Computer Services and Software

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Fax: (403) 495-4507

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Fax: (403) 292-4578

British Columbia

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Fax: (604) 666-0277

Yukon

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Fax: (403) 668-5003

Northwest Territories

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10th Floor
P.O. Bag 6100
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Northwest Territories
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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:

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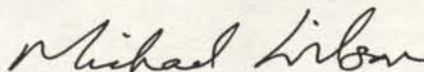1-800-267-8376
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Canada

1990–1991

COMPUTER SERVICES AND SOFTWARE

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) 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*

Structure and Performance

Structure

The computer services and software industry is one of the fastest-growing sectors in the Canadian economy.

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

Its three major subsectors are professional services, data processing services and software products development. In part, because of the industry's rapid evolution, data are often not sufficiently disaggregated to quantify all aspects of its activities at this time.

In this emerging industry, two major activities cut across all three subsectors — systems integration and value-added reselling. Systems integration activities include design, development, testing, documentation, installation, support and training for custom-designed, complex systems. These complex systems include computer and communication systems as well as the integration of both these systems. Systems integrators, who undertake these activities, face increasing demands to provide custom-designed and packaged software. Since each of the three major subsectors deal with systems integration, separate data on systems integrators are not currently available.

Contained within the computer services and software industry are many value-added reselling activities. These activities enhance computer products by adding hardware or software to make the products of a hardware supplier more useful to purchasers. This activity involves the resale of some hardware as an integral part of the computer services and software industry. Value-added reselling activities are carried out by some computer services and software firms, wholesalers and retailers, and therefore are not quantified separately. As a result, data on these activities are not readily available. For example, it is not clear what share of the $3 689 million in gross margins earned by wholesalers of computer equipment and software in 1990 should be attributed to value-added reselling activities.

Professional Services

The professional services subsector includes establishments that provide consulting services and develop custom-made software packaged to meet individual needs. The professional services provided include systems advice and technical consulting, contract systems analysis and programming, applications management, project or facilities management, training and education.

Data Processing Services

The data processing services subsector consists of establishments that provide computer processing as well as related products and services, including gateway and network services, data base access, shared processing and data entry services.

Software Products Development

The software products development subsector consists of establishments that develop and sell packaged software.

Figure 1 — Total Revenue and Employment
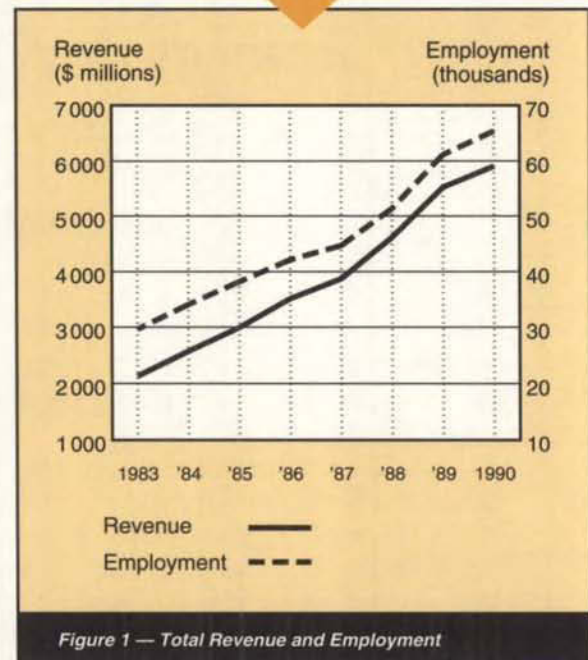
There are three types of packaged software: systems software packages (operating systems); user tools (systems development and maintenance packages); and applications (ready-to-use packages). Vertical (industry-specific) applications meet the various needs of specific industries, such as hospital systems, geographical information systems and banking systems. Horizontal (generic) applications packages address the accounting, payroll, inventory control and similar needs of firms across many industries.

Total Industry

For statistical purposes, Statistics Canada includes firms providing other services including rental, leasing, repair and maintenance services as part of the computer services and software industry. This industry profile focuses on the characteristics, performance, future prospects and competitive status of the three major subsectors of the computer services and software industry. In 1990, 11 023 firms in the Canadian computer services and software industry employed 65 417 people and generated revenues of about $5 906 million (Figure 1). Since only those establishments whose primary output is computer services or software are captured, these figures substantially understate the size of computer services and software activities in Canada. For example, the telecommunications equipment and computer manufacturers were responsible for 38 percent and 19 percent, respectively, of the software research and development (R&D) performed in Canada,

whereas the computer services and software industry in Canada performed only 17 percent of the software R&D in 1989.

In 1989, the last year for which disaggregated data are available, the professional services, data processing services, and software products development subsectors accounted for $3 959 million, or 72 percent of the industry's revenues of $5 520 million. Professional services accounted for 35 percent of shipments in 1989, data processing services, 22 percent and software products development, 15 percent. The remaining 28 percent of the industry's revenues were made up of other activities including hardware sales, leasing and rentals, hardware repair and maintenance, operating revenues and non-operating revenues.

