Computers and Peripheral Equipment

INDUSTRY PROFILE

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INDUSTRY PROFILE

1990–1991

COMPUTERS AND PERIPHERAL 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*

Computers

Computers are redefining modern society. They are used by virtually all professions, and their application has spawned a distinctive jargon as well as new talents and occupations,

[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.

such as programmer, word processor, software developer and systems designer. The microelectronic chips that power computers now operate as the "brains" of many products. These embedded computer systems have become an unseen part of normal life. In fact, according to a major trade magazine, "the average computer 'nonuser' probably uses a dozen or more computers regularly but does not recognize them as computers, because the devices are dedicated to running things like cordless telephones and automobiles."[2] Computers are now an essential component of products used by everyone in a developed society.

Computer technology has advanced into its "fifth generation" from the mid-1940s' electromechanical, vacuum-tube, plug-programmed behemoth. Computers have increased in speed, capacity and versatility and have decreased in size, power consumption and manufacturing cost.

At the dawn of the computer era, high product and marketing development costs limited the number of firms that could participate. As the product and market matured, due primarily to advances in microelectronic technology and the introduction of "user-friendly" operating software, more firms entered the arena, both as major players and as specialists in niche markets. The number of manufacturers, R&D houses and software suppliers now extends well beyond the handful of original participants.

Ironically, the very acceptance and proliferation of computers has led them to become commodities that customers buy as cheaply as possible. Consumer buying patterns have put the industry on a treadmill of ceaseless innovation and price-cutting and have established product cycles that are nasty, brutish and short. Financial analysts observe that profitability in every sector of the computer industry is under pressure.[3]

Structure and Performance

Structure

Because the microelectronic chip is an important component in so many products and because computer technology is so widely applied, it is sometimes difficult to determine exactly how to classify a company and its products. In Canada, approximately 700 firms make at least one product that can be categorized as a computer or a piece of peripheral equipment. In 1990, however, only 209 establishments classified themselves as being primarily in the computers and peripheral equipment industry and reported their financial, production and employment statistics under this grouping.[4] The principal statistics in this profile are based upon these 209 establishments. Trade data are collected by Customs Canada at the border. These data represent the exports of computers and peripheral equipment of these 209 establishments as well as the production of computers and peripheral equipment from other standard industrial classifications.

The establishments in this industry manufacture computers and peripheral equipment, such as disk and drum drives, input-output devices, storage modules and printers. About 20 percent of these establishments make products that would be instantly recognized by the layperson as being computers or peripheral equipment. The remainder of the firms make specialized products for niche markets, computer parts or subsystems. These companies constitute the backbone of the supplier infrastructure for the industry. Many manufacturers also produce the software necessary to animate their products. (Establishments that primarily design and manufacture integrated circuits are covered in the *Microelectronics* profile; software developers are described in *Computer Services and Software*.)

In Canada, the establishments in this industry range from small operations with fewer than 10 employees to large manufacturing operations with more than 1 500 employees. Their facilities and operations are varied, from a minimal assembly and sales organization to one that has complete R&D and manufacturing capabilities with nation-wide sales and service offices. Of the 209 establishments, about 15 percent are large branch operations of foreign-owned multinational enterprises (MNEs). The remainder are mostly Canadian-owned, smaller enterprises that generally specialize in products for niche markets that are too small to be of interest to the larger MNEs.

The computer market in Canada is characteristic of an advanced industrialized society, demanding a full spectrum of computer products. It is substantial, ranking seventh in the world in terms of dollar volume. Computers have permeated Canadian industry and influence how Canadians do business (e.g., bank machines), regulate traffic flow (e.g., co-ordinated stoplights) and communicate (e.g., telephones and electronic media). Imports have historically exceeded exports, creating a trade deficit. This deficit reflects the fact that Canadian manufacturing does not encompass the full range of computer products demanded by the market.

