Telecommunications Equipment

INDUSTRY PROFILE

Industry, Science and Technology Canada
Industrie, Sciences et Technologie Canada

Business Service Centres / International Trade Centres

Industry, Science and Technology Canada (ISTC) and External Affairs and International Trade Canada (EAITC) have established information centres in regional offices across the country to provide clients with a gateway into the complete range of ISTC and EAITC services, information products, programs and expertise in industry and trade matters. For additional information, contact one of the offices listed below:

Newfoundland

Atlantic Place
Suite 504, 215 Water Street
P.O. Box 8950
ST. JOHN'S, Newfoundland
A1B 3R9
Tel.: (709) 772-ISTC
Fax: (709) 772-5093

Prince Edward Island

Confederation Court Mall
National Bank Tower
Suite 400, 134 Kent Street
P.O. Box 1115
CHARLOTTETOWN
Prince Edward Island
C1A 7M8
Tel.: (902) 566-7400
Fax: (902) 566-7450

Nova Scotia

Central Guaranty Trust Tower
5th Floor, 1801 Hollis Street
P.O. Box 940, Station M
HALIFAX, Nova Scotia
B3J 2V9
Tel.: (902) 426-ISTC
Fax: (902) 426-2624

New Brunswick

Assumption Place
12th Floor, 770 Main Street
P.O. Box 1210
MONCTON, New Brunswick
E1C 8P9
Tel.: (506) 857-ISTC
Fax: (506) 851-2384

Quebec

Suite 3800
800 Tour de la Place Victoria
P.O. Box 247
MONTREAL, Quebec
H4Z 1E8
Tel.: (514) 283-8185
1-800-361-5367
Fax: (514) 283-3302

Ontario

Dominion Public Building
4th Floor, 1 Front Street West
TORONTO, Ontario
M5J 1A4
Tel.: (416) 973-ISTC
Fax: (416) 973-8714

Manitoba

Newport Centre
8th Floor, 330 Portage Avenue
P.O. Box 981
WINNIPEG, Manitoba
R3C 2V2
Tel.: (204) 983-ISTC
Fax: (204) 983-2187

Saskatchewan

S.J. Cohen Building
Suite 401, 119 - 4th Avenue South
SASKATOON, Saskatchewan
S7K 5X2
Tel.: (306) 975-4400
Fax: (306) 975-5334

Alberta

Canada Place
Suite 540, 9700 Jasper Avenue
EDMONTON, Alberta
T5J 4C3
Tel.: (403) 495-ISTC
Fax: (403) 495-4507

Suite 1100, 510 - 5th Street S.W.
CALGARY, Alberta
T2P 3S2
Tel.: (403) 292-4575
Fax: (403) 292-4578

British Columbia

Scotia Tower
Suite 900, 650 West Georgia Street
P.O. Box 11610
VANCOUVER, British Columbia
V6B 5H8
Tel.: (604) 666-0266
Fax: (604) 666-0277

Yukon

Suite 210, 300 Main Street
WHITEHORSE, Yukon
Y1A 2B5
Tel.: (403) 667-3921
Fax: (403) 668-5003

Northwest Territories

Precambrian Building
10th Floor
P.O. Bag 6100
YELLOWKNIFE
Northwest Territories
X1A 2R3
Tel.: (403) 920-8568
Fax: (403) 873-6228

ISTC Headquarters

C.D. Howe Building
1st Floor, East Tower
235 Queen Street
OTTAWA, Ontario
K1A 0H5
Tel.: (613) 952-ISTC
Fax: (613) 957-7942

EAITC Headquarters

InfoExport
Lester B. Pearson Building
125 Sussex Drive
OTTAWA, Ontario
K1A 0G2
Tel.: (613) 993-6435
1-800-267-8376
Fax: (613) 996-9709

Publication Inquiries

For individual copies of ISTC or EAITC publications, contact your nearest Business Service Centre or International Trade Centre. For more than one copy, please contact:

For Industry Profiles:
Communications Branch
Industry, Science and Technology Canada
Room 704D, 235 Queen Street
OTTAWA, Ontario
K1A 0H5
Tel.: (613) 954-4500
Fax: (613) 954-4499

For other ISTC publications:
Communications Branch
Industry, Science and Technology Canada
Room 216E, 235 Queen Street
OTTAWA, Ontario
K1A 0H5
Tel.: (613) 954-5716
Fax: (613) 952-9620

For EAITC publications:
InfoExport
Lester B. Pearson Building
125 Sussex Drive
OTTAWA, Ontario
K1A 0G2
Tel.: (613) 993-6435
1-800-267-8376
Fax: (613) 996-9709

Canada

(V.8.93.01)

I N D U S T R Y P R O F I L E

1990–1991

TELECOMMUNICATIONS EQUIPMENT

FOREWORD

In a rapidly changing global trade environment, the international competitiveness of Canadian industry is the key to growth and prosperity. Promoting improved performance by Canadian firms in the global marketplace is a central element of the mandates of Industry, Science and Technology Canada and International Trade Canada. This Industry Profile is one of a series of papers in which Industry, Science and Technology Canada assesses, in a summary form, the current competitiveness of Canada's industrial sectors, taking into account technological, human resource and other critical factors. Industry, Science and Technology Canada and International Trade Canada assess the most recent changes in access to markets, including the implications of the Canada-U.S. Free Trade Agreement. Industry participants were consulted in the preparation of the profiles.

