SECTOR COMPETITIVENESS FRAMEWORKS

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# SOFTWARE AND COMPUTER SERVICES

OVERVIEW AND PROSPECTS

#### FOREWORD

The new Canadian marketplace is expanding from national to global horizons and its economic base is shifting increasingly from resources to knowledge. These trends are causing Canadian industries to readjust their business approaches, and government must respond with new tools to help them adapt and innovate. Industry Canada is moving forward with strategic information products and services in support of this industry reorientation. The goal is to aid the private sector in what it is best qualified to do — create jobs and growth.

Sector Competitiveness Frameworks are a series of studies published by Industry Canada to provide more focussed, timely and relevant expertise about businesses and industries. They identify sectors or subsectors having potential for increased exports and other opportunities leading to jobs and growth. They cover 28 of Canada's key manufacturing and service sectors.

While they deal with "nuts and bolts" issues affecting individual sectors, the Sector Competitiveness Frameworks also provide comprehensive analyses of policy issues cutting across all sectors. These issues include investment and financing, trade and export strategies, technological innovation and adaption, human resources, the environment and sustainable development. A thorough understanding of how to capitalize on these issues is essential for a dynamic, job-creating economy.

Both government and the private sector must develop and perfect the ability to address competitive challenges and respond to opportunities. The Sector Competitiveness Frameworks illustrate how government and industry can commit to mutually beneficial goals and actions.

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"This particular information and communications sector was selected (for study) because, arguably, it is the most important segment of ICT economically."

- Draft report, "Software Statistics: Some Issues and Results", Organisation for Economic Cooperation and Development, Paris, June 1997

# 1. HIGHLIGHTS

Statistics Canada defines the software and computer services industry to include companies whose primary business is (i) in development and sale of software products, (ii) in services like consulting, custom software development, facilities management, and processing services, and (iii) in the sale, lease and maintenance of computer hardware. The focus of this Overview is on the first two lines of business but some data are only available at the overall level. For this reason, in this Overview, the term software industry is used to refer to the first line of business (development and sale of software products), and the term computer services to the second line of business (consulting, custom software development, facilities management, and processing services). The term software and computer services industry covers all three lines of business. Many firms have multiple lines of business which overlap these subsectors.

The software and computer services industry is one of Canada's fastest growing industries. According to Statistics Canada<sup>1</sup>, its revenues increased at a compound annual growth rate (CAGR) of 10.9 percent from 1990 to 1996, reaching \$15.4 billion. Employment grew 11.4 percent per year over the same period, from 71,700 to over 137,000.

\* The software industry is a notable export performer. The Branham Consulting Group<sup>2</sup>, which tracks the top 100 independent Canadian software companies, reported that these firms had export revenues of \$2.2 billion in 1997, 85 percent of their total revenues.

- \* Canadian software companies have captured leading positions in a number of important market niches, such as computer graphics, document management, school administration and cryptography, among others.
- \* The Canadian software and computer services industry is a leading R&D performer, with expenditures of \$519 million in 1996<sup>3</sup>, 6.4 percent of total Canadian industrial R&D. Because a large part of the industry is made up of service firms which perform little R&D, the overall percentage of industry revenues devoted to R&D was only 3.4 percent, which is low for a high tech industry.
- \* The industry is made up largely of small and medium sized enterprises (SME's). There were 15,300 software and computing services firms in 1995, of which only 582 had revenues exceeding \$2 million<sup>4</sup>. The largest Canadian-owned software firm is Geac Computer Corp. whose revenues exceeded \$64. million in its fiscal year 1998. The largest Canadian-owned computer service corporation is CGI Group, with revenues in the \$1 billion range after a series of acquisitions.

# The software and computer services industry is a perfect example of the knowledge based industries on which future economic growth depends....

- Human capital is critical to success because the fixed assets of the industry are negligible,
   it rolies entirely on the creativity of people for success.
- \* The industry's output provides the technology upon which all industries, from agriculture to aerospace, depend for the competitive advaltage required to achieve success in the global marketplace. The enabling effect of information technology, especially software, has been proven time and again.

The Canadian software and computer services industry has proven highly successful in global markets...