[2]Rick Cook, "Embedded Systems in Control," *Byte*, June 1991, page 153.

[3]"Changed Industry," *Wall Street Journal*, 5 September 1991, page A-1.

[4]See *Standard Industrial Classification, 1980*, Statistics Canada Catalogue No. 12-501 (SIC 3361, electronic computing and peripheral equipment industry).

The hardware manufacturing industry is located primarily in Ontario and Quebec. In 1990, the industry employed 11 854 people. Most companies have sales and service offices spread throughout Canada.

The Canadian subsidiaries of a dozen of the largest MNEs account for the majority of the shipments and employees. Their production includes some final product, but most establishments concentrate on subsystems. Others build to order, importing their production technology as well as some parts and finished products for resale in Canada. Many MNEs make a vital contribution to the information technologies manufacturing and R&D infrastructure.

Some MNEs have product mandates allowing them to produce specific goods for world markets. The choice and extent of product mandates result from the global strategies of the parent firms. The output of these firms ranges from final products through key components to interfacing equipment between computers and other electronically based technologies. Digital Equipment of Canada, for example, manufactures small to mid-sized mainframe computers in Kanata, Ontario. In addition, the Kanata facility has world mandates for fault-tolerant systems and desktop computers. Philips Electronics and Olivetti each have a facility in Montreal to produce personal computers (PCs). Among the niche players is Canadian-owned Electrohome of Kitchener, which produces large-screen data, graphics and video projection systems for commercial purposes. From its Waterloo facility, NCR manufactures a wide range of products for the banking industry under world mandates. Westinghouse's Burlington plant manufactures interactive terminals for airline reservation systems for global markets.

Canadian computer subsidiaries have also secured world mandates for major computer components. Unisys, located in Winnipeg, manufactures large-capacity disk drives for large-memory systems for all its mainframe computers as well as other large-capacity disk drives and peripherals. IBM in Toronto has that company's mandate to manufacture specific memory cards, power systems and local area networks (LANs) that link the operations of various computers together with the telecommunications systems. Similarly, Hewlett-Packard and Xerox manufacture specific computer and information-processing products in Canada under world mandates from their parent companies. Some MNEs, such as Sun Microsystems and Apple, conduct manufacturing and other activities through subcontracting or through alliances with Canadian IT firms.

Other mandated manufacturing establishments focus on equipment that allows computers to interface with other computers and other media, such as the telephone and television. Gandalf Data of Nepean, Ontario; specializes in computer communications as well as circuit modules and modems. Motorola in Richmond, British Columbia, manufactures mobile data terminals and associated devices for world distribution. Epic Data, also of Richmond, produces data-collection terminals and a controller to operate between computers and data collection systems.

All product mandates are, of course, subject to change. MNEs establish and locate plants on the basis of differing labour rates, capital costs and government pressures. Continued production in Canada is dependent upon the competitiveness of establishments not only in world markets but also within each MNE.

Among the Canadian-owned producers of computers are Sidus Systems and PRIMAX in the Toronto area, Mind Computer Products in Winnipeg, Cemtech in Ottawa and Trillium Computer Resources of Waterloo, Ontario.

In the computer field, the structural pattern of company size, ownership and product mandate is not unique to Canada but prevails in most industrialized countries. Only the actual product mix differs, based on the MNEs' decisions about where to manufacture what.

Performance

Developments in microelectronic integrated circuits led to the development of microprocessor chips and high-density semiconductor memory chips. These technological advances have vastly improved the performance of computers.

The pattern of equipment ownership has changed in recent years. Initially, most equipment was leased because of a combination of high costs and intensive maintenance requirements. The rapidly falling cost of computer power has changed that pattern. Now, outright purchase is the rule, except among the users of large and powerful mainframe computers. The introduction of the PC, as well as the versatile and powerful computer workstation concepts for engineering and scientific work, generated a new and massive market for hardware and software. The market share of large systems has declined, while the share of mid-sized and small systems has increased. The current growth of installed capacity is in PCs and workstation systems, which are much less expensive than the larger mainframe computers.