International

International markets are of major importance to large and medium-sized Canadian computer services and software companies and therefore affect their structures. This is particularly true of Canadian-based multinational companies. The table below presents the shares of consolidated revenues generated by domestic and foreign sales for three leading computer software firms in 1990. International markets are required by Canadian firms to recuperate the increasingly large R&D expenditures needed to produce internationally competitive computer services and software in a competitive market that is experiencing decreasing product life cycles. These international markets are crucial to the growth of most software firms from their earliest stages.

Trade and international payments data for the industry available at the time of writing do not fully capture the size and importance of the export market. There are two reasons

Domestic and Foreign Shares of Consolidated Revenues, 1990

(percent)

	Domestic	Foreign
Cognos	14.6	85.4
Corel Systems	5.0	95.0
SHL Systemhouse	73.4	26.6

Sources: Annual Reports and company-released information.

for this situation. By international agreement, Canadian sales of software to the United States are valued, in line with U.S. precedents, at only the cost of the medium that holds the program (i.e., the value of the blank disk or tape). The value of a blank disk is often minuscule in comparison with the value of the program it holds. For instance, a software program on a disk that may retail in the foreign market for $100 to $500 is valued at the U.S. border at only approximately $2. For this reason, the profile does not use export data but relies instead on the annual survey[2] of computer services and software conducted by Statistics Canada. While this survey provides an indication of the importance of international markets for Canadian computer services and software firms, it does not capture the computer services and software revenues of the firms outside the scope of the survey. Therefore, it is only a partial measure of all transborder flows of computer services and software from Canada.

This survey indicates that foreign revenues earned in one form or another by computer services and software firms more than tripled from 1983 to 1989, increasing from $131.5 million to $438.1 million. By 1990, these foreign revenues reached $468.7 million (see "Selected International Transactions" on page 12).

The international balance of payments survey conducted by Statistics Canada is specified by activity rather than by industry. As a result, Canada's international receipts and payments for computer services as reported by Statistics Canada[3] give a measure of Canada's balance of payments performance of computer services and software by all companies that trade computer services and software and not just those in the industry. Computer service firms, like most professional services, require local presence for delivery, and therefore these firms often incorporate in the countries where they wish to compete. As a result, the Canadian parent company may receive only royalty payments, licensing fees from software sales and intellectual property, and some repatriated profits. Royalty payments may have to be collected for several years to fully recoup the costs. In this rapidly growing industry, royalty and licensing fees generally lag behind other revenues.[4]

Computer service receipts in services such as network services and remote processing increased threefold from $71 million in 1983 to $214 million in 1990. Since an unknown share of these computer service receipts are earned by computer service and software firms, this series and the one above should not be added.

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[2]See *Computer Service Industry*, Statistics Canada Catalogue No. 63-222, annual.

[3]See *Canada's International Transactions in Services*, Statistics Canada Catalogue No. 67-203, annual.

[4]The "computer services" category captures all cross-border payments for computer services incurred (e.g., remote processing and contract programming), and some royalties and licensing fees for software, except those royalties and licensing fees that fall under "royalties" and are not disaggregated by activity.

Canadian payments abroad for computer services totalled $517 million in 1990. The deficit of $303 million between international payments and receipts in 1990 reflects service fees paid by Canadian subsidiaries of foreign software producers for the rights to distribute software developed abroad in Canada. American multinationals, such as Ashton-Tate, Lotus, Microsoft, Oracle, SAS and WordPerfect, dominate the international software market.

A further $663.2 million was paid on Canadian imports of software in 1990. However, due to an international agreement,[5] parallel data on exports are not available. Moreover, the information on foreign revenues earned by computer services and software firms cannot be used as a proxy because it is not a true measure of transborder flows.

Exclusive of wholesale markups, revenues for the Canadian computer services and software industry are estimated at $5 906 million in 1990. Total industry revenues earned in Canada by both Canadian and foreign firms were $6 618 million in 1990. These data, however, vastly understate the total value of revenues and the multinational nature of the computer services and software market because Canadian suppliers from outside the industry are not included in the estimates.

Software Manufactured by Others

By focusing on establishments that have computer services and software as their principal business, the industry data omit a large number of participants whose principal business is other than software. For example, a special study[6] of firms principally involved in the manufacturing and wholesaling of computer equipment indicated that their manufacturing and wholesaling activities as well as computer services generated $1 425 million in software revenue in 1986. This was not an exhaustive survey of software sales, because many firms, such as telecommunications carriers and financial institutions, were classified to other industries that market software as a secondary product. Although manufacturing operations were not included, the value of their output may be captured by including wholesale sales, because software sold by all the large computer hardware manufacturers through their wholesalers is classified to Statistics Canada's Standard

Industrial Classification (SIC) 5744, wholesalers of computer equipment and software. This aspect of the industry is discussed in more detail in the Appendix on page 15. In contrast, the in-house management information systems divisions of large corporations and financial institutions also performed computer services and software activities internally that are not captured by this profile.

A recent Statistics Canada report[7] showed that wholesalers of computers and peripheral equipment derived $806.3 million in software revenues and had foreign software purchases of $419.5 million in 1988. These numbers indicate both the high margins on software products, which may be capturing some value-added activity by wholesalers, and the high levels (85 percent) of imported software products that passed through wholesalers of computer products in 1988. Wholesalers of computer products in Canada include the subsidiaries of foreign software producers, equipment manufacturers as well as traditional wholesalers. Comparable export data for software are unavailable.

