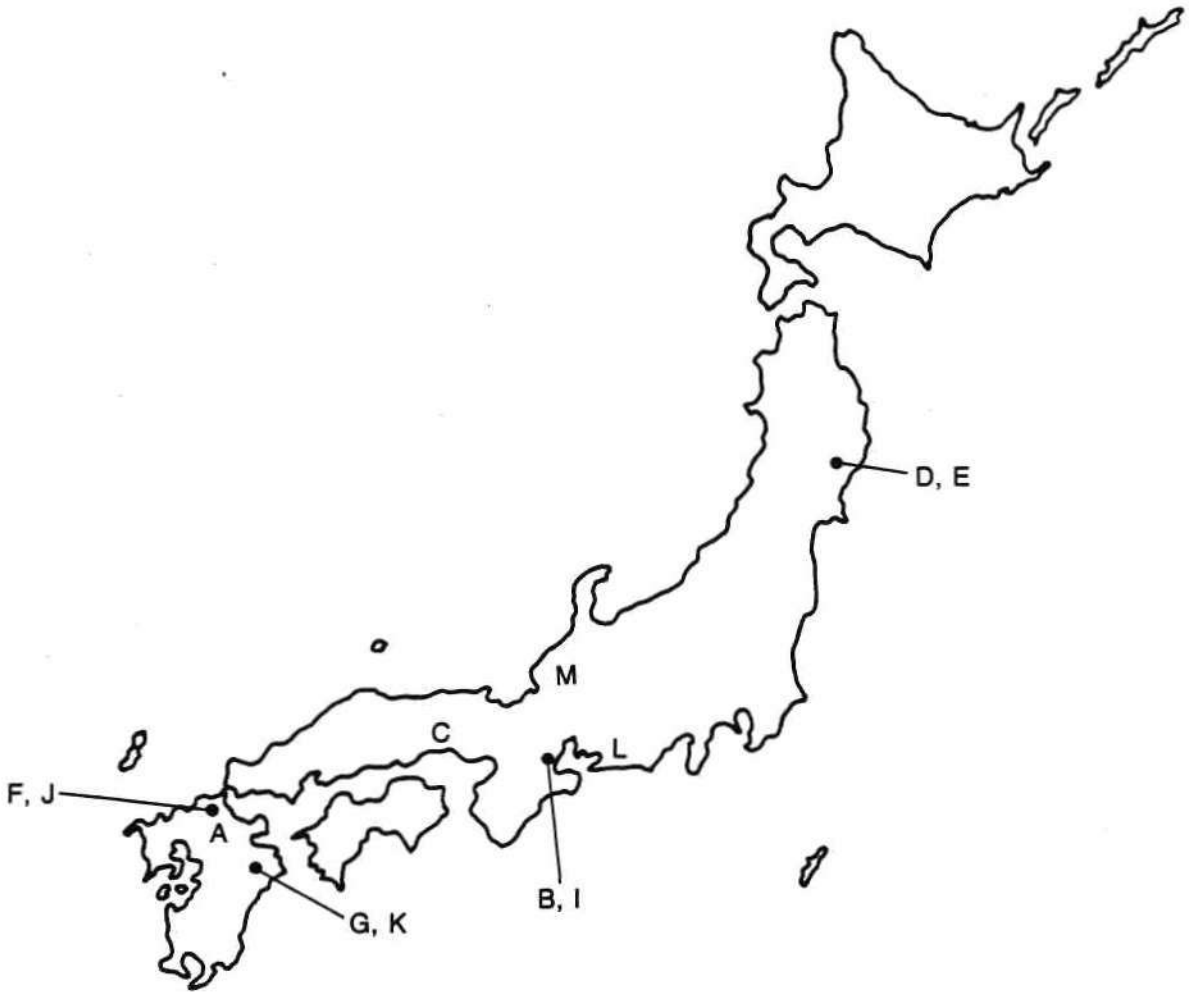
Table Map Code	Location	Year Established	Employees	Floor Space (m^2)	Functions/Products
A	Buzen Toshiba Electronics	1973	280	N/A	Fab, Assembly, Test--Optoelectronics
B	Hamaoka Denshi Buhin	1970	350	N/A	Assembly
C	Himeji Factory	1964	4,109	242,413	Fab, Assembly, Test--Discretes
D	Iwate Toshiba Electronics	1973	N/A	23,000	Assembly--Linear, Discretes
E	Iwate Toshiba Electronics Kitakami	1984	650	40,000	Fab, Assembly, Test--MOS
F	Kitakyushu Factory	1966	1,648	54,559	Fab, Assembly, Test--Linear
G	Kitsuki Factory	1983	120	8,300	Assembly--Bipolar, MOS
H	Micro Technology Laboratory	1983	60	N/A	Fab, Test--Bipolar, MOS
I	Micro-Electronics Center	1970	2,245	68,334	Fab, Test--Bipolar, MOS
J	Nohgata Toshiba Electronics	1970	450	5,000	Fab, Assembly, Test
K	Oita Factory	1970	2,100	67,755	Fab, Assembly, Test
L	Toshiba Components	1939	850	N/A	Assembly--Discretes
M	Kaga Toshiba Electronics	1985	300	N/A	Assembly, Test--Discretes
	Korea Electronics*	1983	1,500	N/A	Assembly, Test--ICs, Discretes, Opto
	Toshiba Electronics Malaysia	1974	1,000	N/A	Assembly, Test--ICs, Discretes
	Industria Mexicana Toshiba	N/A	N/A	N/A	Assembly, Test--ICs, Discretes
	Toshiba Semiconductor (USA)	1980	350	N/A	Assembly--MOS Memory
	Toshiba Semiconductor GmbH	1982	100	3,000	Assembly, Test--MOS

*Joint Venture
N/A = Not Available

Source: Dataquest
November 1986

Figure 8

Toshiba Corporation
JAPANESE SEMICONDUCTOR PLANT LOCATIONS



Source: Dataquest
November 1986

Toshiba Corporation

RESEARCH AND DEVELOPMENT

Toshiba believes that "technology is the driving force of corporate development," and thus the Company has been intensifying its R&D efforts. In fiscal 1986, 5.4 percent of sales--¥190 billion--was spent on R&D, compared with 3.7 percent of sales expended in fiscal 1982. R&D emphasis is on semiconductors, factory automation, and new materials.

Toshiba has an R&D center located in Kawasaki, Kanagawa Prefecture, and seven development laboratories--five in Kawasaki; one in Otawara, Tochigi Prefecture; and one in Yokohama, Kanagawa Prefecture. Semiconductor R&D is done in Kawasaki, where a VLSI development center has been built.