- \* The United States is by far the largest player in the global software and computer services market. Many Canadian software companies treat the U.S. as the domestic market.
   Success in the U.S. has proven to be the key to markets worldwide.
- \* Canadian companies have established a reputation for high quality, effective software products in the U.S. They have been abundantly successful in a wide range of product niches, capturing leading market shares in many industry-specific markets.
- \* After establishing a strong position in the U.S., Canadian firms usually turn to European markets, then to the Asia-Pacific. The larger companies offer their products, either direct through their own sales offices or through distributors, in dozens of countries around the world.

# 1.1 Major Trends

- \* World demand for software and computer services will continue to grow rapidly. Indeed, INPUT, a leading American information technology (IT) market research firm, believes the 1997-2002 growth rate will be 13.5 percent annually, increasing revenues to \$1 trillion (U.S.). Canadian firms are well positioned to capture their share of the growth.
- \* The world software industry is at a critical joncture. The emergence of the Internet promises to transform the industry like the development of the personal computer did fifteen years ago. The current powers of the IT industry, such as Microsoft, Intel, Oracle, and Compaq, either did not exist or were negligible factors in the pre-PC market of the 1970's, dominated by IBM, DEC and NCR. The explosive growth of the 'Net is changing the dynamics of the entire IT industry, creating another paradigm shift. It is not clear

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who the industry leaders will be a decade from now.

- Global competition in the software industry is ferocious, leading to broad price decline.
   This has meant an annual decline of 5 percent in the sales price index during the past decade.
- \* To survive the turmoil and succeed in the next generation of software, Canadian firms must continue to identify emerging markets and develop the technology and products which will meet the new demands. In a market characterized by rapidly shrinking product life cycles, declining prices, and ferocious global competition, the Canadian industry faces a major challenge. It is a well-proven maxim of the industry that success goes to the firms which define new categories or niches and then dominate them.

### **1.2** The Bottom Line

A number of issues are important for the long-term success of the software and computer services industry, requiring industry and government to work together to ensure continued growth:

# Trade

- \* Software companies are vigorous exporters. Most base their entire business plan on quickly building market share in the huge U.S. market. These firms are exporters from day one. In the U.S., and especially overseas, where the quantity of information available on markets of all kinds in the U.S. is not available, they rely on the Department of Foreign Affairs and International Trade's posts for assistance in identifying potential distributors and strategic partners. Strategic alliances can make the difference between success and failure in markets with different languages and business practices.
- \* The only significant barrier to trade in software is inadequate protection of intellectual

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property rights. Only eighteen countries have software piracy rates below fifty percent, which means that in the rest of the world more than half the PC software in use has been stolen. Canada must work through such fora as the World Intellectual Property Organization to press at every opportunity for passage, and more particularly enforcement, of software copyright legislation.

# **Human Resources**

- \* The success of the software industry is dependent entirely on its intellectual capital, its human resources. Meeting the demand for talent in this fast growing industry remains a challenge. The Software Human Resources Council (SHRC) estimates that there is currently a shortage of 14,000 programmers; this number is expected to rise to 20,000 by 2000. There is also a shortage of management skills in the industry, especially in the marketing and sales area. Industry, academia and governments must work together to encourage more young people to pursue computing careers, and to ensure that appropriate training is available.
- The industry's training requirements present a big opportunity to Canadian new media learning materials suppliers

# Technology

\* Because its success is dependent on the timely introduction of new products to keep pace with global market demands, the software industry is a strong R&D performer. The industry is a strong advocate of the Scientific Research and Experimental Development (SR&ED) tax credit, which provides significant support to its research effort. The credit is particularly valuable to small firms, which are frequently hard pressed to finance essential R&D. \* Programs to foster cooperation between universities and industry in R&D should be encouraged. Research performed in universities often takes too long to reach potential users in the software industry.

# Financing

\* Until the recent past software companies had extreme difficulty raising capital, largely because neither bankers nor venture capitalists understood the dynamics of the industry. This situation has now greatly improved as specialist financiers have emerged to meet the industry's needs. A problem still remains for early stage companies in obtaining equity financing in smaller amounts.

The Canadian software and computing services industry has been highly successful in recent years, compiling an excellent record of growth in revenues, exports and employment. It must now rise to the new challenges posed by the growth of the Internet and its attendant transformation of the technology and markets of the business.