Research and Development

While it is not possible to quantify the total amount of general software development undertaken in the Canadian economy, it is possible to calculate the amount of scientific software R&D being carried out. Revenue Canada considers only that part of software development activity involving true experimentation and significant uncertainty with respect to either the establishment of scientific or lowest-cost solutions as scientific R&D on software. The balance of software development involves the use of known technologies in new application areas.

Canadian software R&D expenditures exceeded $1 billion in 1988. About 67 percent, or $684 million, was undertaken by firms in manufacturing industries such as telecommunications equipment, business machines and aircraft. Various service industries accounted for the remaining $331 million. By 1990, the computer services and software industry itself undertook software R&D valued at $256 million. Software R&D accounted for 21 percent of all R&D in Canada's manufacturing sector and for 28 percent in the services sector.

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[5]On 1 January 1990, Canada and the United States entered a data-sharing agreement. Under this agreement, Canada agreed to use U.S. data on imports from Canada as the value of Canadian exports to the United States. Furthermore, the United States will use Canadian data on imports from the United States as their value of exports to Canada. However, the United States does not evaluate software imports; therefore, Canadian exports of software to the United States are not currently well captured in the export data. For this reason, the foreign revenues used here are based on an industry survey, so trade in software by firms outside the scope of survey is not captured.

[6]See *Computer Service Industry*, Statistics Canada Catalogue No. 63-222, 1986, page 54.

[7]See *Service Industry Bulletin – Special Report on Software*, Statistics Canada Catalogue No. 63-015, Vol. 1, No. 3, April 1990 (SIC 5744, wholesalers of computer equipment and software), pages 4-5.

Software is the most pervasive of the 14 key technologies addressed in Statistics Canada's industrial R&D survey.[8] The software R&D performed in other sectors has contributed to the pool of highly skilled systems engineers, computer programmers and systems analysts. Both large and small firms in the computer services and software industry have benefited.

Industrial Concentration

In 1989, the 78 firms with revenues of more than $10 million earned almost half (48 percent) of total industry revenues, with a further 11 percent coming from the 90 firms that each had annual revenues of between $5 million and $9.99 million.[9] Numerous smaller firms also furnish products and services that meet the needs of local, national and international markets. The 9 292 firms with sales of less than $2 million accounted for 28 percent of industry revenues in 1989. Although vendors of computer services and software operate in all provinces, those in Ontario and Quebec accounted for 80 percent of revenues in 1989.

This industry is centred in Ontario. Figure 2 illustrates the regional distribution of revenue, firms and employment in the industry in 1988. On average, firms with head offices in Ontario are larger than those in the rest of the country. Firms headquartered in Ontario had 57 percent of the industry's revenues, 49 percent of its firms and 50 percent of its employment. Firms headquartered in Quebec tended to be more labour-intensive with 28 percent of employment but only 23 percent of both firms and revenues. Except for the minor role of the Atlantic region, the rest of the industry is fairly evenly divided between the Prairies and British Columbia. In both these regions, the average size of a firm tends to be smaller than those in Central Canada. Firms headquartered in Ontario earned 8.9 percent of their total revenues from their related offices in other provinces. Similarly, firms headquartered elsewhere had offices in Ontario earning 5.9 percent of their revenues. Therefore, the distribution of earned revenues is slightly less Ontario-centred than shown above.

Professional Services

The professional services subsector has enjoyed rapid growth in the past decade. In 1989, it generated revenues of $1 947 million. In 1988, the subsector was significantly concentrated, with the top five firms earning 46 percent of subsector revenues. This subsector is domestically oriented and largely Canadian-owned. These firms provided services such as systems and technical consulting, contract systems
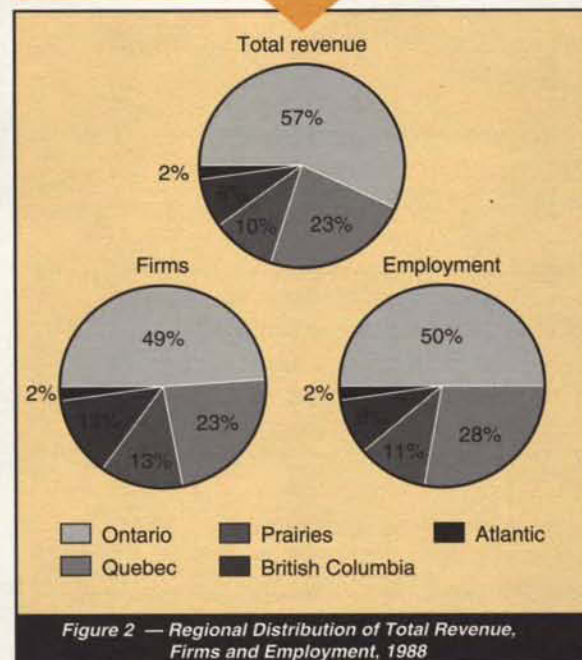

Figure 2 — *Regional Distribution of Total Revenue, Firms and Employment, 1988*

analysis, custom-designed software development, applications management, project or facilities management, corporate electronic data processing (EDP) consulting, training and third-party maintenance. By their nature, ongoing on-site professional consultation services require a local presence for delivery. Well-established, professional services firms have created subsidiaries abroad to serve foreign markets. Large Canadian professional services firms include the CGI Group, DMR Group and Groupe LGS.