Over the period 1984 to 1990, annual manufacturing shipments from the establishments classified as computer and peripheral equipment manufacturers have more than doubled, rising from $1 290.4 million to $2 857.2 million (Figure 1), resulting in annual growth rates (end-period to end-period) of almost 14.2 percent in current dollar terms. ISTC data suggest that manufacturers of computers and peripheral equipment increased exports as a share of total

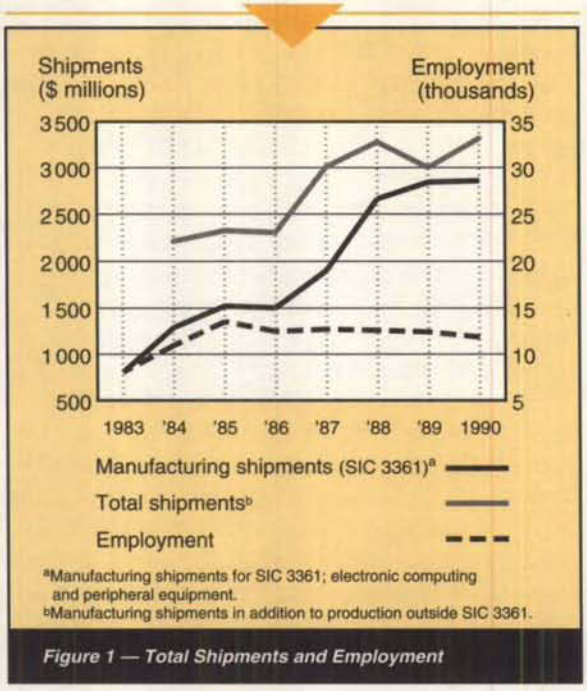

Figure 1 — Total Shipments and Employment

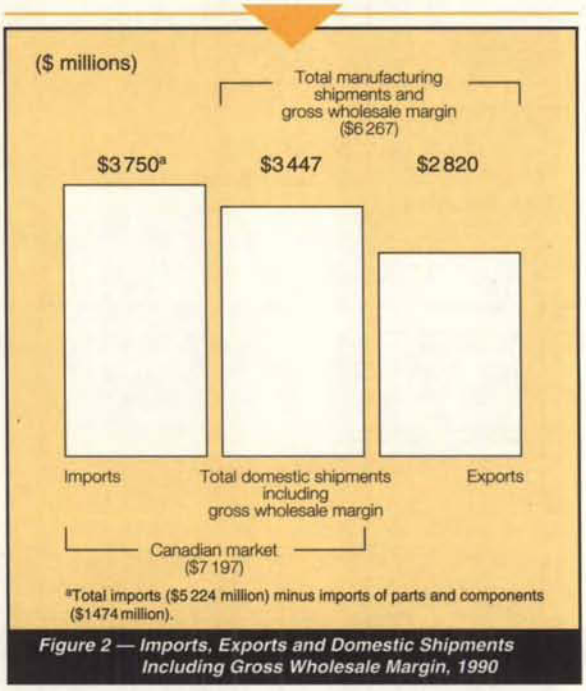

Figure 2 — Imports, Exports and Domestic Shipments Including Gross Wholesale Margin, 1990

manufacturing shipments from 79 percent in 1984 to 85 percent by 1990. This trade pattern is consistent with increasing use of world mandates. Using this information, total manufacturing shipments by all establishments manufacturing computers and peripheral equipment are estimated to have risen from $2 211.4 million in 1984 to $3 317.6 million in 1990 — an increase of 50 percent.

Parallelling this growth has been a rapid expansion of wholesaling activity. Although data are available only from 1986 to 1990, gross wholesale margins on computers and peripheral equipment rose from $2 379.2 million to $2 949.4 million or at a rate of 5.5 percent annually. Thus, total manufacturing shipments plus gross wholesale margins in Canada increased from $4 684.1 million in 1986 to $6 267.0 million in 1990.