Ensuring that Canada remains prosperous over the next decade and into the next century is a challenge that affects us all. These profiles are intended to be informative and to serve as a basis for discussion of industrial prospects, strategic directions and the need for new approaches. This 1990–1991 series represents an updating and revision of the series published in 1988–1989. The Government will continue to update the series on a regular basis.

Michael H. Wilson
Minister of Industry, Science and Technology
and Minister for International Trade

Introduction

The Canadian information technologies (IT) industry sector consists of approximately 12 000 firms employing 287 000 people. Services and products from these companies are worth more than $40.2 billion.[1] They produce nearly all types of data sensing, data processing and communications hardware and software. They also provide consulting and other services relating to computer use.

Companies in the IT sector use established and emerging technologies and generally operate on the leading edge of production techniques as well as product research and development (R&D). The IT sector is of major strategic significance to Canada. Not only is it a prominent industrial sector in its own right, but also it acts as an enabling technology that has broad applications across the full spectrum of Canadian business activity. To more fully appreciate the impact of the IT sector on the Canadian economy, consult all six of the IT profiles in this series:

- *Computer Services and Software*
- *Computers and Peripheral Equipment*
- *Consumer Electronics*
- *Instrumentation*
- *Microelectronics*
- *Telecommunications Equipment*

Related industry profiles have also been published on *Geomatics Industries* and *Space*.

[1]Previously published Industry, Science and Technology Canada (ISTC) data do not include telecommunications carriers in the IT sector. Their inclusion now is in recognition of their important role in the sector.

Structure and Performance

Structure

The telecommunications equipment industry comprises manufacturers of equipment used for the transmission, switching and distribution of voice, numerical and video information. The equipment is used in public telecommunications networks and private networks. The industry manufactures terminal devices (telephone receivers including various additional features to basic "telephones"), public and private switches, multiplexers, data network equipment (distinct from voice transmission equipment), microwave and fibre optic transmitters/receivers, mobile radio (including cellular) equipment and other related equipment. The industry also manufactures products used in producing, broadcasting and distributing television and radio signals. Two elements of this industry are specifically excluded from this profile: fibre optic and copper cable are included in *Electrical Wire and Cable*, and communications equipment for defence purposes is covered in the *Defence Electronics* and *Space* profiles.

In 1990, shipments for this industry were worth $5 855.5 million, slightly more than the Canadian market of $5 782.5 million (Figure 1). With imports of $1 909 million and exports of $1 982 million, the sector had a small trade surplus of $73 million in 1990. This surplus compares with trade deficits of $33 million in 1991 and $249 million in 1989, and a surplus of $716 million in 1984. In 1988, the industry employed 46 925 people, up 12 percent since 1984 (Figure 2). Employment in 1990 is estimated to be in excess of 48 000 people.

The principal customers for telecommunications equipment are telecommunications common carriers, which use the equipment to offer a variety of communications services. With extensive deregulation in the service industry, which has permitted customers to own their terminal equipment and private networks, a strong secondary market of sales to residential and business customers has developed.

The value of the world market for telecommunications equipment in 1990 is estimated to be about C$130 billion. The worldwide industry can be divided into three groups. The first, and dominating, group contains a small number of very large, vertically integrated, R&D-based companies. They make a wide range of products, but their core business is public switching products. Alcatel, AT&T, Ericsson, NEC, Northern Telecom and Siemens are the six largest international companies in this group. The second group includes long-established firms that have a strong capability in telecommunications but are not major participants in the public switching market. Bosch, Digital Equipment, Harris, IBM, Motorola, Philips and Rockwell are included in this group. The third group consists of specialty companies that have a narrow product line deriving from new technologies and applications.

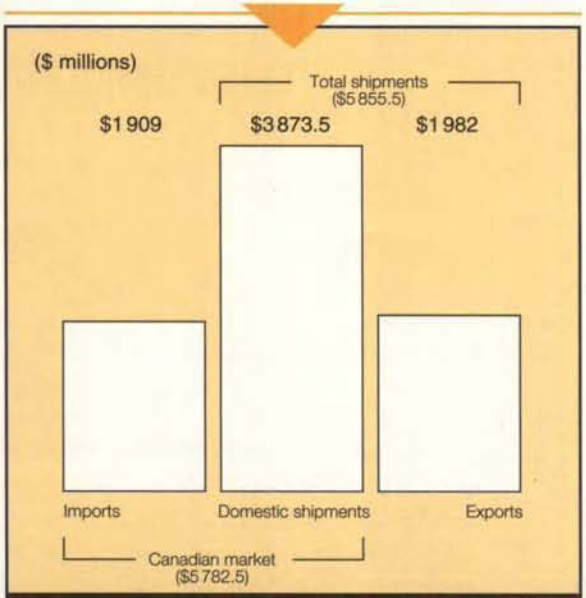

Figure 1 — Imports, Exports and Domestic Shipments, 1990

The Canadian telecommunications equipment industry has one world-scale player from the first group, Northern Telecom, with 1991 world revenues of $9.4 billion, 39 percent of which was generated in Canada.[2] Ericsson has been a successful supplier of cellular equipment and has established a centre in Canada for cellular R&D activities. With the recent acquisition of Canada Wire and Cable and the transmission division of Rockwell, Alcatel's presence in this business in Canada has also grown appreciably. AT&T, NEC and Siemens have yet to establish R&D or manufacturing operations in Canada.