Data Processing Services

In 1989, firms offering data processing services earned revenues of $1 204 million. The subsector is highly concentrated. The five largest firms earned 40 percent of revenues in 1988. Among the larger data processors in Canada are Co-operators Data Services, ISM Information Systems, Groupe IST and Star Data Systems.

Data processors in Canada and abroad traditionally have served local markets, although advanced communications may rapidly alter this market characteristic. In Canada, foreign competition has not been an important factor in this subsector. Because of slow growth in the demand for traditional

[8]See *Computer Service Industry*, Statistics Canada Catalogue No. 63-222, 1988, Appendix A.
[9]See *Computer Service Industry*, Statistics Canada Catalogue No. 63-222, 1989.

processing services in the mid-1980s, some firms have brought new services such as on-line financial information to the marketplace. Other firms have expanded into systems integration markets. From 1988 to 1989, there was a 17 percent increase in revenues in this subsector largely due to more contracting out rather than to a total rise of this economic activity in the economy.

Software Products Development

In 1989, the Canadian software products development subsector generated revenues of $808 million. The top five firms earned 35 percent of the subsector's revenues in 1988. Apart from subsidiaries of foreign-based multinationals, the largest Canadian software producers are Cognos, Corel Systems and Geac.

Most Canadian software producers have chosen to specialize in user-friendly software and, increasingly, in vertical or industry-specific applications packages. However, several Canadian software developers (including Corel Systems, Delrina Technology and Q.W. Page Associates) have successfully introduced horizontal applications packages to the market.

The larger Canadian value-added resellers (VARs) companies emphasize systems integration. These firms include CGI Group, DMR Group, Groupe IST, Groupe LGS, ISM Information Systems and SHL Systemhouse. Computer hardware companies, such as IBM and Unisys, are also increasing their presence in this field. Currently, governments and major corporations constitute the major markets for these activities. Large VARs tend to be international in their orientation with an emphasis on strategic alliances such as the one recently signed between SHL Systemhouse and Samsung of the Republic of Korea.

Performance

The Canadian computer services and software industry began with the establishment of the first data processing companies in the mid-1960s. The high cost of mainframe computers and customers' inexperience with computer technology created a rapidly growing market for data processing services. Until the late 1970s, annual growth rates of 15 to 20 percent were common.

In the mid- to late 1970s, the nature of the computer services and software market changed with the introduction of minicomputers and microcomputers. The introduction of the IBM personal computer (PC) in 1982 began the mass marketing of computers. The new technology dramatically reduced the price of computing power and diminished the need for external data processing services. Demand for

(constant 1986 $ millions)

Gross domestic product ━━━

Figure 3 — Real GDP Generated by Computer Services and Software
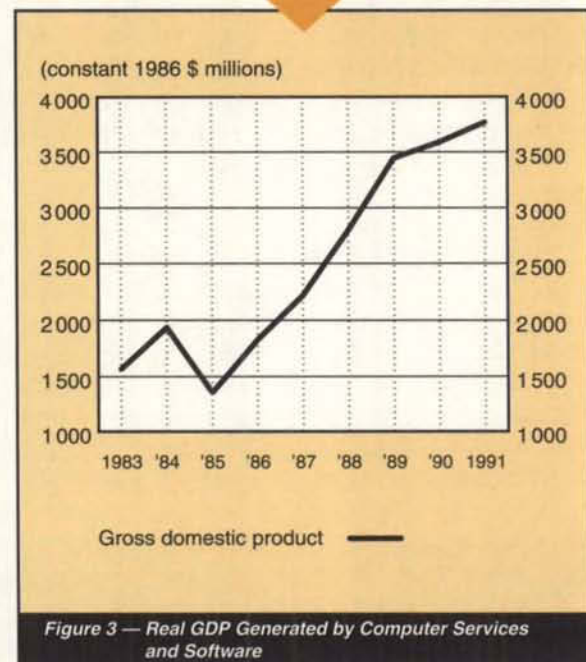
software and other professional services grew quickly, and the industry proved recession-proof in the early 1980s.

After relatively flat growth in gross domestic product (GDP) from 1984 to 1986, computer services and software resumed strong growth (Figure 3). Preliminary data on GDP generated by computer services and software from 1986 to 1991 indicate a real growth, discounted for inflation, of 15.5 percent, in contrast with the total economy GDP growth of 1.9 percent over the same period.

Professional Services

Professional services revenues have outpaced those of the industry as a whole. Their share of industry revenue rose from 22 percent in 1982 to 35 percent in 1989.

Data Processing Services

The data processing segment of the industry has experienced little growth since 1982. Its share of computer services and software industry revenues fell from 43 percent in 1982 to 22 percent in 1988 prior to the increase in outsourcing activity in 1989. In that year, it kept pace with growth for the industry as a whole. Some data processing firms have established foreign offices that serve specialty markets. Other firms have offered new products and services, such as specialized data bases and network services. Consolidation through mergers and takeovers has taken place as firms battle for market shares. -
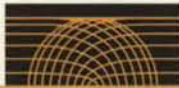
Software Products Development

By 1983, independent software producers played a significant part in the development of software, and their importance has grown steadily since then. Their share of the industry has risen from 10 percent in 1983 to 15 percent by 1989. Much of that growth reflected the increasing demand for applications packages provided by independent software developers. The advent of desktop computing has created a fertile environment for the developers of applications and user tools.