Between 1984 and 1990, total exports rose from $1 747 million to $2 820 million. Global rationalization of the industry has resulted in large trade flows. In 1990, the Canadian industry exported about 85 percent of its production. The preponderance of Canada's exports go to the United States. Trade flows are mostly between subsidiaries and their parents. The branch plants' output of subassemblies is integrated into finished systems at the parents' facilities and vice versa.

Imports of computers and peripheral equipment rose from $4 245 million in 1984 to $5 224 million in 1990. These imports enter in two streams — parts and final products. The parts are incorporated into further processed parts and final products. Final products are sold through wholesalers or directly by the manufacturer. The computer equipment industry is now a global industry. International parent companies award world product mandates to their foreign subsidiaries according to their ability to compete in terms of quality and price. As a result, computer components are manufactured around the world and then shipped for final assembly. Computer parts accounted for 60 percent of the Canadian computers and peripheral equipment industry's exports in 1991. The advent of world product mandates explains the importance of imports in meeting the requirements of the domestic market and of the international marketplace for Canadian exports.

Figure 2 indicates the size of the Canadian market in 1990. Since imported parts are largely incorporated into shipments, only imported final product is included in the figure and "the Canadian market" in order to avoid the double counting inherent in the "apparent Canadian market" figures appearing in the trade statistics table on page 8.

Between 1986 and 1990, the apparent Canadian market has grown at an average annual rate of about 5.5 percent, from $7 012.1 million to $8 671.0 million in current dollars during a time when gross wholesale margins were being squeezed. With an average annual growth rate of 10.9 percent over the same period, growth in exports outpaced that of the apparent Canadian market.

Strengths and Weaknesses

Structural Factors

Until recently, the strongest computer companies have met market needs and established technical standards with little co-ordination among the companies. Fortunately, however, the developing computer sophistication of users, coupled with their need to intercommunicate, has lessened the tendency toward this practice. More and more, purchasing groups and independent associations are establishing protocols that allow the computer user to be less vendor-dependent for hardware and especially software.

The UNIX operating system is one example of an effort to respond to the need for more open, uniform and non-proprietary standards. Another initiative has been undertaken by a major automotive manufacturer and a leading aerospace company. They are using their market powers to develop a software environment for manufacturing and office uses. Their product is called MAP/TOP (Manufacturing Automation Protocol/Technical and Office Protocol).

The movement toward non-proprietary standards has resulted in expanding opportunities for Canadian companies, which are customarily smaller than MNEs and have traditionally served niche markets. Interestingly, it has also resulted in the formation of some hitherto inconceivable marketing and production alliances among major firms that have historically been rivals.

In Canada, the computer industry has evolved into two types of firms. The first group is composed of large companies that have a considerable degree of vertical integration, in-house R&D facilities, an efficient production operation and an effective sales force. Many of the Canadian operations of MNEs are in this class.

The second group of firms is smaller, generally Canadian-owned, and frequently uses technology developed by others to manufacture and enhance whatever products are the most popular in the particular market niches they are serving. Their production processes are usually of a bundling and assembling nature. They become successful precisely because they are fast followers and can quickly supply markets that the larger companies ignore. The majority of Canadian-owned firms are in this group.

Most MNEs conduct R&D not only in their home country but also in Canada on a product mandate basis. Smaller Canadian firms regularly invest well over 10 percent of sales in R&D. Their R&D is not usually in new devices or their fabrication methods; rather, it normally consists of the development of new circuitry using commercially available components. This type of R&D activity has low capital requirements but uses acquired experience and knowledge, all of which best fits the financial and talent profiles characteristic of Canadian companies.