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# 2. KEY POINTS ABOUT THIS INDUSTRY

#### 2.1 Introduction to the Industry

#### Definition

Statistics Canada defines the software and computer services industry to include companies whose primary business is (i) in development and sale of software products, (ii) in services like consulting, custom software development, facilities management, and processing services, and (iii) in the sale, lease and maintenance of computer hardware. The focus of this Overview is on the first two lines of business but some data are only available at the overall level. For this reason, in this Overview, the term software industry is used to refer to the first line of business (development and sale of software products), and the term computer services to the second line of business (consulting, custom software development, facilities management, and processing services). The term software and computer services industry covers all three lines of business. Many firms have multiple lines of business which overlap these subsectors.

## History of the Industry

Software, both operating system and applications, for mainframe computers originally came bundled with the computer. The independent software industry began in 1965 when IBM, in an agreement with the US Justice Department, agreed to separate software from hardware, or to unbundle it. A variety of custom software houses sprang up to address users needs for special applications.

In 1971 Intel developed the first microprocessor, the technology which would eventually transform the entire computer industry. In 1977, the introduction of several popular microcomputers, including the Apple II, created a new era in computing. The micro software industry was really launched in 1979 by the first "killer application", *Visicalc*. The first IBM PC

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was introduced in 1981, with Microsoft's MS-DOS operating system. IBM's entry established the legitimacy of the microcomputer, and the market exploded. As PC sales accelerated thousands of software companies were established to offer all type of programs. Some notably Microsoft, Lotus, WordPerfect and Borland, quickly built revenues in the hundreds millions.

Apple brought the easy-to-use graphical user interface to market with the introduction of the Macintosh in 1984. Its superior technology failed to capture market share because of Apple's poor marketing strategy. The PC world finally caught up with the Mac interface when Microsoft shipped *Windows 3* in 1990. It precipitated a major change in the software industry. Companies which quickly introduced *Windows* products gained major market share. Companies which reacted too slowly, including Lotus, WordPerfect and Borland, the leaders of the first era of personal computing, suffered severe damage. The ability of new technology to transform the software marketplace was proven by *Windows 3*.

Another such transformation is underway now. The explosive growth of the Internet, driven by the introduction of Netscape's *Navigator* browser in 1994, is having an even greater effect than *Windows*. The 'Net offers enormous new opportunities for software companies in providing the programs and tools that will enable users to exploit the huge range of information and products which is being made available in cyberspace. The risks are also large. When transformations are underway, those who choose the wrong technologies or standards, or react too slowly, are left behind. The failure rate in the software industry is high at the best of times, and higher when the technical foundations shift. Software companies are faced with choosing between Netscape or Microsoft browser technology, between the Java and ActiveX programming languages, between *Windows NT*, Unix and *NetWare*, and many other technical and market decisions. While the winners cannot be predicted, it can be forecast with confidence that the software and computer services industry will continue to grow rapidly on a global basis. INPUT estimates the 1997-2002 growth rate at 13.5 percent annually.

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The services side of the industry has gone through a series of less wrenching changes. The initial entrants were service bureaux, which provided batch processing services to companies which did not operate their own systems. Systems Dimensions Ltd. and Multiple Access Computing were early Canadian entrants. Consulting firms followed, to advise firms on their computing strategies and to develop custom software to meet them. Smaller systems were often provided by value added resellers; hardware company dealers that combined hardware with various software packages to meet industry-specific needs. Systems integration, the provision of large integrated systems using multiple vendors' hardware and software, tied together with custom code, emerged in the 1980s.

In the 1990s, the difficulty and cost of keeping up with rapidly changing trannology, gave rise to outsourcing, the contracting out of companies' entire information management operations to IT specialists.

Mergers have been a feature of the computer service industry since its establishment, as firms endeavour to extend their service offerings and geographic reach. For example, industry pioneers, Systems Dimensions and Multiple Access, were both acquired by other companies.

# Industry Dynamics

The business dynamics of the software and computer service sides of the industry are entirely different. The software company must identify a need not met by existing software, perform the R&D to develop an effective solution, then market it vigorously in a fiercely competitive global environment, since all the big markets are outside of Canada. The company must raise the money to finance its R&D and marketing programs. Risks are high because of the large upfront costs, which must be met before the product is even launched. Any misstep can lead to failure. Successfully navigating the pitfalls leads to spectacular growth, as demonstrated by Canadian leaders like Cognos, Corel, Geac, Hummingbird and PC Docs.