The major computer hardware multinationals remain the dominant players in the high-growth software market. They have demonstrated their determination to remain a major force in the software market by announcing significant software mandates for their Canadian subsidiaries and by taking equity positions in software product firms.

Strengths and Weaknesses

Structural Factors

In spite of the outstanding growth rates achieved by the industry, many small firms in the Canadian computer services and software industry experience the management problems typical of other small businesses. Many firms are led by founders who often lack the management skills, depth of business experience and investment capital necessary to develop a strong commercial image, a convincing business plan and other keys to business success. Moreover, the strategic nature of the technologies employed by these firms present certain management challenges not faced by many domestically oriented small businesses.

The computer services and software industry is expected to face a constantly changing domestic and international business environment throughout the 1990s. Consequently, the industry must attract and nurture the best and most experienced senior managers available. However, in a relatively young industry, with few successful Canadian companies of sufficient stature to develop a talented management base, the required talent is in short supply.

Effective marketing significantly affects the ability of firms to compete in this industry. Despite the proximity of the United States, which has the largest software market in the world, many Canadian firms find it difficult to establish a presence there. Canadian companies often lack the skills and resources to get their products to this market. To date, marketing techniques used by many smaller firms have not measured up to those of their U.S. competitors. Moreover, U.S. computer services and software companies have forged strong marketing alliances with U.S. hardware firms. A lengthy sales process and the need to provide product modifications, after-sales services and client training add complexity to the marketing activities in this industry. Canadian firms that have developed strong positions in highly competitive international markets have effective marketing and distribution mechanisms in place. They also demonstrate a clear understanding of the markets they serve.

The increasing shortage of experienced computer professionals is a cause for concern about the industry's future competitiveness. Along with other leading industrialized nations, Canada has experienced a significant decline in postsecondary enrolment in fields associated with computer science. Enrolment in computer-related disciplines at colleges and universities peaked at 30 507 students in 1984 and has since declined by some 30 percent.[10] It is not clear why job openings in computer science fields typically exceed the number of professionals seeking positions. An adequate future supply of trained technical and managerial personnel is essential to sustaining the competitiveness of the Canadian computer services and software industry.

R&D activities of the computer services and software industry play an important role in maintaining competitiveness. Fierce competition among the top software firms has resulted in significantly shortened product life cycles. Canadian firms must increasingly concentrate on developing successful new products and enhancing existing ones. Canadian computer services and software firms spent between 4.6 and 5.7 percent of their revenues on R&D between 1985 and 1989. In Canada, federal support for industrial R&D is largely delivered through the tax system. To increase software developers' awareness that certain development activities are eligible for the scientific R&D investment tax credit, Revenue Canada is reviewing its regulations and administrative measures in order to expedite refunds to Canadian-controlled private corporations undertaking scientific R&D.

Software product companies experience great difficulty in securing adequate institutional financing. They face all of the challenges encountered by technology-based companies: growing competition, increased corporate concentration, the need to finance major R&D activities on a continuing basis and a fast-paced, rapidly changing market that requires decisions and products to be developed quickly. Computer software firms are often unable to provide sufficient collateral to satisfy bankers. When they turn to venture capital investors,

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10See *Education in Canada, A Statistical Review*, Statistics Canada Catalogue No. 81-229, 1989.

software developers often present ineffective applications due to their lack of tangible assets and uncertainties in placing market values on intellectual capital in its development and early marketing stages.

The costs of transportation and materials have little impact on the competitiveness of Canada's computer services and software industry. However, as firms increasingly use trans-border data networks to sell information products and services, the ability of Canadian data processors and software developers to compete from their Canadian bases will be influenced by the competitiveness of Canadian telecommunications rates.

Trade-Related Factors

There are no tariff barriers to trade in computer services and software, and few trade disputes have arisen between Canada and the United States. However, in trade with other countries, non-tariff barriers (NTBs) include restrictions on labour mobility, international data transfer regulations, government procurement policies and related standards. Additionally, the lack of intellectual property protection in some foreign markets may preclude market entry.

Given the historical openness of Canada-U.S. trade in computer software, the effect of the Canada-U.S. Free Trade Agreement (FTA) on the industry has been positive, but limited. Nevertheless, the FTA, which was implemented on 1 January 1989, reduces barriers to the movement of the key industry personnel required to perform research, design, market and customer support activities. It improves access to each other's market for Canadian and U.S. industry visitors, professionals, traders and investors.

Intellectual property protection against software piracy has become an important trade-related issue. Inadequate intellectual property protection, for example, is often cited as a reason not to pursue certain markets in Asia. The new Canadian *Copyright Act* increases domestic software protection to the level provided to other copyright materials. The United States also has amended its copyright laws to include software protection. Due to the protection, marketing efforts of many Canadian companies are focused on U.S. markets. Even in the United States, however, litigation concerning the "look and feel" of software products has failed to alleviate uncertainty for software developers.

Under the FTA, Canada and the United States have agreed to work toward better international intellectual property rules. A working group on trade-related intellectual property issues has also been established in the Uruguay Round of the multilateral trade negotiations (MTNs) under the General Agreement on Tariffs and Trade (GATT).