There are no indigenous Canadian companies in the second category, but a few foreign-based suppliers, including Motorola and Harris, do have subsidiaries in Canada that are involved in telecommunications-related activity.

Canada has a significant number of players in the third category, of which four — Gandalf, Glenayre, Mitel and Newbridge — have annual revenues exceeding $100 million.

[2]Northern Telecom Limited, *Annual Report*, 1991. Since Northern Telecom Limited reports earnings in U.S. dollars, these numbers have been converted using the Bank of Canada's annual rate of C$1.1458 for 1991.

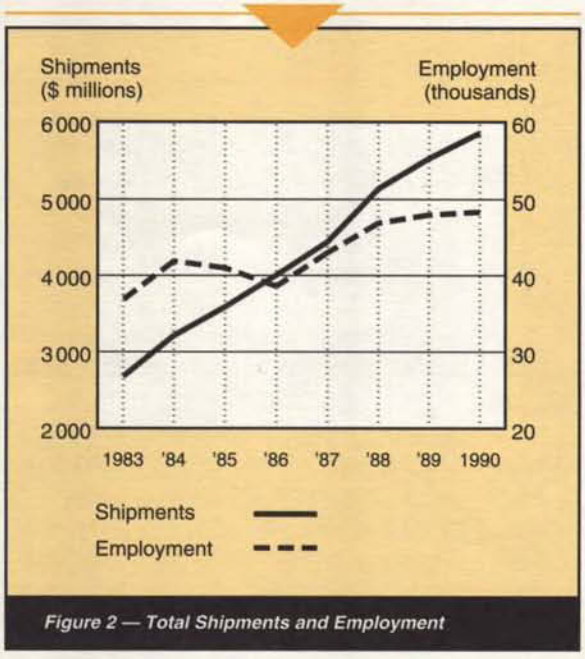

Figure 2 — Total Shipments and Employment

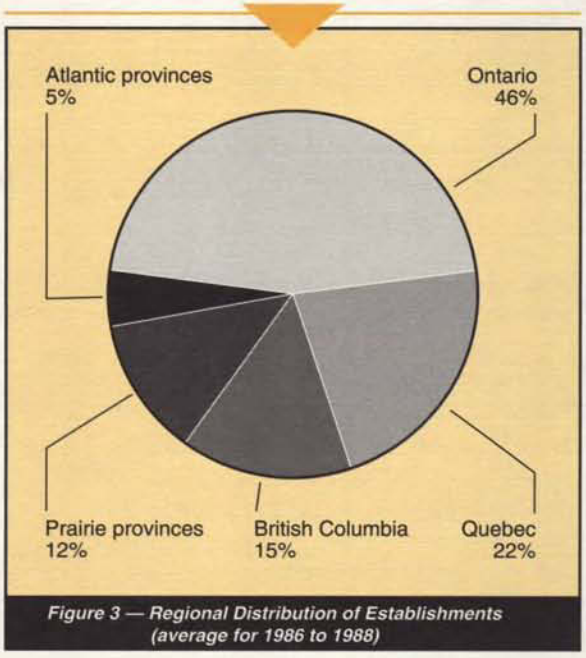

Figure 3 — Regional Distribution of Establishments (average for 1986 to 1988)

Overall, it is estimated that 31 companies account for over 90 percent of the industry's output. Domestic ownership in the industry is significant.

Geographically, Canadian telecommunications equipment development and manufacturing activity is concentrated in Ontario and Quebec, with growing pockets of expertise in British Columbia (Figure 3). Capability outside these locations is largely provided by Northern Telecom, which has manufacturing plants or affiliates in all provinces except New Brunswick, where there is a sales-and-service facility as well as telemarketing.

Historically, telecommunications equipment suppliers in all countries marketed their products and services to a limited number of government-regulated or government-owned monopoly carriers, resulting in close ties and long-term relationships developing between equipment suppliers and carriers. The 1980s was a decade of national and international market liberalization in the provision of telecommunications services, a movement that is profoundly altering traditional relationships. Amid the general increasing openness of national markets, additional potential is generated by expansion and growth of the European Community (EC). The EC is adopting consistent standards to be used by all member countries. These new opportunities are fostering mergers, acquisitions and strategic alliances as companies with a national market focus attempt to develop global marketing capabilities.

Performance

Historically, Canadian shipments of telecommunications equipment have tended to grow at an average annual rate of about 6 percent, reflecting the judicial liberalization of major equipment markets, the insistence on increased competition among interconnected telecom suppliers, the change-over from analogue to digital equipment and a growing market for telecommunications services. Much faster growth, on the order of 15 percent per year, prevailed in the late 1970s and early 1980s, reflecting the expanding use of data communications, the implementation of digital technology and the expansion by Canadian telecommunications equipment manufacturers into the U.S. market.