Because of the key role of MNEs in the worldwide computer market, Canada's ability to entice their investment is, and will be, a major determinant of the structure of the computer industry in this country. The more important considerations for attracting the multinationals include the proximity to major markets and suppliers, as well as the cost, quality and availability of a skilled work force. All of these are factors in which Canada offers many advantages.

Canada's unique advantage is location. Because of its proximity to the industry's largest market, the United States, transportation time and cost on bulkier items are reduced, and communications between headquarters and subsidiaries are easier. Related to this are similarities in culture and business practices and ease of communication. Canada's work force is skilled and experienced in high technology, and its wages and costs are competitive with those in the United States and Europe. Canada also has an excellent community college and trade school system as well as several world-class universities specializing in mathematics, computer science and engineering. Many of the firms in this sector have played leading roles in assisting universities in establishing departments that better serve the industry's needs. As a result, there is a significant supply of graduates with the talent required to undertake high-tech manufacturing and related R&D support work.

Indigenous Canadian companies have performed about as well as their counterparts in Europe and the United States. There have been notable successes in particular product niches, such as certain types of PCs and terminals.

Access to capital is a problem for firms in Canada's computer industry. The capital that continues to support the industry is less patient than it was in the early 1980s and demands a higher rate of return. Because of high capital costs and short product cycles, the survival of a small to medium-sized firm in this industry often depends on its ability to secure the funds required to drive the next generation of product R&D. This situation has resulted in delaying expansion plans and curtailing innovative products, or even the sale of fledgling and, in some cases, established firms to larger, foreign-based enterprises. The larger MNEs and their subsidiaries have had access to capital from sources around the world; consequently, this issue has less impact on them.

North American computer firms are at a competitive disadvantage compared with Japanese and other Far Eastern firms, which have access to low-cost capital from within their highly integrated corporate families. U.S. and Canadian firms must seek their financing in the open market. Access to low-cost capital has enabled Japanese and Korean firms to

invest heavily in the computer and related products sectors. As a result, they have increased their share of the world market.

Companies from newly industrialized countries (NICs), such as Taiwan and the Republic of Korea, are increasing their market presence. Becoming a supplier to a MNE is often the stepping stone to becoming a strong and independent player. Many firms from NICs have developed this way, and Canadian companies now face increased competition from these sources.

Trade-Related Factors

Canadian companies have had considerable success selling to foreign markets because of their technical competence and price competitiveness. They have successfully penetrated markets in the United States, the Middle East, Europe and Asia. Established export products include multilingual and point-of-sale terminals, PCs and peripheral equipment.

There are few barriers to trade in this sector. Canada, the United States and Japan have no tariffs on medium and large computers. The European Community (EC) has a Most Favoured Nation (MFN) rate of 4.9 percent. The Canada-U.S. Free Trade Agreement (FTA), implemented on 1 January 1989, has removed all computer tariffs between Canada and the United States if the goods meet certain rules of origin.

Procurement policies are frequently used by countries to nurture their domestic computer industries. Such practices are now constrained because of the General Agreement on Tariffs and Trade (GATT) procurement code. It requires member countries to have open and competitive tendering for federal procurement contracts in excess of C$213 000, with certain noted exceptions — transportation, communication and defence-related federal contracts. Under the FTA, this threshold was reduced to C$31 000. Extensions and improvements to these provisions are currently under negotiation. Governments sometimes use these procurement incentives as an inducement for local investment by MNEs.

Technical standards do not vary significantly between countries and are not a trade barrier. As the world moves toward a global economy, consumers are insisting that computers be able to send information to other computers and accept information from them no matter where they are being operated, who manufactured them, or how many communication companies transmit the signal. These demands can be met only if the companies involved agree to meet and adhere to international standards.

On 12 August 1992, Canada, Mexico and the United States completed the negotiation of a North American Free Trade Agreement (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.