Governments generally purchase software from well-established firms with proven track records. The FTA extends national treatment to Canadian and U.S. suppliers of computer services and software without requiring them to establish facilities within each other's borders. The FTA increased the amount of procurement open for competition between Canadian and U.S. firms by lowering the threshold for restricted access procurement to US$25 000. U.S. national security exemptions and U.S. small business set-asides (portions reserved for small businesses) remain. Because small and medium-sized firms may find the U.S. government procurement market difficult to penetrate, both Canada and the United States have agreed to work toward multilateral liberalization of government procurement and to negotiate further improvements to the bilateral agreement.

As more international trade in goods and services takes place electronically, the need increases for unencumbered flows of data, voice and video signals. The availability and price of these transborder data flows are of growing importance to the software and systems exporters who distribute their products and provide services by means of advanced international telecommunications networks. Under the FTA, existing access within and across borders is maintained so that services can be provided through telecommunications networks. Although basic telecommunications monopolies are allowed under the FTA, it prohibits subsidized or discriminatory access to basic telecommunications services. The need for similar international provisions is receiving increased attention since the industry is experiencing frustration in co-ordinating transatlantic and transpacific access to basic telecommunications. The United States remains concerned about Canada's insistence that certain types of data processing take place within Canadian borders. Regulations under Canada's *Bank Act*, for example, require the Canadian storage and processing of certain types of data related to banking.

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

The rapid decline in the cost of hardware and the growth in its performance have increased demand for software with increased capability and speed. Successful software development requires knowledge of the technology embodied in the newest computer hardware and its systems software. Multinational computer hardware companies, particularly those based in the United States, are the principal source of such technology. For the most part, Canadian producers have kept up with the pace and cost of technological change.

Increasingly, applications software, once developed to the protocols of specific machines, must be designed to operate on many hardware platforms (i.e., with various operating systems). Development of such products is costly. With the rapid implementation of local area networks (LANs), which often link computers of different sizes and makes, the need for international software standards is increasingly being recognized. Such standards are beneficial to software producers who wish to devote their development efforts to new products rather than to product conversions. A number of hardware multinationals have announced open systems strategies, establishing what appears to be a major trend toward the integration of systems standards.

The development of advanced computer languages has also affected software development. A sophisticated market has increased the demand for advanced products. Fourth- and fifth-generation languages, expert systems, artificial intelligence and voice recognition systems will be key components of future software products. The ability to run several different applications simultaneously (multitasking) will create a market demand for powerful new software applications. Meeting this demand may prove both an opportunity and a challenge for packaged software developers. Strengthening links between Canadian software producers and hardware companies and between software producers and the software R&D laboratories should result in the development of new products that will generate future growth.

Improved methodology and tools will play an important role in the development of high-quality, competitive software products. Canadian firms have developed several excellent products in these fields. Computer-aided system engineering (CASE) products incorporate process engineering technologies similar to those used in the automated design and production of manufactured products. Although most Canadian software developers rely on the handcrafting of software code, an increasing number are turning to these tools for improved software reliability, effectiveness and productivity.

More recently, telecommunications equipment technologies have emphasized the integration of computer services and software applications in networks. The development of advanced networks has spawned a demand for networking software to facilitate the exchange of electronic data within and among companies. The development of an integrated service digital network (ISDN), with the capability to integrate voice, data, text and images, will allow the creation of more complex systems and have a significant impact on the data processing and systems integration subsectors.

Other Factors

Professional Services

The professional services subsector has grown rapidly and has maintained its position in the domestic market as a result of the growing demand for complete solutions and customized software, as well as the shift from the time-sharing services of data processing firms to in-house computing. Some professional services firms are increasing their penetration of foreign markets through mergers and acquisitions. The provisions of the FTA have increased the opportunities open to Canadian firms in this subsector. It has also increased U.S. and other foreign competition they face. These factors should challenge a growing number of medium-sized to large firms to become internationally competitive.

Data Processing Services

Although the emergence of low-cost minicomputers and microcomputers has allowed traditional customers to switch to in-house computing, the industry nonetheless remains in an excellent position to compete for the provision of traditional data processing services. Firms in this subsector are relatively mature and well entrenched in the Canadian market. They have established management and corporate links to other large and successful firms that have helped them in reaching outsourcing markets. The future performance of firms in this subsector and the emergence of non-traditional suppliers will depend on their ability to successfully introduce new products and services to the market.

Software Products Development

The success of Canadian software products developers is linked to improvements in management, marketing, financing,

productivity and access to highly qualified personnel. Most independent Canadian software producers remain small, with limited financial management and marketing resources. Nevertheless, Canada has produced a number of international corporate success stories. These successes include Cognos, with the fourth-generation language applications development tool PowerHouse; Corel Systems, with the graphics package Corel Draw; Alias Research, in the field of industrial design and animation; and Delrina Technology, with its forms-generation package PerFORM.

Canadian strength in the software products development subsector is also evident in the vertical software marketplace. Innovative Canadian software applications in health care, education and geographical information systems have achieved international recognition. Canadian firms that have launched internationally successful vertical products include Intera Tydac Technologies (geographical information systems), Lynx Geosystems (mining and environmental modelling), BDM Information Systems (health care), Alias Research (computer-aided industrial design and animation) and CTB - Columbia Computing Services (education).