Since the 1981–1982 recession, growth in shipments has tended to follow the long-term rate of about 6 percent. Real growth figures also understate growth because quality improvements are not captured. During the 1980s, these improvements included better sound quality, increased numbers of functions on telephones, increased capacity and simultaneous transmission of voice, data and images. Modest measured growth rates reflect the mature nature of the Canadian market and increased competition from foreign suppliers. They also reflect a tendency for firms to serve foreign markets from abroad rather than export from Canada. Export growth may have been constrained by the relative maturity of the U.S. market, by the need for Canadian manufacturers to undertake value-added activity in the United States in order to sustain

market share, and by the difficulty of achieving consistent, sustained success in other foreign markets.

Import growth has been substantial in recent years. Japan's share of Canadian imports has doubled from 1984 to 1989, largely at the expense of U.S. exporters. Part of this increase in Japanese imports results from the aggressive Japanese penetration of the U.S. market; it also reflects Japanese strengths in high-volume, consumer-type telecommunications equipment and in such new products as facsimile machines and cellular telephones.

R&D investment grew strongly through 1987, representing about 22 percent of shipments in every year from 1983 to 1987. R&D's share of value shipped has declined steadily since then, dropping below 18 percent of shipments in 1990. In absolute terms, spending has levelled off at slightly above $1 billion in 1988, 1989 and 1990.

The profitability of the Canadian industry was weak from 1988 to 1991. While Northern Telecom's profits have remained strong, many of the other companies have struggled. Others, such as Tie/communications and Microtel, have partially or totally abandoned the manufacturing of telecommunications equipment in the face of declining market shares and financial difficulties. Many of the smaller, high-growth firms have not been able to achieve consistent profitability, albeit 1992 profit levels and stock market results indicate some firms are doing well. Both Newbridge and S.R. Telecom shares more than doubled their value in the first 11 months of 1992. Northern Telecom's profitability has been achieved through investment in advanced manufacturing technology, the successful introduction of new products and aggressive cost-cutting, including the closure or sale of four Canadian manufacturing plants in the 1989 to 1991 period while opening up four other Canadian facilities. Other firms, such as Mitel and Gandalf, have consolidated manufacturing activity.

Strengths and Weaknesses

Structural Factors

The three major strengths of the Canadian telecommunications equipment industry are its technology base, the presence of Northern Telecom and the sophisticated and advanced domestic market. It is complemented by space programs that have emphasized communications. Countering these strengths is the absence from the Canadian scene of many of the other key world players and the small size of the domestic market.

Telecommunications equipment manufacturing is a high-technology activity, requiring enormous investments in R&D. The major international firms all have strong R&D capabilities, including the ability to design and fabricate integrated circuits. The industry accounts for 20 percent of all the industrial R&D done in Canada, an impressive investment considering that it contributes less than 1 percent to Canada's gross domestic product (GDP). Successful firms in the industry spend in excess of 10 percent of their revenues on R&D. Northern Telecom's R&D expenditures, for example, have grown from 5.7 percent of 1977 sales of $1.1 billion to 11.6 percent or $1.09 billion of 1991 sales of $9.4 billion.[3] Essential to Northern Telecom's technological success is Bell-Northern Research (BNR), its 70 percent-owned affiliate, with headquarters and major laboratories in Canada. A sample of 11 smaller Canadian companies reported that R&D expenditures averaged 12.6 percent of revenue, ranging from a low of 5 percent of revenue to a high of 21.2 percent.

The existence of a Canadian-based multinational, Northern Telecom, as the third largest global telecommunications equipment supplier in terms of annual revenues with a broad product portfolio has been a significant strength for this industry in Canada. The growth of Northern Telecom in foreign markets and its acquisitions, recently of STC PLC in the United Kingdom, have lessened its dependence on the Canadian market. Nonetheless, while 1991 sales in Canada accounted for 39 percent of Northern Telecom's revenues, over 40 percent of its manufacturing and administrative costs, and 60 to 70 percent of its R&D capacity, are situated in Canada. It has given Canada recognition as an important contributor to the industry's swiftly changing technological development. In addition, it has provided a steady and continuing market for suppliers of parts and components. Many of the other indigenous telecommunications manufacturers are direct descendants of Northern Telecom.

In June 1992, Northern Telecom established an alliance with Matra SA of France. The deal involved Northern Telecom's purchase of 20 percent of Matra Communications, a loan of $154 million to be converted to another 20 percent of the common shares in 1995 and a 7 percent purchase of MMB, Matra's parent holding company. Through this deal, Northern Telecom gains access to radio technologies that complement its switching expertise and strengthens its foothold within the continental members of the EC.

[3]Northern Telecom Limited, *Annual Report*, 1991. Since Northern Telecom Limited reports earnings in U.S. dollars, these numbers have been converted using the Bank of Canada's annual rate of C$1.1458 for 1991.

The Canadian market is one of the most advanced and sophisticated in the world. The stability of the domestic market, its sophisticated and diverse nature, and the willingness to innovate have contributed significantly to the development of the Canadian telecommunications supply structure. In addition, the long-term business relationship between the telephone operating companies and the leading equipment suppliers has provided the latter with the financial strength to pay for growing investment in product development and the track record to convince potential customers of the quality of Canadian products. On the other hand, the Canadian market is not large, and the success of a few companies in achieving substantial market penetration has made market share difficult to obtain for other potential participants such as new Canadian firms and subsidiaries of leading foreign-based suppliers.