MARKETING AND METHODS OF DISTRIBUTION

Toshiba's major distributors in Japan are Toshiba Electron Device, Midoriya Electric, Tokyo Shuma, and Kenden Kogyo.

In the United States, Toshiba's products are sold by Toshiba America Ltd., headquartered in Tustin, California. Toshiba's products are also available through several major U.S. distributors.

Toshiba has sales offices throughout Europe, and also sells through European distributors.

Toshiba Corporation

OUTLOOK

Toshiba plans to introduce a 4-megabit dynamic RAM and a 1-megabit static RAM, using submicron technology, by 1987.

In January 1983, Toshiba began construction of a new IC assembly and test operation in Braunschweig, West Germany. Main products from this factory are 64K dynamic RAMs, 16K static RAMs, and 65K static RAMs. 256K dynamic RAMs will soon be added in the product line.

In addition, Toshiba opened an LSI design center in Neuss, West Germany, which has a satellite design link with its Japanese facilities. This design center is supposed to serve the European customers for gate arrays, macro cells, and other custom and semicustom LSIs. Toshiba is also planning to open a design center in the United Kingdom in 1986.

Toshiba Corporation

BACKGROUND AND OVERVIEW

Toshiba Corporation was founded in 1875 by Hasashiga Tanaka. The Company was originally called Tanaka Seizo-sho; in 1904, it was renamed Shibaura Engineering Works. In 1939, the Company merged with Tokyo Electric Company (founded in 1890) and became Tokyo Shibaura Electric Co., Ltd. In 1978, the Company's English name was changed to Toshiba Corporation. Toshiba originally manufactured telegraph equipment but has grown to become the third-largest Japanese electrical equipment manufacturer, with more than 100,000 employees and sales and income exceeding $10 billion annually.

Toshiba, as a total electric and electronic equipment manufacturer, operates with the following four business sectors and material groups:

- Indusrial Electronics Business Sector
- Electronic Components Business Sector
- Consumer Products Business Sector
- Heavy Electrical Apparatus Business Sector

Toshiba is the world's fifth-largest semiconductor producer and ranks second in discrete devices. The Company is particularly strong in the rapidly growing CMOS field.

The completion of six development and production facilities in 1984, including the Iwate and Oita plants, supported Toshiba's aggressive sales efforts in expanding the Company's semiconductor sales by 55 percent, to US$1,750 million, compared with US$1,120 million in 1983.

In the past few years, Toshiba Corporation has entered into several significant technology agreements with other semiconductor companies. A technological assistance aggreement with SGS-Ates of Italy provides for Toshiba to supply SGS-Ates with CMOS-wafer fabrication technology. Toshiba and SGS also have an agreement to codevelop high-speed CMOS standard logics.

A technological agreement with Zilog, Inc., in the United States, gives Zilog access to Toshiba's CMOS technology; in return, Toshiba gains rights to the Zilog Z80 and Z8000 microprocessors. Both companies are to develop CMOS versions of the two processors. Toshiba began production of the CMOS version of the Z80 in October 1983.

A deal with LSI Logic, also of the United States, provides for an exchange of LSI Logic computer-aided design technology for Toshiba diffused gate-array technology. Toshiba currently sources processed wafers to LSI Logic on a wafer-foundry basis.

Toshiba Corporation

As shown in Table 1, DATAQUEST estimates Toshiba Corporation's European revenues at $83 million in 1984, an increase of 113 percent over 1983. DATAQUEST estimates that approximately 5 percent of Toshiba's worldwide semiconductor sales are in Europe.

Table 1

Toshiba Corporation
ESTIMATED EUROPEAN SEMICONDUCTOR REVENUES BY PRODUCT LINE
(Millions of U.S. Dollars)

	1980	1981	1982	1983	1984
Total Semiconductor	$12	$18	$25	$39	$83
Total Integrated Circuit	$ 9	$15	$22	$31	$71
Bipolar Digital	0	0	0	0	0
MOS	6	13	22	30	68
Linear	3	2	0	1	3
Total Discrete	$ 2	$ 2	$ 2	$ 6	$ 8
Transistor	2	2	2	6	8
Diode	0	0	0	0	0
Thyristor	0	0	0	0	0
Other	0	0	0	0	0
Total Optoelectronic	$ 1	$ 1	$ 1	$ 2	$ 4

Source: DATAQUEST

PRODUCTS AND MARKETS SERVED

One of the topics of the year was Toshiba's development of 1-megabit DRAMs, in both N-channel and CMOS versions. Sample shipments began in June 1985, and mass production will begin in 1986.

Recent achievements in the MOS field are the world's first 256-Kbit CMOS SRAM, of which Toshiba began sample shipments in December 1984, and a 256-Kbit "Flash" EEPROM that simultaneously enables a short erase time and high density.

Other new products announced by Toshiba are bright-red LED lamps, high-power light-triggered thyristors, and color-TV use bipolar ICs.

Toshiba Corporation

Toshiba Corporation
1-6 Uchinisaiwai-cho 1-chome
Chiyoda-Ku, Tokyo 100, Japan
Telephone: 03-501-5411 Telex: 122587
(Billions of Yen Except Per Share Data)

Balance Sheet (March 31)

	1978*	1979	1980	1981	1982
Working Capital		¥ (14)	¥ (4)	¥ 60	¥ 95
Long-Term Debt		¥ 239	¥ 233	¥ 252	¥ 242
Shareholders' Equity		¥ 193	¥ 237	¥ 281	¥ 400
After-Tax Return on Average Equity (%)		N/A	21.1	19.4	31.5

Operating Performance (Fiscal Year Ending March 31)

	1978*	1979	1980	1981	1982
Revenue	¥1,569	¥1,771	¥1,987	¥2,196	¥2,437
Japanese Revenue		¥1,446	¥1,550	¥1,691	¥1,807
Non-Japanese Revenue		¥ 325	¥ 437	¥ 505	¥ 630
Cost of Revenue		¥1,190	¥1,263	¥1,407	¥1,605
R&D Expense		¥ 58	¥ 71	¥ 77	¥ 90
SG&A Expense		¥ 361	¥ 471	¥ 447	¥ 490
Pretax Income		¥ 54	¥ 103	¥ 123	¥ 112
Pretax Margin (%)		3.0	5.2	5.9	4.8
Effective Tax Rate (%)		65.1	59.8	59.6	62.4
Net Income	¥ 2	¥ 21	¥ 44	¥ 49	¥ 44
Average Shares Outstanding (Millions)		2,107	2,178	2,226	2,348
Per Share					
Earnings	¥ 0.0	¥ 9.5	¥ 19.8	¥ 21.3	¥ 18.9
Dividends		¥ 5.47	¥ 5.91	¥ 6.94	¥ 7.0
Book Value		¥ 9.17	¥ 10.86	¥ 12.63	¥ 16.94
Price Range		N/A	N/A	N/A	N/A
Total Employees		N/A	98,000	99,000	103,000
Capital Expenditures		N/A	¥ 81	¥ 98	¥ 140
Exchange Rate (Yen per US$)	¥ 253	¥ 200	¥ 232	¥ 216	¥ 229

N/A = Not Available
*The information shown in this column is the only information available for 1978.