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Services, however, are delivered on a contractual basis. While there are risks that the vendor will not be able to meet the terms of the contract, the risks are much less than those of software products. While some companies have developed proprietary technology, R&D is not critical to success in services. Foreign operations are seldom an issue, until companies become large enough to consider acquiring or establishing foreign subsidiaries. Growth in operations can usually be financed from cash flow. Acquisitions have been a popular route to more rapid revenue growth, extending geographic coverage and firm capabilities. They have been an essential ingredient of international expansion. The business risks in services are much smaller than in products, but so is the potential for growth, except via acquisition.

# 2.2 The Global Context

INPUT, a leading American market research firm, estimates the world software and computer services market at \$557 billon (U.S.) in 1997, an increase of 12 percent over 1996. In terms of revenues, 24 percent was derived from software products and 76 percent from services. The United States, at \$269 billion (U.S.), represents almost half the world market. The Canadian

Chart 1



Source: INPUT

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market was estimated at \$13.9 billion (U.S.), only 2.5 percent of the global total. INPUT forecasts that the world market will grow to \$1 trillion (U.S.) by 2002, a CAGR of 13.5 percent.

The United States dominates both international production and consumption of software and computer services. US consumption accounted for 53 percent of world demand for software products, 47 percent of computer services.

Chart 2





Source: INPUT

The software industry has been characterized by the global dominance of large suppliers able to meet customer expectations of performance, quality and price, and to establish control of distribution channels. Many of these leaders have been able to establish their products as de facto standards of compatibility within their market niche. The only non-US firm in the ten largest software companies is Germany's SAP AG.

The situation is similar in computer services. There are just two non-US companies in the top ten, Fujitsu of Japan and CAP Gemini of France. INPUT reports that IBM has the biggest market

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share, 6 percent of the total world software and computer services market.

Canadian software and computer services companies have captured about 2.5 percent of the global market. While none of them are in the first rank in terms of sheer size, several have seized dominant market shares in their product niches. Softimage and Alias/Wavefront in animation, Corel in graphics, PC Docs and OpenText in document management, Cognos in data mining and Chancery in school administration are examples of such success.

# Trade Policy Issues

Tariffs are not a barrier to trade in software. They are applied only to the value of the carrier medium, the diskette or tape, which is an insignificant part of the selling price of the software. Non-tariff barriers include restrictions on labour mobility, cross border data transfer regulations, government procurement policies, and discriminatory application of standards. They have not proven to be serious problems.

The most significant trade barrier is inadequate protection of intellectual property rights, in particular software copyright. The problem is that while most countries have software copyright legislation, enforcement in many countries is ineffectual or nonexistent. According to a stud performed for the Software Publishers Association and the Business Software Alliance, four out of ten business software applications in use were pirated in 1997. Only 10 countries had a software piracy rate of less than 40 percent while 22 countries had a rate of more than 80 percent. As shown in Table 1, worldwide revenue losses due to piracy were estimated at \$11.4 billion (U.S.) in 1997. Canada had a piracy rate of 39 percent and revenue losses at \$295 million (U.S.). Trade with countries where software piracy is rampant is simply not viable.

|                    | Piracy Rate | Retail Revenue Pirated<br>(Million of U.S. dollars) |
|--------------------|-------------|---|
| U.S.               | 27%         | 2,779.7   |
| Canada             | 39%         | 294.6   |
| Western Europe     | 39%         | 2,518.7   |
| Asia/Pacific       | 52%         | 3,916.2   |
| Latin America      | 62%         | 919.7   |
| Middle East/Africa | 65%         | 391.5   |
| Eastern Europe     | 77%         | 561.4   |
| Worldwide          | 40%         | 11,381.7  |

#### Table 1 - Global Software Piracy 1997

Source: 1997 Global Software Piracy Report, a study conducted by International Planning and Research Corporation for the Business Software Alliance and Software Publishers Association.

In December, 1996 a new copyright treaty was negotiated at the World International Property Organization. The treaty provides excellent protection for software, but it will only be effective when the signatory countries pass the necessary legislation and enforce it. Canada, and many other countries, continues to press for full protection of intellectual property rights in trade negotiations.

# 2.3 Canadian Industry Snapshot

In 1996 total revenues of the Canadian software and computer services industry were \$15.4 billion<sup>1</sup>. Its GDP was \$6.5 billion in constant 1986 dollars<sup>5</sup>. It employed 137,300 people, of whom 40,700 were self-employed.<sup>6</sup> There are over 16,000 software and computer services firms.