The strengths of the small and medium-sized enterprises in the Canadian telecommunications industry reside in the technological excellence of their products and in their ability to identify and fill market niches. Individual firms characteristically demonstrate a highly cyclical performance, with periods of rapid growth and profitability alternating with periods of stagnation and difficulty when their products are eclipsed or existing niches have been filled before new ones have been identified. The dependence on niche markets gives Canada disjointed capabilities, which have been detrimental to its ability to compete with more-integrated suppliers from other countries when serving markets in less developed countries. The Canadian industry as a whole has strengths in systems integration capability, but few firms have been willing and able to undertake prime contractor responsibility for major offshore systems projects.

Trade-Related Factors

Canadian tariffs on telecommunications equipment range from 10.3 percent to 17.8 percent, while U.S. tariffs vary between 4.7 percent and 8.5 percent. These tariffs apply to goods that originate outside Canada or the United States. The Canada-U.S. Free Trade Agreement (FTA), implemented on 1 January 1989, in its initial round and in the subsequent acceleration rounds, has removed the tariffs on all telecommunications products in which there is significant trade between the two countries. Tariffs on telecommunications products going into the EC range from 5.1 percent to 7.5 percent. The Japanese tariff rate is 5.1 percent.

Also important as a factor in international trade have been a number of non-tariff barriers (NTBs). A prominent NTB has been government procurement policies. With telecommunications entities excluded from the General Agreement on Tariffs and Trade (GATT) procurement code, government-owned telecommunications services in many countries favour local suppliers over suppliers from other countries. This barrier is being weakened by the growing trend toward privatization of telecommunications companies and the establishment of international standards. As a result of a trade agreement between the United States and Japan, procurement barriers in Japan have been reduced for all other countries having a Most Favoured Nation (MFN) status, making the Japanese market more accessible to suppliers from Canada.

The activities of international standards-setting bodies are becoming increasingly relevant to trade in telecommunications equipment. Where standards were once used to protect national markets from foreign competitors, they are now being used by the major competitors as tools to gain competitive advantage over each other in major regional or world markets. National standards now need to be consistent with international standards in order for users to obtain the full benefits of current technology.

Preferential financing plays an important part in the telecommunications trade structure. Developed countries, including Canada, have supported the export efforts of their telecommunications suppliers through the provision of low-interest-rate financing to the purchasing countries. Over 18 percent of the telecommunications equipment exports by the Organization for Economic Co-operation and Development (OECD) countries to non-OECD markets in 1987 involved the use of export credits. While lender countries have agreed to try to limit the use of export credits, there are a growing number of countries in which major systems sales are impossible without such financing.

Technological Factors

Telecommunications is widely recognized as a key strategic and enabling technology. Manufacturing, service and resource industries need modern, advanced and reasonably priced communications services in order to be competitive. The products of this industry have contributed to the competitiveness of many other Canadian industries.

Technology is of interest from three aspects:

- in the application of telecommunications products
- in the development of successful products
- in the process of making the products.

To maintain long-term competitiveness, the telecommunications equipment industry invests in underlying technologies, such as advanced semiconductors (microelectronics, electro-optics and photonics) and software. In view of the high costs and long lead times, very few firms have the resources to support adequate private R&D

in advanced technologies; consequently, governments have become involved in establishing and funding research institutes and consortia. In Canada, governments provide assistance through the National Research Council of Canada (NRC), the Communications Research Centre (CRC), the Natural Sciences and Engineering Research Council of Canada (NSERC), industry incentive programs such as the Strategic Technologies Program (STP), and R&D alliances or research centres such as the Canadian Institute for Telecommunications Research (CITR), the National Wireless Communications Research Foundation (NWCRF), Telecommunications Research (TR) Labs (formerly the Alberta Telecommunications Research Centre), l'Institut National de la Recherche Scientifique (INRS) — Telecommunications, the Telecommunications Research Institute of Ontario (TRIO) and the Canadian Centre for Marine Communications (CCMC). Telecommunications research activity is undertaken at over 25 universities in Canada.

Being able to make telecommunications products at the lowest possible cost with high reliability remains a challenge. Under some circumstances, this challenge has led Canadian suppliers to stop producing certain low-end or high-volume products. Some products are now supplied from countries with lower wage costs. Low-cost residential telephones and low-end key telephone systems are examples of products imported into Canada. In other cases, the need to lower costs has led Canadian manufacturers to invest heavily in automating their manufacturing processes. Automation includes flexible manufacturing systems, the use of surface-mount technology (a technique well-suited to mechanized assembly), design and implementation of application-specific integrated circuits (ASICs) to reduce component count and assembly (and service) complexity, the application of automatic testing on the production line and a general trend toward using just-in-time production techniques.

Other Factors

Human resource management within the industry remains a critical element in the success of the industry. Companies depend on the available supply of adequately trained university and community college graduates. The retraining of existing employees is also critically important, as job content in the industry changes from relatively unskilled assembly to highly technical activities. There is no evidence to suggest that human resource limitations are currently constraining Canada's ability to compete, but the industry remains concerned about the continuing availability of an adequate supply of skilled personnel.