Source: Toshiba Annual Reports
DATAQUEST

Toshiba Corporation

Table 1

Toshiba Corporation
REVENUES BY PRODUCT AREA
(Billions of Yen)

	Fiscal Year Ending March 31				
	1978	1979*	1980	1981	1982
Consumer Products	¥ 571	¥ 596	¥ 686	¥ 693	¥ 712
Heavy Duty Electrical Apparatus	406	528	553	588	716
Electronic Components and Industrial Electronic Business	331	375	438	567	631
Other Products	196	204	229	252	285
Total Sales	¥1,504	¥1,703	¥1,905	¥ 2,100	¥ 2,344
Other Income	65	68	82	96	93
Total Revenues	¥1,569	¥1,771	¥1,987	¥ 2,196	¥ 2,437
Exchange Rate (Yen Per US$)	253	200	232	216	229
Total Revenues (Millions of US$)	$6,201	$8,855	$8,573	$10,182	$10,642

*Estimated by DATAQUEST from data presented in 1980 Toshiba Annual Report.

Source: Toshiba Corp. Annual Reports
DATAQUEST

Toshiba Corporation

Table 2

Toshiba Corporation
ESTIMATED SEMICONDUCTOR REVENUES
(Millions of Dollars)

	1975	1976	1977	1978	1979	1980	1981	1982
Total Semiconductor	134	236	263	401	442	629	774	714
Total Integrated Circuit	49	90	111	189	220	332	394	428
Bipolar Digital (Technology)	6	8	11	8	9	12	14	16
TTL	-	-	-	-	-	-	-	-
DTL	-	-	-	-	-	-	-	-
ECL	-	-	-	-	-	-	-	-
Other Bipolar Digital	-	-	-	-	-	-	-	-
Bipolar Digital (Function)	6	8	11	8	9	12	14	16
Bipolar Digital Memory	-	-	-	-	-	-	-	-
Bipolar Digital Logic	-	-	11	8	9	12	14	16
MOS (Technology)	24	35	41	88	135	219	250	311
NMOS	-	-	-	-	30	66	80	101
PMOS	-	-	-	-	15	18	20	24
CMOS	-	-	-	-	90	135	150	186
MOS (Function)	24	35	41	88	135	219	250	311
MOS Memory	-	-	-	-	50	75	80	141
MOS Microprocessor	-	-	-	-	-	-	8	30
MOS Logic	-	-	-	-	85	144	162	140
Linear	19	47	59	93	76	101	130	101
Total Discrete	78	131	141	192	187	241	304	217
Transistor	-	-	73	110	87	122	157	108
Small Signal Transistor	-	-	-	-	-	-	-	-
Power Transistor	-	-	-	-	-	-	-	-
Diode	-	-	48	62	65	88	112	80
Small Signal Diode	-	-	-	-	-	-	-	-
Power Diode	-	-	-	-	-	-	-	-
Zener Diode	-	-	-	-	-	-	-	-
Thyristor	-	-	14	14	17	19	21	16
Other Discrete	-	-	6	6	18	12	14	13
Total Optoelectronic	7	15	11	20	35	56	76	69
LED Lamps	-	-	-	-	-	-	-	-
LED Displays	-	-	-	-	-	-	-	-
Optical Couplers	-	-	-	-	-	-	-	-
Other Optoelectronics	-	-	-	-	-	-	-	-

Source: DATAQUEST

Toshiba Corporation

Toshiba Corporation
1-6 Uchinisaiwai-cho 1-chome
Chiyoda-Ku, Tokyo 100, Japan
Telephone: 03-501-5411 Telex: 122587
(Billions of Yen Except Per Share Data)

Balance Sheet (March 31)

	1977*	1978*	1979	1980	1981
Working Capital			¥ (14)	¥ (4)	¥ 60
Long-Term Debt			¥ 239	¥ 233	¥ 252
Shareholders' Equity			¥ 193	¥ 237	¥ 281
After-Tax Return on Average Equity (%)			N/A	21.1	19.4

Operating Performance (Fiscal Year Ending March 31)

	1977*	1978*	1979	1980	1981
Revenue	¥1,445	¥1,569	¥1,771	¥1,987	¥2,196
Japanese Revenue			¥1,446	¥1,550	¥1,691
Non-Japanese Revenue			¥ 325	¥ 437	¥ 505
Cost of Revenue			¥1,190	¥1,263	¥1,407
R&D Expense			¥ 58	¥ 71	¥ 77
SG&A Expense			¥ 361	¥ 471	¥ 447
Pretax Income			¥ 54	¥ 103	¥ 123
Pretax Margin (%)			3.0	5.2	5.9
Effective Tax Rate (%)			65.1	59.8	59.6
Net Income	¥ 2	¥ 0	¥ 21	¥ 44	¥ 49
Average Shares Outstanding (Millions)			2,107	2,178	2,226
Per Share					
Earnings	¥ 1.2	¥ 0.0	¥ 9.5	¥ 19.8	¥ 21.3
Dividends			¥ 5.47	¥ 5.91	¥ 6.94
Book Value			¥ 9.17	¥ 10.86	¥ 12.63
Price Range			N/A	N/A	N/A
Total Employees			N/A	98,000	99,000
Capital Expenditures			N/A	¥ 81	¥ 98
Exchange Rate (Yen per US$)	¥ 291	¥ 253	¥ 200	¥ 232	¥ 216

*For 1977 and 1978, the only information available is shown in this table.

Source: Toshiba Annual Reports
DATAQUEST

Toshiba Corporation

Table 1

Toshiba Corporation
REVENUES BY PRODUCT AREA
(Billions of Yen)

	Fiscal Year Ending March 31				
	1977*	1978	1979	1980	1981
Consumer Products	¥ 574	¥ 571	¥ 596	¥ 686	¥ 693
Heavy Duty Electrical Apparatus	313	406	528	553	588
Electronic Components and Industrial Electronic Business	317	331	375	438	567
Other Products	N/A	196	204	229	252
Total Sales	N/A	¥1,504	¥1,703	¥1,905	¥ 2,100
Other Income	N/A	65	68	82	96
Total Revenues	¥1,448	¥1,569	¥1,771	¥1,987	¥ 2,196
Exchange Rate (Yen Per US$)	291	253	200	232	216
Total Revenues (Millions of US$)	$4,971	$6,201	$8,855	$8,573	$10,182

*Estimated by DATAQUEST from data presented in 1980 Toshiba Annual Report.