Evolving Environment

The computer services and software industry has evolved from an industry dominated by data processors to one in which the highest growth rates are realized by professional service firms and software producers. In the future, the three major subsectors will probably remain distinct, although the lines of demarcation between them may blur as customers demand complete solutions to computing problems. Vendors will increasingly combine systems design with software and hardware products, consulting, training and maintenance services. The emergence of a few large companies with these systems integration capabilities is possible. A significant number of smaller firms may also become subcontractors to larger systems integration firms. Mergers and acquisitions in the industry are likely to continue.

Professional Services

Anticipated requirements for customizing or enhancements to packaged applications should sustain domestic and international demand for professional services. At the same time, FTA reductions in residence requirements and other barriers to the movement of personnel will increase opportunities for international trade in professional services. Over the medium term, industry specialists project a compound annual growth of between 10 and 15 percent in this subsector. Contract programming and design services are projected to outperform the subsector as a whole.

In addition to increased direct competition from computer hardware vendors in the custom-designed software development field, professional services firms will have to compete with hardware firms for the small but rapidly growing market for PC support in multivendor environments.

Data Processing Services

To offset the relatively slow growth in its traditional market, the data processing subsector has begun to market a variety of new services, particularly outsourcing and specialized on-line information services. From a competitiveness perspective, there are two important considerations regarding this evolution. First, data processing firms are beginning to offer services similar to those available from the professional services and the software products development subsectors. Second, these new services, particularly specialized data bases and packaged software applications, are increasingly being traded across borders, a practice that will be facilitated by the application of national treatment under the FTA and NAFTA. This subsector may therefore have more opportunities to export its products, but may also face increased competition from U.S. data processing firms in its traditional domestic markets.

A new development in the computer services and software market may provide a significant opportunity for these firms. There appears to be a major structural shift in this market, and corporations are beginning to contract out the development and management of corporate systems. With their considerable management experience and financial strength, a number of firms in this subsector may be well positioned to exploit this opportunity. At the same time, new competition from the in-house software and systems operation from financial institutions seems likely to increase competition.

In the future, the data processing industry will have to concentrate its competitive efforts on competition with other industry subsectors in domestic and international markets. Industry experts predict a modest compound annual growth of less than 10 percent for data processing revenues over the medium term. Much of this growth is expected to reflect the strong performance of network services.

Software Products Development

Worldwide demand for software will grow strongly over the medium term as the computerization of European and Pacific Rim economies catches up with that of the United States. The acceptance of computer technologies by virtually all industrial sectors in industrialized countries is expected to spur the growth of new vertical applications and customized software development. The movement to develop packaged

applications software for sophisticated users is speeding up the development of new tools, applications and specialized software enhancements. The current trend toward even more complex applications packages is likely to give way to a focus on variations for particular uses. Over the medium term, the demand for customized or specialized, vertical applications may overtake the demand for generic, horizontal packages.

Canada's proximity to a growing U.S. market will present opportunities for independent software producers to develop innovative vertical software products for the resource, manufacturing and service sectors. Industry specialists project compound annual growth in Canadian software revenues of between 10 and 15 percent over the medium term. Market growth is likely to be driven by the exploitation of emerging technologies in object-oriented programming systems, expert systems and artificial intelligence.

The strength of demand for complete solutions provides strong prospects for VARs. Industry experts anticipate moderate revenue growth over the medium term of more than 10 percent at compound annual rates.

Competitiveness Assessment

Professional Services

The professional services subsector should have no difficulty in continuing to serve the general consulting needs of local clients, since it is well established in that market. A few large, foreign-owned computer consulting firms have moved into this market, which traditionally has been controlled by Canadian-owned firms. The freer movement of professionals under the FTA will create new opportunities and additional competition in both U.S. and Canadian markets.

Data Processing Services

While data processing firms are currently competitive, they may anticipate increased competition in slow-growth traditional markets. The larger firms have the resources to develop and market new services that extend the market for their existing offerings, while the smaller firms will concentrate on narrow specialty markets.

Software Products Development

In the software products development subsector, Canadian firms are competitive in applications involving customized software, user tools and vertical applications. Continued success in this subsector will require excellent products, the maintenance of a strong presence in foreign markets and, increasingly, adherence to emerging international and national standards.

The ability of Canadian systems integrators and VARs to compete in special application areas and to provide complete solutions is less predictable. Competition will increase from other subsectors, other industries and foreign suppliers. With improved financial resources and management skills, Canada's systems integrators should find success in the special applications and complete systems markets.

For further information concerning the subject matter contained in this profile or in the initiatives listed on page 14, contact

Information Technologies Industry Branch
Industry, Science and Technology Canada
Attention: Software Products and Informatic Services
235 Queen Street
OTTAWA, Ontario
K1A 0H5
Tel.: (613) 954-3287
Fax: (613) 952-8419

PRINCIPAL STATISTICS

	1983	1984	1985	1986	1987	1988	1989	1990[e]
Firms[a]	5 492[b]	6 626	8 091	7 001	6 897	9 381	9 693	11 023
Employment[a]	29 612[b]	34 061	38 183	42 128	44 667	51 363	61 137	65 417
Revenue[a] ($ millions)	2 130[b]	2 569	2 993	3 514	3 872	4 615	5 520	5 906
data processing services	919	927	1 138	1 186	994	1 032	1 204	N/A
software products development	214	282	327	258	418	639	808	N/A
professional services	439	577	667	1 031	1 252	1 597	1 947	N/A
hardware sales/leasing/rentals/repairs	505	692	777	816	974	1 112	1 179	N/A
other operating revenue	37	68	47	169	170	173	271	N/A
non-operating revenue	16	23	37	53	65	62	111	N/A
GDP[c] (constant 1986 $ millions)	1 569	1 937	1 356	1 830	2 218	2 797	3 446	3 589
Intramural R&D[d] ($ millions)	58	94	146	195	219	225	256	256

[a] See *Computer Service Industry*, Statistics Canada Catalogue No. 63-222, annual (SIC 7720, computer and related services).