The rate of adoption for some networking products will also be related to human resources outside the industry. Networking, among other things, facilitates teamwork among those working at home or in different locations. Improvements in this technology need to be combined with improved management of those working at home — the *Financial Times*[4] has projected that nearly 12 million people in North America will be working at home by 1995.

Evolving Environment

Several major trends characterized the worldwide telecommunications equipment industry throughout the 1980s. First, the IT sector emerged through the convergence of computing and communications, making it possible, for example, to incorporate digital technologies, including compressed data, into communications products. Second, the liberalization of telecommunications services markets has opened up possibilities for expanded equipment trade. Third, the increasing technological sophistication of products and processes, which requires increasing investment in R&D, has accelerated the rationalization of the equipment industry. Fourth, newly industrialized countries (NICs) are becoming increasingly significant markets. Fifth, the industry is being consolidated through mergers, acquisitions, joint ventures, strategic alliances and research consortia. Sixth, new international standards are being established.

The trends of the 1980s are also expected to be true of the 1990s. In addition, three emerging trends can be added. First, telephone and broadcast communications may converge because of the feasibility of delivering broadband communications to the home. The impact of this is to facilitate such transactions as shopping and banking services from the home. Second, systems integration among the service providers is being extended. For instance, telephone companies are striving to provide global services to their multinational and transnational customers. The impact of this is to facilitate the transfer of text, data and visual communications between people and machines despite being initiated on different computers and operating systems. Third, personal communications networks will continue to expand. Personal communications networks are essentially radio networks and therefore wireless at the point of use, with current examples being the residential cordless telephone and the cellular telephone.

In the trend to personal communication networks, several avenues are being explored to increase their capacity, to reduce

[4]"Punching in electronically with head office," *Financial Times*, Toronto, 14-20 September 1992, page 11.

capital and operating costs, and to increase the versatility and utility. Innovations range from advanced multiplexing to multiple applications of microcells. Current cellular telephone technology allows wide area coverage but consumes relatively high power for limited capacity and therefore usage cost is high. Emerging microcell technology in which Canadian industry is in the lead provides very small devices, consumes very little power and increases capacity. It will therefore have low operating costs, making it attractive for high usage, but will be limited to the 50 to 150 metre range from each base station.

With the new microcell technology and service networks, Canada will be the first to provide two-way communications capability at home, at work and at public locations using the same telephone set. To achieve this capability, base stations will be located in shopping malls, subway stations, airports and other high-traffic locations. The initial and operating costs of these new telephones is forecast to be low and therefore, in combination with their mobility and usability, the Canadian market may be in the range of $1 billion per year, according to estimates by Canadian industry. Each subscriber will be able to have a personal telephone and number.

The Canadian telecommunications equipment industry is well advanced in responding to all of the trends with both leading technology and service networks to provide operational capability.

Technology is a major element of a number of these industry trends. Changes in technologies often pose a threat to existing players and provide opportunities to firms that wish to enter the industry.

The implementation of new technologies will require significant investment. Some countries are already making that investment. The EC, for example, invested 550 million European Currency Units (ECU) (C$844 million) between 1987 and 1992 on the RACE (R&D for advanced communications technologies for Europe) program. It has already begun RACE II, in which it will invest another 489 million ECU (approximately C$750 million) from 1991 to 1994, to position its industry in the area of broadband communications.

Japan has begun to make a concerted effort in promoting broadband access to the home, the first important step in converging telecommunications and the other information media. In the spring of 1991, it announced the Subscriber Optical Communications Systems Project, which will bring optical fibre cable and equipment to most Japanese households by 2015.

The single European market after 1992 will provide opportunities if Canadian industry is willing to make the necessary investments in market development. The same is true in the Pacific Rim. At the same time, industries in Europe and Asia are developing capabilities to compete with Canadian suppliers. Tremendous opportunities will continue to exist in developing countries; while some will be accessible to firms with good products and smart marketing who persevere, many will only be open to firms that are positioned to offer attractive financing.

In December 1992, the federal government announced that it will participate with the private sector in the Canadian Network for Advancement of Research, Industry and Education (CANARIE). This national fibre-optic network will assist researchers and allow equipment producers to test new equipment and communications computer software. The objective is to produce equipment that will increase current capacity by 24 times by the year 2000.

Improved market access to Mexico through the North American Free Trade Agreement (NAFTA) should provide new opportunities. On 12 August 1992, Canada, Mexico and the United States completed the negotiation of the NAFTA. The Agreement, when ratified by each country, will come into force on 1 January 1994. The NAFTA will phase out tariffs on virtually all Canadian exports to Mexico over 10 years, with a small number being eliminated over 15 years. The NAFTA will also eliminate most Mexican import licensing requirements and open up major government procurement opportunities in Mexico. It will also streamline customs procedures, and make them more certain and less subject to unilateral interpretation. Further, it will liberalize Mexico's investment policies, thus providing opportunities for Canadian investors.