Source: Toshiba Corp. Annual Reports
DATAQUEST

Toshiba Corporation

Table 2

Toshiba Corporation
ESTIMATED SEMICONDUCTOR REVENUES
(Millions of Dollars)

	1974	1975	1976	1977	1978	1979	1980	1981
TOTAL SEMICONDUCTOR	167	134	236	263	401	442	629	768
Total Integrated Circuit	49	49	90	111	189	220	332	388
Bipolar Digital	8	6	8	11	8	9	12	14
TTL								
DTL								
ECL								
Other								
Bipolar Digital (Recap)				9	8	9	12	14
Memory				0	0	0	0	0
Logic				9	8	9	12	14
MOS	20	24	35	41	88	135	219	230
NMOS						30	66	70
PMOS						15	18	20
CMOS						90	135	140
MOS (Recap)						135	219	230
Memory						50	75	80
Microprocessor						0	0	8
Logic						85	144	142
Linear	21	19	47	59	93	76	101	144
Total Discrete	112	78	131	141	192	187	241	304
Transistor				73	110	87	122	157
Small Signal								
Power Transistor								
Diode				48	62	65	88	112
Small Signal								
Power								
Zener								
Thyristor				14	14	17	19	21
Other				6	6	18	12	14
Total Optoelectronic	6	7	15	11	20	35	56	76
LED Lamps								
LED Displays								
Optical Couplers								
Other								

Source: DATAQUEST

10.10 Toshiba

Table 10.10-1

Toshiba

ESTIMATED SEMICONDUCTOR REVENUES

(Dollars in Millions)

	1971	1972	1973	1974	1975	1976	1977	1978
TOTAL SEMICONDUCTOR		119	155	167	134	236	263	383
TOTAL I C	13	30	41	49	49	90	111	189
BIPOLAR DIGITAL	4	5	7	8	6	8	11	8
TTL								
DTL								
ECL								
OTHER								
MOS	4	12	15	20	24	35	41	88
PMOS								
NMOS								
CMOS								
LINEAR	5	13	19	21	19	47	59	93
INTERFACE								
CONTROL								
ENTERTAINMENT								
OTHER								
HYBRID								
TOTAL DISCRETE		88	108	112	78	131	141	192
TRANSISTOR							73	110
SMALL SIGNAL								
POWER								
DIODE							48	62
SMALL SIGNAL								
POWER								
ZENER								
THYRISTOR							14	14
OTHER							6	6
OPTOELECTRONIC		1	6	6	7	15	11	2
LED LAMPS								
LED DISPLAYS								
COUPLERS								
OTHER								

Note: The following exchange rates were used to convert yen to dollars:
1971: 343 yen = $1.00; 1972: 302 yen = $1.00; 1973: 269 yen = $1.00;
1974: 292 yen = $1.00; 1975: 297 yen = $1.00; 1976: 296 yen = $1.00;
1977: 266 yen = $1.00; 1978: 207 yen = $1.00

Source: DATAQUEST, Inc.

Toshiba Corporation

Toshiba Corporation
ESTIMATED SEMICONDUCTOR REVENUES
(Millions of Dollars)

	1973	1974	1975	1976	1977	1978	1979	1980
TOTAL SEMICONDUCTOR	155	167	134	236	263	401	442	629
Total Integrated Circuit	41	49	49	90	111	189	220	332
Bipolar Digital	7	8	6	8	11	8	9	12
TTL								
DTL								
ECL								
Other								
Bipolar Digital (Recap)					9	8	9	12
Memory								
Logic								
MOS	15	20	24	35	41	88	135	219
NMOS							30	66
PMOS							15	18
CMOS							90	135
MOS (Recap)							135	219
Memory							50	75
Microprocessor							0	0
Logic							85	144
Linear	19	21	19	47	59	93	76	101
Total Discrete	108	112	78	131	141	192	187	241
Transistor					73	110	87	122
Small Signal								
Power Transistor								
Diode					48	62	65	88
Small Signal								
Power								
Zener								
Thyristor					14	14	17	19
Other					6	6	18	12
Total Optoelectronic	6	6	7	15	11	20	35	56
LED Lamps								
LED Displays								
Optical Couplers								
Other								

Source: DATAQUEST, Inc.

10.10 Toshiba

Table 10.10-1

Toshiba

ESTIMATED SEMICONDUCTOR REVENUES

(Dollars in Millions)

	1971	1972	1973	1974	1975	1976	1977	1978
TOTAL SEMICONDUCTOR		119	155	167	134	236	263	383
TOTAL I C	13	30	41	49	49	90	111	189
BIPOLAR DIGITAL	4	5	7	8	6	8	11	8
TTL								
DTL								
ECL								
OTHER								
MOS	4	12	15	20	24	35	41	88
PMOS								
NMOS								
CMOS								
LINEAR	5	13	19	21	19	47	59	93
INTERFACE								
CONTROL								
ENTERTAINMENT								
OTHER								
HYBRID								
TOTAL DISCRETE		88	108	112	78	131	141	192
TRANSISTOR							73	110
SMALL SIGNAL								
POWER								
DIODE							48	62
SMALL SIGNAL								
POWER								
ZENER								
THYRISTOR							14	14
OTHER							6	6
OPTOELECTRONIC		1	6	6	7	15	11	2
LED LAMPS								
LED DISPLAYS								
COUPLERS								
OTHER								

Note: The following exchange rates were used to convert yen to dollars:
1971: 343 yen = $1.00; 1972: 302 yen = $1.00; 1973: 269 yen = $1.00;
1974: 292 yen = $1.00; 1975: 297 yen = $1.00; 1976: 296 yen = $1.00;
1977: 266 yen = $1.00; 1978: 207 yen = $1.00

Source: DATAQUEST, Inc.

10.10 Toshiba

Table 10.10.2-1
Toshiba
ESTIMATED SEMICONDUCTOR REVENUES
(Dollars in Millions)

	1972	1973	1974	1975	1976	1977
TOTAL SEMICONDUCTOR	119	134	162	133	233	234
TOTAL I C	30	35	47	49	89	98
BIPOLAR DIGITAL	5	6	8	6	8	10
TTL						
DTL						
ECL						
OTHER						
MOS	12	13	19	24	35	36
PMOS						
NMOS						
CMOS						
LINEAR	13	16	20	19	46	52
INTERFACE						
CONTROL						
ENTERTAINMENT						
OTHER						
HYBRID						
TOTAL DISCRETE	88	93	109	77	129	125
TRANSISTOR						55
SMALL SIGNAL						
POWER						
DIODE						42
SMALL SIGNAL						
POWER						
ZENER						
THYRISTOR						18
OTHER						10
OPTOELECTRONIC	1	6	6	7	15	11
LED LAMPS						
LED DISPLAYS						
COUPLERS						
OTHER						

Source: DATAQUEST, Inc.