## **Regional Distribution**

Ontario is the leader in the industry, with 60.7 percent of total revenues in 1995. Quebec had 17.5 percent, British Columbia 10.7, and Alberta 5.8, with the remaining 5.3 percent divided among the other provinces<sup>4</sup>.

Chart 3

# Regional Distribution of Revenues: Software and Computer Services, 1995



Source Statistics Canada, Cat. no. 63-222

Distributio

#### n by Size

The software and computer services industry is comprised largely of small and medium sized enterprises (SME's). In 1995, 81 percent of the firms had revenues of less than \$250,600<sup>4</sup>. A study conducted on behalf of Industry Canada identified revenues of \$2 million as the threshold level at which a software company had reached the critical mass likely to offer long term success. Only 582 software an i services companies out of 15,300, 3.8 percent, had reached that size by 1995. There is considerable turnover in the ranks of the industry every year. New entrants are constantly being founded. Existing firms often merge with others, or are acquired by larger Canadian and foreign companies. Some firms, of course, fail.

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Chart 4

# Percent of Firms and Paid Employees by Revenue Size Group: 1995



Source: Statistics Canada, Cat. no. 63-222

# Leading Canadian Companies

The Branham Group Inc. compiles a directory of the leading independent Canadian software and computer services companies which is published annually in *The Financial Post*<sup>2</sup>. An examination of the leading companies offers an insight into the varied routes to success in the industry. The largest Canadian software company is Geac Computer Corp., whose revenues exceeded \$646 million in its April, 1998 fiscal year. Geac was established as a minicomputer manufacturer with a specialized line of software for libraries and financial institutions. After stumbling close to failure, it adopted a strategy of expanding rapidly in the software industry through an aggressive acquisition campaign, which carried it to its current success. Cognos Inc., the original leader of the Canadian software industry, achieved renewed growth after its software development tools business matured by launching an extremely successful line of business intelligence tools. Its revenues reached approximately \$339 million<sup>7</sup> in its February, 1998 fiscal year.

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Choosing companies at random from the Branham list demonstrates the diversity of the software applications markets in which Canadian companies have achieved international success: STS Systems Inc., Pointe-Claire, Que, \$87 million of integrated retail systems, JetForm Corp., Ottawa, \$76.6 million of forms management software; MDSI Mobile Data Solutions Inc., Richmond, BC, mobile workforce management solutions, \$70 million; Promis Systems Corp., Toronto, manufacturing systems, \$34 million; PCI Geomatics Group, Richmond Hill, Ont., geomatics software development, \$13 million. All of these companies derive a minimum of 65% of their revenues from exports.

All the largest companies on the Canadian computer services market, IBM, SHL Systemhouse, DMR Consulting Group, and EDS of Canada, are foreign owned. The largest Canadian-owned company, CGI Group, has revenues exceeding \$1 billion a result of recent acquisitions. With the exception of CGI, none of the Canadian-owned computer service companies has major foreign operations.

# International Perspective

The Canadian software industry is heavily export oriented. The US market is notable not only for its huge size (\$269 billion (U.S.), almost half the world market), but for the willingness of customers to try something new if it promises to solve a problem for them. Canadian software developers naturally address US market needs very early in their business planning. Most successful Canadian software entrepreneurs treat the US as their domestic market, almost ignoring Canada. (It is interesting that recent reports indicate that successful European companies pursue the same strategy, attacking the US market, not their domestic one.) Of fifty small software companies interviewed by Reuber and Fischer, the majority earned more than 50 percent of their revenues abroad<sup>8</sup>. Success of Canadian firms requires that they adopt an international perspective early.

The computer services industry is not nearly as active in foreign markets. In 1997 only 12.7 percent of the revenues of the Top 50 Canadian service companies were derived from foreign sources<sup>2</sup>, indicating that even in sophisticated information technologies, success in a service business usually requires local presence, delivery and support. Customers insist on immediate resolution of any problems which arise with critical information systems. They naturally prefer local suppliers to distant ones. With few exceptions, penetration of foreign service markets requires the establishment or acquisition of local operations. Either strategy is complex and expensive. Early Canadian entrants into foreign computer service markets encountered severe problems and sustained major losses.