[b] Unpublished Statistics Canada data.

[c] Data provided by Statistics Canada, Industry Measures and Analysis Division, special tabulation.

[d] See *Industrial Research and Development Statistics (with forecasts)*, Statistics Canada Catalogue No. 88-202, annual.

[e] 1990 numbers except GDP and R&D are estimates based on the Toronto-based International Data Corporation's projected growth rates.

N/A: not available

SELECTED CANADIAN INTERNATIONAL TRANSACTIONS

	1983	1984	1985	1986	1987	1988[d]	1989[d]	1990[d]
Foreign revenue[a] ($ millions)	131.5	193.0	216.7	297.2	318.7	406.4	438.1	468.7
Receipts – computer service activities[b] ($ millions)	71.0	99.0	84.0	142.0	183.0	247.0	212.0	214.0
Imports of software[c] ($ millions)	N/A	N/A	N/A	N/A	N/A	493.7	568.6	663.2
Payments – computer services[b] ($ millions)	70.0	67.0	92.0	106.0	325.0	406.0	357.0	517.0
Total "foreign payments" ($ millions)	N/A	N/A	N/A	N/A	N/A	899.7	925.6	1 180.2

[a] See *Computer Service Industry*, Statistics Canada Catalogue No. 63-222, annual (SIC 7720, computer and related services).

[b] See *Canada's International Transactions in Services*, Statistics Canada Catalogue No. 67-203, annual.

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

[d] 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

REGIONAL DISTRIBUTION[a] (1988)

	Atlantic	Quebec	Ontario	Prairies	British Columbia
Firms (% of total)	2	23	49	13	13
Employment (% of total)	2	28	50	11	9
Total revenue (% of total)	2	23	57	10	8

[a] See *Computer Service Industry*, Statistics Canada Catalogue No. 63-222, annual.

MAJOR FIRMS

Name	Country of ownership	Location of head office
B.C. Systems Corporation	Canada	Victoria, British Columbia
CGI Group Inc.	Canada	Montreal, Quebec
Co-operators Data Services Limited	Canada	Regina, Saskatchewan
Cognos Incorporated	Canada	Ottawa, Ontario
Corel Systems Corp.	Canada	Ottawa, Ontario
DMR Group Inc.	Canada	Montreal, Quebec
Groupe IST inc.	Canada	Montreal, Quebec
Groupe LGS Inc.	Canada	Montreal, Quebec
ISM Information Systems Management Corporation	Canada	Regina, Saskatchewan
SHL Systemhouse Inc.	Canada	Ottawa, Ontario
Star Data Systems Inc.	Canada	Toronto, Ontario

INDUSTRY ASSOCIATIONS

Canadian Advanced Technology Association (CATA)
Second 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

For further information on the following initiatives, contact Industry, Science and Technology Canada (see page 11).

Software '90

Along with Supply and Services Canada, the Department of Communications and External Affairs and International Trade Canada, ISTC played a major role in supporting Software '90, a conference for software developers, organized as a co-operative venture by the industry's trade associations.

ISTC has worked closely with Revenue Canada to clarify guidelines for eligibility for the software R&D investment tax credit. It has worked to promote a better understanding of, and increased access to, the investment tax credit for software R&D. The R&D activities of software companies are eligible for funding under government programs such as the Industrial Research Assistance Program (IRAP) and the Strategic Technologies Program (STP). ISTC has also organized software firm financing seminars for participants from both the computer services and software industry and the financial sectors.

Software Agenda for Action

In 1987, ISTC focused concerted attention on the promise and problems of the Canadian software products industry. The 1988 Software Agenda for Action, developed with the software industry, provided a valuable framework for plans to enhance the industry's international competitiveness.

Software Industry Liaison Committee

In addition to its work with industry in the National Software Working Committee, ISTC has promoted consultations on issues of concern to the industry through the establishment of the Software Industry Liaison Committee, whose members are federal and provincial officials responsible for the promotion and development of the computer services and software industry.

Software Products Sector Campaign

In collaboration with industry, the Software Products Sector Campaign is investigating obstacles to the competitiveness and growth of the software products subsector. A comparative analysis of the U.S. and Canadian industries has addressed such issues as management, human resources, finance, marketing and distribution. Case studies, conducted by the National Centre for Management Research and Development, investigated factors contributing to successful U.S. market entry. The Science Council of Canada undertook a study of R&D in a number of industrial sectors. Software R&D, amounting to 23 percent of the total, received significant attention in this research. Employment and Immigration Canada has completed a major study of skills availability and needs in computer-related professions.

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 telecommunications 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, wholesalers 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.