10.10 Toshiba

Table 10.10.2-1

Toshiba
ESTIMATED SEMICONDUCTOR REVENUES
(Dollars in Millions)

	1971	1972	1973	1974	1975	1976
TOTAL SEMICONDUCTOR		119	134	152	133	233
TOTAL I C	15	30	35	47	49	89
BIPOLAR DIGITAL	4	5	6	8	6	8
TTL						
DTL						
ECL						
OTHER						
MOS	5	12	13	19	24	35
PMOS						
NMOS						
CMOS						
LINEAR	6	13	16	20	19	46
INTERFACE						
CONTROL						
ENTERTAINMENT						
OTHER						
TOTAL DISCRETE		88	93	99	77	129
TRANSISTOR						
SMALL SIGNAL						
POWER						
DIODE						
SMALL SIGNAL						
POWER						
ZENER						
THYRISTOR						
OTHER						
OPTOELECTRONIC	0	1	5	6	7	15
LED LAMPS						
LED DISPLAYS						
COUPLERS						
OTHER						

Source: DATAQUEST, Inc.

10.10 Toshiba

Table 10.10.2-1

Toshiba
ESTIMATED SEMICONDUCTOR REVENUES
(Dollars in Millions)

	1971	1972	1973	1974
TOTAL SEMICONDUCTOR		119	134	152
TOTAL I C	15	30	35	47
BIPOLAR DIGITAL	4	5	6	8
TTL				
DTL				
ECL				
OTHER				
MOS	5	12	13	19
PMOS				
NMOS				
CMOS				
LINEAR	6	12	15	18
INTERFACE				
CONTROL				
ENTERTAINMENT				
OTHER				
HYBRID	0	1	1	2
TOTAL DISCRETE		88	93	99
TRANSISTOR				
SMALL SIGNAL				
POWER				
DIODE				
SMALL SIGNAL				
POWER				
ZENER				
THYRISTOR				
OTHER				
OPTOELECTRONIC	0	1	6	6

Source: DATAQUEST, Inc.

TriQuint Semiconductor, Inc.

TriQuint Semiconductor, Inc.
Group 700, P.O. Box 4935
Beaverton, OR 97075
(503) 644-3535

Established 1984
No. of Employees: 148

BACKGROUND

TriQuint, a subsidiary of Tektronix, was founded to manufacture and market ultrahigh-speed GaAs ICs. The Company intends to be a full-line supplier of standard commodity parts based on its Q-Logic GaAs foundry process.

Emphasis is on foundry service and multiproject chips. The Company's first products included the Q-Chip array. TriQuint had more than 25 customers by October 1985, which included RCA for an 8-bit 100-mips RISC microprocessor. In 1986, the Company introduced standard GaAs ICs for digital and microwave applications and custom ASIC capability.

Sixty percent of the Company's capacity is used for military/aerospace production; the remainder is used for commercial business.

COMPANY EXECUTIVES

- President--Alan D. Patz (formerly general manager, GaAs ICs, Tektronix)
- Vice President, Marketing and Sales--Dennis C. Powers (formerly sales manager, Tektronix)
- Vice President, Manufacturing--Dr. Gordon Roper (formerly principal engineer, Tektronix)
- Vice President, Foundry Products--Dr. Ajit Rode (formerly IC process engineer, Tektronix)
- Vice President, R&D--Dr. Richard Koyama (formerly technical manager, Tektronix)
- Vice President, Engineering and Digital Products--Dr. Binoy Rosario (formerly design manager, Tektronix)
- Vice President, Microwave Products--Philip Snow

TriQuint Semiconductor, Inc.

- QA/Materials Manager—Richard Allen (formerly division manufacturing manager, Tektronix)
- Director of Finance and Administration—Richard Sasaki (formerly financial manager, Tektronix)

FINANCIAL BACKING

In its initial round of financing, in 1984, TriQuint received 80 percent of its funds from Tektronix Development Co.

STRATEGIC ALLIANCES

- January 1984—TriQuint spun out of Tektronix; a sales agreement was completed.
- May 1986—TriQuint and EEsof teamed to incorporate TriQuint's custom GaAs MMIC models into Touchstone, EEsof's MMIC CAD software. A GaAs MMIC element library was jointly developed.
- June 1987—TRW and TriQuint agreed to jointly develop and supply class-S GaAs devices.
- March 1988—MSC and TriQuint agreed to provide GDS-II type interchangeability and equivalent performance for GaAs ICs. (MSC was shut down in late 1988.)
- October 1988—TriQuint and Gazelle announced a two-year, $16.9 million pact to supply Gazelle with GaAs wafer foundry service.

SERVICES

- Foundry including cell library support
- Design training
- Multiproject chip and wafer processing
- Assembly and test

TriQuint Semiconductor, Inc.

PROCESS TECHNOLOGY

- 1.0u- and 0.5u-GaAs D-MESFET (1A/1D and HA processes)
- 1.0u- and 0.5u-E/D GaAs MESFET (Q-ED process)
- 3-inch and 4-inch wafers, ion implantation
- Complexities to 10,000 gates

PRODUCTS

- TQ1xxx series Q-Logic family of standard logic products
- TQ9xxx series standard MMICs
- TQ6xxx series linear ICs
- QLSI standard cell library (includes 4K ROM cell)

Applications

- TVRO
- Microwave
- Electronic warfare
- Fiber optics
- High-speed EDP
- Workstation interface
- High-speed communications
- Cache memory

FACILITIES

The Company's Beaverton, Oregon, facility has 25,000 square feet devoted to office and assembly, plus a 12,000-square-foot Class 100 clean room.

TriQuint Semiconductor, Inc.

TriQuint Semiconductor, Inc.
Group 700, P.O. Box 4935
Beaverton, OR 97075
(503) 645-8067

Established 1984
No. of Employees: 89

BACKGROUND

TriQuint, a subsidiary of Tektronix, was founded to manufacture and market ultrahigh-speed GaAs ICs. The Company intends to be a full-line supplier of standard commodity parts based on its Q-Logic GaAs foundry process.

Emphasis is on foundry service and multiproject chips. The Company's first products included the Q-Chip array. TriQuint reportedly had more than 25 customers by October 1985, which included RCA for an 8-bit 100-mips RISC microprocessor. In 1986, the Company introduced standard GaAs ICs for digital and microwave applications and custom ASIC capability.

Sixty percent of the Company's capacity is used for military/aerospace production; the remainder is used for commercial business.