Technological Factors

Assembly costs have fallen dramatically. The once labour-intensive assembly of thousands of transistors and other electronic components that form a computer has been simplified to robotically placing a few key chips and microelectronic components on a predesigned board. Modern robots can be programmed to produce a range of computer products, thus allowing firms to gain the economies of scale inherent in robotic production while maintaining the product diversity needed to satisfy market demands. These advances have turned computers into a mass-produced commodity product. Miniaturization affects not only the capital costs of computer manufacturing but also operating and overhead costs, thereby significantly lowering costs per computation. Since 1950, computing costs have been cut in half every three years. By 1990, technological advancement was sufficient to lower computing costs to one ten-thousandth of the 1950 level.[5] These technical advances continue to broaden computer use and lower the cost.

The development of products in this industry requires close co-operation between equipment and component manufacturers. All Canadian manufacturers rely heavily on foreign-designed semiconductors and other parts. Firms based in the United States and Japan can exploit new developments more

[5]Lawrence G. Tesler, "Networked Computing in the 1990s," *Scientific American* (September 1991), page 88.

easily than their Canadian counterparts because they are located closer to the suppliers of these innovative developments. On the other hand, being next to the United States has led to a large body of shared experience through academic and company relationships as well as defence industry ties. Technically aggressive Canadian companies are managing to gain access to some of the new U.S. advancements as soon as they become available.

Other Factors

National governments are often the largest single purchasers of computers within their own borders. At present in Canada, the federal and provincial levels of government, including Crown corporations, form over 50 percent of the total potential computer marketplace.

Subject to international agreements such as the GATT and the FTA, public institutions often use their market power to support goals such as economic growth, employment growth and industrial development. If an MNE makes significant investment, R&D and supplier development commitments that improve the international competitiveness of the Canadian computer sector, its products may be treated as Canadian for the purposes of some federal government procurement. This policy stimulates expanded Canadian operations by MNEs and encourages additional investments on the part of indigenous companies.

Evolving Environment

The increased importance of data communications and computer networking has resulted in a convergence between computing and telecommunications. Telecommunications companies have adapted the digital technology on which computers are based to conventional voice functions as well as data uses. The distinctions between telecommunications and computer companies have blurred as computer firms have entered the telecommunications field and vice versa.

Similarly, there will be interaction between these industries and the instrumentation industry. By far the greatest catalyst to the improvement of instrumentation products and the development of new market applications has been their integration with computer and telecommunications technology. The resultant devices are especially evident in industrial process control and building automation applications. By integrating process data with the overall management information and communication systems, managers have the facts to make decisions that can effectively implement production and operating strategies.

Historically, the computer industry was dominated by a few full-line, vertically integrated manufacturers and vendors. The emergence of a stand-alone microelectronics industry allows product manufacturers to subcontract specific portions of their output. Less vertical integration is now necessary, thereby decreasing the entrance costs for new firms. This factor, along with the expansion and specialization of the marketplace, has made it possible for fledgling and established companies to seek and obtain unique market niches.

The emergence of computers as a commodity item has led MNEs to establish production facilities wherever economic advantages emerge. Some MNEs have moved substantial portions of their production to NICs, especially those of the Pacific Rim. In recent years, as a matter of strategy, many have chosen to take advantage of the benefits offered by Mexico's Maquiladora program by locating facilities there. As a result, other firms indigenous to these areas have emerged not only as suppliers to the MNEs but also as producers in their own right.

Competitiveness Assessment

Canadian production is mostly determined by the responses of MNEs to world markets rather than to the Canadian market. Canada is competitive as a location for multinational investment because of its proximity to the U.S. market and the cost, quality and availability of labour, land, energy and transportation.

All types of computers, by their very popularity, are fast becoming commodity items. This characteristically results in lower prices for the manufacturers and requires them to produce larger volumes in order to maintain the same revenue. The requirement for large-volume, low-cost production inevitably motivates a restructuring and a possible reduction in the number of MNEs operating in Canada as well as the industry worldwide.