Additional clauses in the NAFTA will liberalize trade in a number of areas including land transportation and other service sectors. The NAFTA is the first trade agreement to contain provisions for the protection of intellectual property rights. The NAFTA also clarifies North American content rules and obliges U.S. and Canadian energy regulators to avoid disruption of contractual arrangements. It improves the dispute settlement mechanisms contained in the FTA and reduces the scope for using standards as barriers to trade. The NAFTA extends Canada's duty drawback provisions for two years, beyond the elimination provided for in the FTA, to 1996 and then replaces duty drawback with a permanent duty refund system.

The Canadian industry has done very well serving the domestic market and, more recently, the U.S. market. The 1989 Canadian Supreme Court decision affirming federal jurisdiction over telecommunications services providers that are part of the national telecommunications services should make the domestic market more coherent. The introduction of long-distance telephone competition and regulatory and policy movement toward convergence of telephone and broadcast functions will also affect how the domestic market develops. A more competitive marketplace will provide greater opportunities for domestic suppliers; it will also make the domestic market more attractive to foreign suppliers.

How the present round of the GATT negotiations concludes will be important in the evolving environment. In addition to the tariff negotiations, negotiations to bring telecommunications services providers under the government procurement code could have important implications for the industry. Specifically, the opening of bidding procedures by government-owned telephone companies would offer major opportunities for the Canadian telecommunications equipment industry.

Legislation under consideration in the United States to permit the Regional Bell Operating Companies (RBOCs) to invest in manufacturing could also provide new opportunities for the Canadian industry. However, firms could also find themselves facing new and even stronger competitors.

Around the world, industry concentration is increasing. The industry seems to be evolving into a smaller number of very large companies, a few middle-sized companies that are either acquired by the large companies or stagnating, and small companies that must make their mark very quickly or die. The large company that matters most to the Canadian environment is Northern Telecom. Northern Telecom has evolved constantly over the past 20 years, changing from a Canadian company to a North American company and, in its most recent reorganization, to a world company. Each of these changes has understandably lessened its dependence on Canada.

Competitiveness Assessment

The Canadian telecommunications equipment industry is generally considered to be world-competitive, enjoying a greater share of the world market than Canada's size and natural advantages would warrant. The disappearance of Canada's trade surplus in the late 1980s and the recent lacklustre performance of many of the firms in most countries is evidence that international competition is intensifying.

Japan, Europe and the United States are all spending greater sums than Canada is, relatively and absolutely, on the underlying technologies of telecommunications. The location of technological development has an influence on the location of downstream industrial activity related to that technology. Markets that have been implementing new telecommunications services at a faster rate than Canada will also tend to attract the more advanced and innovative suppliers to those locations.

With the trend toward concentration in the industry, the globalization of supply and the declining influence of medium-sized companies in the industry structure worldwide, the ability of Canadian firms to grow and prosper from a Canadian base is being threatened. Nevertheless, the liberalization of telecommunications services and equipment markets is opening up new opportunities.

For further information concerning the subject matter contained in this profile or in the sectoral study listed on page 12, contact

Information Technologies Industry Branch
Industry, Science and Technology Canada
Attention: Telecommunications Equipment
235 Queen Street
OTTAWA, Ontario
K1A 0H5
Tel.: (613) 954-3314
Fax: (613) 952-8419

PRINCIPAL STATISTICS[a]

	1983	1984	1985	1986	1987	1988	1989	1990
Establishments	248	268	261	250	249	278	290[f]	297[f]
Employment	36 763	41 896	40 999	38 570	43 019	46 925	47 989[f]	48 374[f]
Shipments ($ millions)	2 678.1	3 210.1	3 584.1	4 003.6	4 446.2	5 136.4	5 526.1[g]	5 855.5[g]
GDP[b] (constant 1986 $ millions)	1 763.6	2 124.9	2 115.2	2 046.0	2 348.1	2 458.5	2 522.9	2 509.7
Investment[c] ($ millions)	220.2	308.9	303.3	315.5	344.8	367.3	300.4	317.5
Profits after tax[d] ($ millions)	286.2	338.2	248.0	305.4	315.4	N/A	N/A	N/A
R&D expenditures[e] ($ millions)	605	716	867	903	975	1 013	1 012	1 037

[a] For establishments, employment and shipments, see *Electrical and Electronic Products Industries*, Statistics Canada Catalogue No. 43-250, annual (SIC 3351, telecommunication equipment industry; and SIC 3359, other communication and electronic equipment industries).

[b] ISTC estimates based on Statistics Canada data.

[c] See *Capital and Repair Expenditures, Manufacturing Subindustries, Intentions*, Statistics Canada Catalogue No. 61-214, annual. Figures are for capital expenditures only.

[d] See *Corporation Financial Statistics*, Statistics Canada Catalogue No. 61-207, annual. Figures are for all of industry group 335, communication and other electronic equipment industries.

[e] Unpublished Statistics Canada data.

[f] ISTC estimates.

[g] See *Monthly Survey of Manufacturing*, Statistics Canada Catalogue No. 31-001, monthly.