COMPANY EXECUTIVES

- President—Alan D. Patz (formerly general manager, GaAs ICs, Tektronix)
- Vice President, Marketing and Sales—Dennis Powers (formerly sales manager, Tektronix)
- Vice President, Manufacturing—Dr. John Roper (formerly principal engineer, Tektronix)
- Vice President, Foundry Products—Dr. Ajit Rode (formerly IC process engineer, Tektronix)
- Vice President, R&D—Dr. Richard Koyama (formerly technical manager, Tektronix)
- Vice President, Engineering—Dr. Binoy Rosario, (formerly design manager, Tektronix)
- QA/Materials Manager—Richard Allen (formerly division manufacturing manager Tektronix)
- Director of Finance and Administration—Richard Sasaki (formerly financial manager, Tektronix)

TriQuint Semiconductor, Inc.

FINANCIAL BACKING

In its initial round of financing, in 1984, TriQuint received 80 percent of its funds from Tektronix Development Co.

STRATEGIC ALLIANCES

- January 1984—TriQuint spun out of Tektronix; a sales agreement was completed.
- May 1986—TriQuint and EEsof teamed to incorporate TriQuint's custom GaAs MMIC models into Touchstone, EEsof's MMIC CAD software. A GaAs MMIC element library was jointly developed.

SERVICES

- Foundry
- Design training
- Multiproject chip and wafer processing
- Assembly and test

PROCESS TECHNOLOGY

- 1.0u- and 0.5u-GaAs D-MESFET
- 1.0u- and 0.5u- E/D GaAs MESFET (Q-ED process)
- 3-inch wafers, ion implantation
- Complexities to 6,000 gates

PRODUCTS

- TQ1xxx series Q-Logic family of standard logic products
- TQ9xxx series standard MMICs

TriQuint Semiconductor, Inc.

Applications

- TVRO
- Microwave
- Electronic warfare
- Fiber optics
- High-speed EDP
- Workstation interface
- High-speed communications
- Cache memory

FACILITIES

The Company's Beaverton, Oregon, facility has 25,000 square feet devoted to office and assembly, plus a 12,000-square-foot class 100 clean room.

(Page intentionally left blank)

TRW Incorporated

1900 Richmond Road
Cleveland, Ohio 44124
Telephone: (216) 291-7000
Fax: (216) 291-7629
Dun's Number: 00-417-9453

Date Founded: 1916

CORPORATE STRATEGIC DIRECTION

TRW Incorporated designs, manufactures, and sells products for the performance of systems engineering, research, and technical services for industry and the United States Government. TRW concentrates on four segments: Space & Defense, Automotive, Information Systems, and Other. TRW's main products and services included spacecraft, software and systems engineering support services, electronic systems, equipment and services, automotive original and replacement equipment, and information systems. TRW is a top 10 player in defense electronics, as well as a leader in satellite technology and command, control, communications, and intelligence.

Total revenue increased 5.1 percent to $7.3 billion* in fiscal year 1989 from $7.0 billion in fiscal year 1988. For fiscal year 1989, US sales accounted for 72.0 percent of total revenue and international sales for 28.0 percent. The Space & Defense segment was responsible for 43.0 percent of TRW's total revenue and 40.0 percent of its operating profit for fiscal year 1989; the Automotive segment was responsible for 47.0 and 49.0 percent, respectively; and the Information Systems segment was responsible for 10.0 and 11.0 percent, respectively. Net income totaled $263.0 million for fiscal year 1989, representing a 0.8 percent growth over fiscal year 1988. TRW employs 74,300 people throughout the world.

In September 1989, TRW announced a corporate reorganization that was effective January 1, 1990. The reorganization goal is to better channel the Space & Defense segment's operations. Through the combining of the Federal Systems Group and the Defense Systems Group, TRW hopes to focus better on systems integration and software markets. To establish an avionics and surveillance group, advanced electronics operations were integrated with ESL, Inc. In the future, TRW plans to concentrate more resources on non-Department of Defense (DOD) federal information systems integration markets and antisubmarine warfare markets.

During 1989, TRW was awarded several large contracts: a $104.6 million air force contract for MX missile-engineering support, $179 million in Strategic Defense Initiative-related laser contracts, a $132.1 million army contract for communications equipment, a $125 million USAF contract for engineering support services, and a $102 million air force contract for space-defense surveillance system. TRW signed two contracts related to the multi-billion-dollar new government program, Global Change Initiative, a long-range project to use technology to help understand and preserve the planet's environment. One contract is a 15-month study to develop a preliminary design for the Earth Observing System Data and Information System; the other is to develop and manufacture key instruments for three satellites in that program.

More detailed information is available in Tables 1 through 3, which appear after "Business Segment Strategic Direction" and present corporate highlights and revenue by region and distribution channel. Table 4, a comprehensive financial statement, is at the end of this profile.

BUSINESS SEGMENT STRATEGIC DIRECTION

Space & Defense

TRW's Space & Defense segment includes spacecraft, software and systems engineering support services, and electronic systems, equipment, and services. TRW designs and manufactures spacecraft equipment, propulsion subsystems, electro-optical and

*All dollar amounts are in US dollars.

instrument systems, spacecraft payloads, high-energy lasers, laser technology, and other high-reliability components. The software and systems engineering support services focus on the fields of antisubmarine warfare, security and counterterrorism, undersea surveillance, and other high-technology space and defense mission support systems. The electronic systems, equipment, and services sector encompass the design and manufacturing of communication systems, avionics systems, and other electronic technologies for space and defense applications. In fiscal years 1989 and 1988, sales to the United States Government accounted for 96 and 97 percent, respectively, of Space & Defense segment sales.

Automotive

TRW's Automotive segment concentrates on automotive original and replacement equipment. TRW designs, manufactures, and markets a wide range of steering, suspension, engine, safety, engineered fastening, electrical, electronic, electromechanical, hydraulic, and other components and systems as original equipment for cars, trucks, buses, farm machinery, and off-highway vehicles. For use as replacement parts, TRW markets a broad line of engine and chassis parts and a general service line for cars, trucks, off-highway vehicles, and other miscellaneous uses.

Information Systems

TRW's Information Systems segment sells consumer and business credit information services, information systems engineering and integration services, and real estate information services for commercial applications, as well as maintenance services and support systems for computers and computer-related equipment.

Other

This segment includes solids control equipment and services sold primarily for use in oil and gas drilling, on-site environmental waste reduction and clean-up services, and coal combustion systems.

Further Information

For more information on TRW's business segments, please contact Dataquest's Semiconductor Applications Markets.