Opportunities for Canadian companies will continue to lie in finding market niches and developing specialized systems or technology. The reduction of tariffs under the FTA has expanded their marketing opportunities. When compared with equivalent-sized firms in other countries, Canada's electronic computing and peripheral equipment industry is competitive both nationally and internationally.

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PRINCIPAL STATISTICS

	1983	1984	1985	1986	1987	1988	1989	1990
Establishments	59	91	108	142	147	195	208[c]	209[c]
Employment	8 040	10 953	13 538	12 487	12 721	12 594	12 422[c]	11 854[c]
Manufacturing shipments - SIC 3361[a] ($ millions)	800.9	1 290.4	1 523.8	1 504.5	1 904.0	2 662.2	2 841.9	2 857.2
GDP (constant 1986 $ millions)	213.7	534.3	656.0	708.3	1 060.5	1 434.4	1 590.7	1 709.8
Investment[b] ($ millions)	22.8	28.3	33.3	62.5	86.5	67.3	80.3	80.3
R&D expenditures ($ millions)	117	144	168	216	239	275	281	323

[a]See *Electrical and Electronic Products Industries*, Statistics Canada Catalogue No. 43-250, annual (SIC 3361, electronic computing and peripheral equipment industry).

[b]Investment data are for capital expenditures only.

[c]ISTC estimates.

TRADE STATISTICS

	1984	1985	1986	1987	1988[f]	1989[f]	1990[f]
Exports[a] ($ millions)	1 747	1 860	1 867	2 466	2 721	2 520	2 820
Imports[b] ($ millions)	4 245	3 940	4 195	5 097	5 195	5 311	5 224
Total manufacturing shipments[c] ($ millions)	2 211.4	2 325.0	2 304.9	3 007.3	3 278.3	3 000.0	3 317.6
Gross wholesale margin ($ millions)	N/A	N/A	2 379.2	2 161.6	2 476.7	2 847.4	2 949.4
Apparent Canadian market[d] ($ millions)	N/A	N/A	7 012.1	7 799.9	8 229.0	8 638.4	8 671.0
Exports[e] (% of total manufacturing shipments)	79.0	80.0	81.0	82.0	83.0	84.0	85.0
Imports (% of total manufacturing shipments + imports - exports)	90.1	89.4	90.5	90.4	90.3	91.7	91.3
(% of the apparent Canadian market)	N/A	N/A	59.8	65.3	63.1	61.5	60.2

[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]Total manufacturing shipments are for manufacturing shipments (SIC 3361) in addition to production outside SIC 3361. Total manufacturing shipments data are calculated using the following formula: exports ÷ exports (% of total manufacturing shipments). Estimated production outside of SIC 3361 can be calculated by subtracting manufacturing shipments (SIC 3361) from total manufacturing shipments.

[d]Total manufacturing shipments + imports + gross margin - exports.

[e]These percentages are based on ISTC data.

[f]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.

N/A: not available

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

	1983	1984	1985	1986	1987	1988[b]	1989[b]	1990[b]
United States	79.0	81.0	79.0	76.0	85.3	71.1	65.8	66.5
European Community	3.0	3.0	5.0	5.0	3.5	3.8	4.2	2.9
Asia	9.0	8.0	8.0	10.0	8.2	20.3	25.2	25.7
Other	9.0	8.0	8.0	9.0	3.0	4.8	4.8	4.9

[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	72.0	73.0	75.0	75.0	78.1	70.8	73.6	80.6
European Community	16.0	17.0	16.0	16.0	14.1	21.0	19.7	14.9
Asia	3.0	2.0	3.0	3.0	3.1	3.1	2.6	2.0
Other	9.0	8.0	6.0	6.0	4.7	5.1	4.1	2.5

[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] (1988)

	Atlantic	Quebec	Ontario	Prairies	British Columbia
Establishments (% of total)	2.0	17.8	58.3	8.1	13.8
Employment (% of total)	X	21.6	60.6	X	1.5
Shipments (% of total)	X	16.7	71.4	X	0.5

[a]ISTC estimates.