N/A: not available

TRADE STATISTICS

	1983	1984	1985	1986	1987	1988[c]	1989[c]	1990[c]
Exports[a] ($ millions)	1 044	1 549	1 564	1 330	1 383	1 323	1 455	1 982
Domestic shipments ($ millions)	1 634.1	1 661.1	2 020.1	2 673.6	3 063.2	3 813.4	4 071.1	3 873.5
Imports[b] ($ millions)	652	833	961	1 218	1 243	1 446	1 704	1 909
Canadian market ($ millions)	2 286.1	2 494.1	2 981.1	3 891.6	4 306.2	5 259.4	5 775.1	5 782.5
Exports (% of shipments)	39.0	48.3	43.6	33.2	31.1	25.8	26.3	33.8
Imports (% of Canadian market)	28.5	33.4	32.2	31.3	28.9	27.5	29.5	33.0

[a] See *Exports by Commodity*, Statistics Canada Catalogue No. 65-004, monthly.

[b] See *Imports by Commodity*, Statistics Canada Catalogue No. 65-007, monthly.

[c] It is important to note that data for 1988 and after are based on the Harmonized Commodity Description and Coding System (HS). Prior to 1988, the shipments, exports and imports data were classified using the Industrial Commodity Classification (ICC), the Export Commodity Classification (XCC) and the Canadian International Trade Classification (CITC), respectively. Although the data are shown as a continuous historical series, users are reminded that HS and previous classifications are not fully compatible. Therefore, changes in the levels for 1988 and after reflect not only changes in shipment, export and import trends, but also changes in the classification systems. It is impossible to assess with any degree of precision the respective contribution of each of these two factors to the total reported changes in these levels.

SOURCES OF IMPORTS[a] (% of total value)

	1983	1984	1985	1986	1987	1988[b]	1989[b]	1990[b]
United States	72	70	63	57	53	45	50	53
European Community	4	5	4	6	5	6	6	7
Asia	15	18	25	28	38	44	38	34
Other	9	7	8	9	4	5	6	6

[a]See *Imports by Commodity*, Statistics Canada Catalogue No. 65-007, monthly.

[b]Although the data are shown as a continuous historical series, users are reminded that HS and previous classifications are not fully compatible. Therefore, changes in the levels for 1988 and after reflect not only changes in import trends, but also changes in the classification systems.

DESTINATIONS OF EXPORTS[a] (% of total value)

	1983	1984	1985	1986	1987	1988[b]	1989[b]	1990[b]
United States	59	62	64	62	58	56	56	57
European Community	11	10	7	7	10	18	14	13
Asia	4	6	7	9	7	7	11	11
Other	26	22	22	22	25	19	19	19

[a]See *Exports by Commodity*, Statistics Canada Catalogue No. 65-004, monthly.

[b]Although the data are shown as a continuous historical series, users are reminded that HS and previous classifications are not fully compatible. Therefore, changes in the levels for 1988 and after reflect not only changes in export trends, but also changes in the classification systems.

REGIONAL DISTRIBUTION[a] (average over the period 1986 to 1988)

	Atlantic	Quebec	Ontario	Prairies	British Columbia
Establishments (% of total)	5	22	46	12	15
Employment (% of total)	X	X	59	X	4
Shipments (% of total)	X	X	60	X	2

[a]ISTC estimates.

X: confidential

MAJOR FIRMS

Name	Country of ownership	Location of major plants
Gandalf Data Limited	Canada	Nepean, Ontario
Glenayre Electronics Ltd.	United States	Vancouver, British Columbia
Harris Farinon Canada Inc.	United States	Dorval, Quebec
Mitel Corporation	United Kingdom/ Canada	Kanata, Ontario Bromont, Quebec
Motorola Canada Limited	United States	Brampton, Ontario Willowdale, Ontario Burnaby, British Columbia
Newbridge Networks Corporation	Canada	Kanata, Ontario
Northern Telecom Canada Limited	Canada	Amherst, Nova Scotia Halifax, Nova Scotia St. John's, Newfoundland Saint John, New Brunswick Charlottetown, Prince Edward Island Lachine, Quebec Montreal North, Quebec Saint-Laurent, Quebec Verdun, Quebec Barrie, Ontario Belleville, Ontario Brampton, Ontario Brockville, Ontario Kanata, Ontario Kingston, Ontario London, Ontario Nepean, Ontario Toronto, Ontario Weston, Ontario Winnipeg, Manitoba Calgary, Alberta Edmonton, Alberta Regina, Saskatchewan Saskatoon, Saskatchewan Burnaby, British Columbia Richmond, British Columbia
Teleglobe Canada Inc.	Canada	Montreal, Quebec

INDUSTRY ASSOCIATIONS

Canadian Advanced Technology Association (CATA)
2nd Floor, 388 Albert Street
OTTAWA, Ontario
K1R 5B2
Tel.: (613) 236-6550
Fax: (613) 236-8189

Information Technology Association of Canada (ITAC)
Suite 402, 2800 Skymark Avenue
MISSISSAUGA, Ontario
L4W 5A6
Tel.: (416) 602-8345
Fax: (416) 602-8346

SECTORAL STUDIES AND INITIATIVES

The following publication is available from Industry, Science and Technology Canada (see address on page 8).

A Proposal Towards a Strategic Plan for the Canadian Telecommunications Equipment Industry
This study was prepared for ISTC and the Canadian Telecommunications Action Committee (CTAC) by NGL Consulting Ltd. in January 1991.

Published in two parts, part one describes the Canadian telecommunications equipment industry in a global context, while part two presents a framework for action.

Printed on paper containing recycled fibres.