Table 1
Five-Year Corporate Highlights (Millions of US Dollars)

	1985	1986	1987	1988	1989
Five-Year Revenue	$5,917.2	$6,036.0	$6,821.0	$6,982.0	$7,340.0
Percent Change	-	2.01	13.01	2.36	5.13
Capital Expenditure	$412.0	$431.0	$452.0	$417.0	$452.0
Percent of Revenue	6.96	7.14	6.63	5.97	6.16
R&D Expenditure	NA	NA	$210.0	$225.0	$256.0
Percent of Revenue	0	0	3.08	3.22	3.49
Number of Employees	93,200	78,600	77,900	73,200	74,300
Revenue ($K)/Employee	$63.49	$76.79	$87.56	$95.38	$98.79
Net Income	($7.1)	$218.0	$243.0	$261.0	$263.0
Percent Change	-	3,170.42	11.47	7.41	0.77

1989 Calendar Year	Q1	Q2	Q3	Q4
Quarterly Revenue	$1,785.00	$1,844.00	$1,792.00	$1,919.00
Quarterly Profit	$69.00	$70.00	$60.00	$64.00

NA = Not available

Source: TRW Incorporated
Annual Reports and Forms 10-K
Dataquest (1990)

Table 2
Revenue by Geographic Region (Percent)

Region	1985	1986	1987	1988	1989
North America	78.71	74.69	74.27	72.36	72.02
International	21.29	25.31	25.73	27.64	27.98
Europe	11.90	16.73	17.61	18.19	18.32
Others	9.39	8.58	8.12	9.45	9.66

Source: TRW Incorporated
Annual Reports and Forms 10-K
Dataquest (1990)

Table 3
Revenue by Distribution Channel (Percent)

Channel	1988	1989
Direct Sales	90.00	90.00
Indirect Sales	10.00	10.00

Source: Dataquest (1990)

1989 SALES OFFICE LOCATIONS

North America—57
Japan—2
Europe—3

MANUFACTURING LOCATIONS

As of December 1988, TRW's operations included 51 manufacturing facilities located in 14 states throughout the United States and 79 manufacturing facilities in 14 other countries. Of the domestic manufacturing facilities, 39 percent were used by the Space & Defense segment, 59 percent were used by the Automotive segment, and 2 percent were used by the Other segment. Of the foreign manufacturing facilities, 4 percent were used by the Space & Defense segment, 95 percent were used by the Automotive segment, and 1 percent was used by the Other segment.

SUBSIDIARIES

North America

ESL Incorporated
TRW Canada Limited
TRW Components International Inc.
TRW Export Sales Corporation
TRW Export Trading Corporation
TRW Fastening System Inc.
TRW International Finance Corporation
TRW Jeudy Inc.
TRW Valves Limited
TRW Vehicle Safety Systems, Inc.

Europe

Blucher Verwaltungs-GmbH
Tokai TRW & Co. Ltd.
TRW Auto Parts Limited
TRW Cam Gears Limited
TRW Ceramics Limited
TRW Connectors Limited
TRW Daut & Rietz GmbH & Co. Kg
TRW DO Brasil, S.A. (98.78%)
TRW Ehrenreich GmbH & Co. Kg
TRW European Tractor Electronics Co. Limited
TRW GmbH Fur Industrielle Beteiligungen
TRW Italia S.p.A.
TRW Messmer GmbH & Co. Kg
TRW Nelson Bolzenschweiss-Technik GmbH
TRW Presswerk Krefeld GmbH & Co. Kg
TRW Reda Pump Limited
TRW Repa GmbH
TRW Repa Limited (90%)
TRW Sabelt S.p.A.
TRW Thompson GmbH & Co. Kg
TRW Transportation Electronics Limited
TRW U.K. Limited
TRW United-Carr GmbH & Co. Kg
TRW United-Carr Limited
TRW Vehicle Safety Systems Limited

ALLIANCES, JOINT VENTURES, AND LICENSING AGREEMENTS

1990

Israel Aircraft Industries (IAI)/Dornier
TRW, IAI, and Dornier have jointly formed a minicommunications satellite development team.

Motorola Incorporated
TRW and Motorola together have built the world's first multimillion-device SuperChip. The CPUAX SuperChip is an advance microelectronic chip containing approximately 4 million 0.5-micron devices able to perform 200 million floating-point operations per second.

Dana Corporation
TRW and Dana will jointly design, engineer, and manufacture vehicle chassis modules. The joint venture is aimed at cutting development costs.

1989

CrossComm Corporation
An original equipment manufacturer and joint development agreement between TRW and CrossComm stated that CrossComm will supply its ILAN hardware and software to TRW for the next five years.

FEI Microwave, Inc.
A five-year original equipment manufacturer distribution agreement was made in which FEI Microwave will market and distribute microwave and millimeter-wave monolithic ICs for TRW.

Rane Corporation
TRW and Rane jointly formed Rane Power Steering, which will produce and market power steering gears for commercial vehicles.

Toyoda Machine Works, Ltd.
TRW and Toyoda Machine Works, Ltd., set up a joint venture in the United States to produce power steering pumps. The new company, Toyoda TRW Automotive Inc., is held 90 percent by Toyoda Machine and 10 percent by TRW.

Boge AG
TRW formed a joint venture company with Boge AG. Part of the joint venture entitles TRW to sell Boge shock absorbers and struts to North American vehicle producers. Additionally, Boge will license its advanced suspension technology to the joint venture company for use in North America.

Norment Industries Inc.
An agreement was made that linked TRW and Norment Industries' capabilities and expertise in the design, distribution, management, and maintenance of security products, systems, and services for commercial industrial and public applications. The two companies will jointly perform work in Japan and the Pacific Basin.

International Rectifier Corporation
Under a three-year agreement, TRW Components International Division will act as the exclusive overseas sales agent for International Rectifier Corporation's radiation-hardened (rad-hard) HEXFET power MOSFETs.

IBM
TRW licensed its image-processing technology to IBM for development of a new check-processing system for large banks.

1988

Ramtron Corporation
TRW's Microelectronics Center has licensed Ramtron's ferroelectronic random-access memory (FRAM) technology. TRW will combine the FRAM technology with its rad-hard VHSIC CMOS process.

MERGERS AND ACQUISITIONS

1990

Monitoring Technology
TRW acquired 12 percent of Monitoring Technology. TRW wants to help Monitoring Technology develop its digital signal device that finds potential machine failures.

Societa Industria Prodotti Elettrici Affini
TRW acquired 70 percent of Societa Industria, a producer of electromechanical and electronic components for automotive applications. TRW renamed the company TRW SIPEA.

1989

Title USA Insurance Corporation
TRW acquired Title USA Insurance, which provides title insurance services in 26 states.