X: confidential

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APPENDIX — RELATED WHOLESALE OPERATIONS

The majority of computer hardware and software manufacturers have been marketing increasing shares of their output through wholesalers. These wholesalers may be owned by the manufacturers or may be independent. Under the old manufacturers' sales tax (MST) there was significant incentive for manufacturers to establish subsidiaries to wholesale their product to avoid MST on their wholesaling activities. As the industry has become increasingly mass consumer oriented rather than focusing on large corporate clients, this wholesaling function has become more important.

The structure of the computer market is very different from that faced by the manufacturers of telecommunications equipment, whose market is still dominated by a few carriers. The domination by key carriers relieves telecommunication equipment companies of many of the selling and training functions carried out by wholesalers of computer equipment. Thus, there has been less incentive for telecommunications equipment manufacturers to establish wholesale subsidiaries than for computer manufacturers. To compare the two key industries within the information technologies sector, the reader needs to be aware of wholesaling activities related to computers and software. Parallel activities are generally included as part of telecommunications manufacturing because of the normal lack of subsidiaries to carry out these functions.

Data on wholesale activities are limited in that they are available only from 1986 to 1990, and both software and hardware are combined for all years except 1988. During that year, about one-eighth of the gross margin was attributable to software. By 1990, preliminary estimates suggest about a sixth of the margins are in software. Computer services provided by wholesalers account for much of the remaining margin. The accompanying table indicates that wholesaling activities during this five-year period grew relative to the Canadian market. Over this period, purchases by wholesalers of hardware and software increased from $2 687 million to $6 430 million or 2.4 times. From 1988 to 1990, purchases by wholesalers exceeded the Canadian market for computers because wholesalers were selling in export markets as well as the domestic market or software was included in wholesaling activities. There is no historical data series on the Canadian market for software because customs officers, prior to 1988, evaluated computer software based on the physical value of the tapes or disks rather than on the value of the information imprinted on them, a practice that is still followed by U.S. customs officers responsible for evaluating Canadian exports.

After 1986, net sales and receipts by wholesalers increased at a similar rate as purchases, rising from $5 520 million in 1986 to $9 961 million in 1990. As a result, gross margins in wholesaling fell from 51.5 percent in 1986 to 33.7 percent in 1990.

Conclusion

Wholesaling activities are a key element of the computer industry in Canada. The gross margins shown in the accompanying table are over and above the revenues generated by manufacturers. Thus, manufacturing alone understates the size of the industry. At the same time, the reader needs to keep the changing nature of the industry in mind. Although Statistics Canada treats firms such as Computerland as wholesalers, selling mainly to companies, with lower prices the advent of the home computer means that wholesalers are continuing to emerge into retail activities.

Wholesaling of Computer Equipment and Software

($ millions)

	1986	1987	1988	1989[a]	1990[a]
Hardware manufacturers[b]					
Canadian market	3 833	4 535	5 136	5 633	5 261
Wholesalers[c]					
Salaries and wages	957	947	1 128	1 297	1 401
Volume of trade	5 544	6 713	8 822	10 145	10 957
Gross margin	2 853	2 592	2 970	3 416	3 689
Percent margin	51.5	38.6	33.7	33.7	33.7
Net sales and receipts	5 520	6 518	8 020	9 223	9 961
Purchases	2 687	4 023	5 177	5 954	6 430
Opening inventory	665	613	719	826	892
Closing inventory	685	710	846	973	1 051

[a] ISTC estimates.

[b] See SIC 3361, electronic computing and peripheral equipment industry.

[c] See SIC 5744, wholesale of computer equipment and software.

Source: Industry, Science and Technology Canada, *Information Technologies Statistical Review, Annual 1991*, Information Technologies Industry Branch, Ottawa, Canada, page 55.