Active Control Systems, Inc.
TRW acquired Active Control Systems, enabling TRW to advance its development of active suspension systems and find applications for this product to production vehicles.

Industrias Pobesa SA
TRW acquired the assets of Industrias Pobesa SA, a manufacturer of wiring assembles for trucks and off-highway vehicles.

Talley Industries
TRW acquired Talley Industries' vehicle airbag business.

Chilton
TRW acquired Chilton from Borg-Warner. Chilton will operate as part of TRW Information Systems Group.

Vitec Information Technologies
TRW acquired 10 percent of Visual Information Technologies.

KEY OFFICERS

Joseph T. Gorman
Chairman of the board, president, and chief executive officer

J. R. Burnett
Executive vice president and deputy general manager, Space & Defense

Edsel D. Dunford
Executive vice president, Space & Defense

Jerry K. Myers
Executive vice president, Automotive

D. Van Skilling
Executive vice president, Information Systems and Services

PRINCIPAL INVESTORS

TRW Employee Stock Ownership and Savings Plan—16.2 percent

Table 4
Comprehensive Financial Statement
Fiscal Year Ending December
(Millions of US Dollars, except Per Share Data)

Balance Sheet	1985	1986	1987	1988	1989
Total Current Assets	$1,683.9	$1,749.0	$1,986.0	$2,105.0	$2,295.0
Cash	63.9	85.0	145.0	127.0	114.0
Receivables	851.1	999.0	1,233.0	1,286.0	1,431.0
Marketable Securities	NA	NA	NA	NA	NA
Inventory	518.9	513.0	487.0	419.0	480.0
Other Current Assets	250.0	152.0	121.0	273.0	270.0
Net Property, Plants	$1,446.2	$1,637.0	$1,800.0	$1,793.0	$1,954.0
Other Assets	$605.3	$523.0	$592.0	$544.0	$1,010.0
Total Assets	$3,735.4	$3,909.0	$4,378.0	$4,442.0	$5,259.0
Total Current Liabilities	$1,429.3	$1,352.0	$1,496.0	$1,396.0	$1,794.0
Long-Term Debt	$775.1	$913.0	$990.0	$1,036.0	$1,218.0
Other Liabilities	$516.1	$446.0	$475.0	$444.0	$498.0
Total Liabilities	$2,720.5	$2,711.0	$2,961.0	$2,876.0	$3,510.0
Total Shareholders' Equity	$1,014.9	$1,198.0	$1,417.0	$1,566.0	$1,749.0
Converted Preferred Stock	1.3	1.0	1.0	1.0	1.0
Common Stock	36.3	37.0	37.0	38.0	38.0
Other Equity	47.2	105.0	178.0	169.0	194.0
Retained Earnings	930.1	1,055.0	1,201.0	1,358.0	1,516.0
Total Liabilities and Shareholders' Equity	$3,735.4	$3,909.0	$4,378.0	$4,442.0	$5,259.0

Income Statement	1985	1986	1987	1988	1989
Revenue	$5,917.2	$6,036.0	$6,821.0	$6,982.0	$7,340.0
US Revenue	4,657.4	4,508.0	5,066.0	5,052.0	5,286.0
Non-US Revenue	1,259.8	1,528.0	1,755.0	1,930.0	2,054.0
Cost of Sales	$4,585.9	$4,678.0	$5,290.0	$5,565.0	$5,779.0
R&D Expense	NA	NA	$210.0	$225.0	$256.0
SG&A Expense	$928.3	$953.0	$1,005.0	$780.0	$780.0
Capital Expense	$412.0	$431.0	$452.0	$417.0	$452.0
Pretax Income	$235.2	$370.0	$415.0	$420.0	$399.0
Pretax Margin (%)	3.97	6.13	6.08	6.02	5.44
Effective Tax Rate (%)	43.10	41.20	41.40	37.90	34.10
Net Income	($7.1)	$218.0	$243.0	$261.0	$263.0
Shares Outstanding, Millions	29.0	58.9	59.7	60.2	60.6
Per Share Data					
Earnings	($0.27)	$3.55	$3.95	$4.23	$4.25
Dividend	$3.00	$3.05	$1.60	$1.63	$1.72
Book Value	$33.96	$19.93	$23.41	$25.70	$25.70

Table 4 (Continued)
Comprehensive Financial Statement
Fiscal Year Ending December
(Millions of US Dollars, except Per Share Data)

Key Financial Ratios	1985	1986	1987	1988	1989
Liquidity					
Current (Times)	1.18	1.29	1.33	1.51	1.28
Quick (Times)	0.82	0.91	1.00	1.21	1.01
Fixed Assets/Equity (%)	142.50	136.64	127.03	114.50	111.72
Current Liabilities/Equity (%)	140.83	112.85	105.58	89.14	102.57
Total Liabilities/Equity (%)	268.06	226.29	208.96	183.65	200.69
Profitability (%)					
Return on Assets	(0.38)	5.70	5.86	5.92	5.42
Return on Equity	(1.40)	19.70	18.59	17.50	15.87
Profit Margin	(0.12)	3.61	3.56	3.74	3.58
Other Key Ratios					
R&D Spending % of Revenue	0	0	3.08	3.22	3.49
Capital Spending % of Revenue	6.96	7.14	6.63	5.97	6.16
Employees	93,200	78,600	77,900	73,200	74,300
Revenue ($K)/Employee	$63.49	$76.79	$87.56	$95.38	$98.79
Capital Spending % of Assets	11.03	11.03	10.32	9.39	8.59

NA = Not available

Source: TRW Incorporated
Annual Reports and Forms 10-K
Dataquest (1990)

TRW Optoelectronics

TRW Optoelectronics
1215 West Crosby Road
Carrollton, TX 75006
(214) 323-2200

Established 1969
Number of Employees: 2,000

BACKGROUND

TRW is a diversified high-technology, multinational company. Its areas of work include electronics and space systems, automotive vehicular products, drilling and pumping systems and products, and others.

TRW's Optoelectronics Division is the largest manufacturer of IR optoelectronic components in the world. The division's R&D efforts are directed toward four growth areas: Hall-effect products, advanced couplers, advanced encoders, and power products.

COMPANY EXECUTIVES

- Vice President and General Manager—Kenneth A. Hagge
- Director of Marketing—Charles Bates

PROCESS TECHNOLOGY

The Company uses GaAs and GaAlAs epi growth on GaAs wafers.

PRODUCTS

- IR emitters
- Photosensors
- Reflective sensors
- Optically coupled isolators
- Photologic and Hallogic sensors
- Slotted switches (interrupters)
- Chips

TRW Optoelectronics

Applications

The Company's products are used in electronic and electromechanical subsystems and systems.

FACILITIES

TRW Optoelectronics is located in Carrollton, Texas.