# 2.4 Performance

In 1996 GDP (in 1986 constant dollars) of the software and computer services industry was \$6.5 billion, up from \$6.0 billion the year before<sup>5</sup>. During 1990-96, output grew 76.3 percent, a

# Chart 5

# Growth of GDP: Software and Computer Services vs. All Canadian Industries



Source: Statistics Canada, Cat. no. 15-001

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CAGR of 9.9 percent. This growth rate far outpaces the annual growth of national GDP, which averaged 1.5 percent.

Growth of the industry has been driven by the huge demand created by rapid advances in computer hardware and software technology. The resulting improved functionality has triggered strong demand for new and updated software products, expanded networks and improved systems. As a result, software and computer services is one of the fastest growing industries.

# Prices

At the same time that the industry has been achieving tremendous growth, software prices have been falling. Between 1988 and 1996 the price index fell by an annual average of 4.9 percent<sup>9</sup>. The declines have been particularly dramatic for mature products in the business productivity and consumer areas, where competition for market share is particularly fierce.

# Research and Development

The key to success in the global software market is the ability to deliver new or upgraded products in a timely fashion. Products which fail to offer the capabilities and features which the market demands, or which are delivered too late, will not achieve the leading market shares which are essential to success. R&D is a critical factor in competitive success. Fierce competition among the top software companies has significantly shortened product life cycles. Companies must develop new products faster in order to maintain their market shares.

Externalities to R&D, the benefits enjoyed by society as a whole, cause the social value to be higher than the private value. As well, the performers of R&D create a critical mass of high level professional and technical employment opportunities for Canada's work force. As a result, the government has a role to play in ensuring that the optimal level of R&D is undertaken. In Canada, tax incentives is an important way of stimulating R&D activity. Canada's tar system

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offers a relatively more attractive incentive for larger firms engaging in R&D than does the tax system of any other OECD country (except Spain). Canada also ranks second after Italy in the attractiveness of R&D tax incentives for small firms<sup>10</sup>. Federal support for industrial R&D is largely delivered through the Scientific Research and Experimental Development (SR&ED) Tax Credit Program. The recently clarified SR&ED rules for software development are intended to simplify the usage of this tax credit by software developers. The advantage of the Canadian system of tax support for R&D is that it has remained relatively stable since the early 1980s.

Statistics Canada<sup>3</sup> reports that the software and computer services industry spent \$519 million on R&D in 1996. These expenditures grew at a CAGR of 14.6 percent since 1990. They represent 3.4 percent of total operating revenues. The percentage is substantially higher in software than in services.

#### Financial Performance

From 1990 to 1996 the software and computer services industry has generally been profitable, although there have been brief periods when losses were incured. As for the other industries, the financial performance of the software and computer services industry declined during the recession of the early 1990s but the overall financial performance of the industry has been fairly encouraging since 1994.

|                   |      | Annual |      |      |      |      |      |       | Average |  |
|-------------------|------|--------|------|------|------|------|------|-------|---------|--|
|                   | 1990 | 1991   | 1992 | 1993 | 1994 | 1995 | 1996 | 91-93 | 94-96   |  |
| Profit Margin     | 9.1  | 0.8    | 3.8  | 2.6  | 5.3  | 4.4  | 6.8  | 2.4   | 5.5     |  |
| Net Profit Margin | 4.4  | -1.1   | 0.2  | -1.0 | 2.4  | 2.1  | 3.9  | -0.6  | 2.8     |  |
| Return on Equity  | 14.2 | -4.9   | 1.0  | -4.7 | 12.7 | 10.2 | 14.2 | -2.9  | 12.3    |  |

 Table 2: Financial Performance (in percent)

Since 1994, the profit margin has increased significantly and more important the return on equity ratio, which represents the bottom line for the investors, peaked at 14.2 percent in 1996. It is important to note that industry level data include major losses sustained by some of the large service companies and obscure some excellent performances. Many software companies have been extremely successful during the period 1991 to 1993.

# Employment

The industry has been a major job creator. Employment almost doubled, from 71,700 to 137,300 between 1990 and 1996<sup>5</sup>. There was significant growth among the self-employed, where numbers





Total Employment and the Self Employed: 1990 - 1996

Source: Statistics Canada, Cat. no. 71-001

jumped from 19,600 in 1990 to 40,700 in 1996. In contrast, manufacturing employment declined by 1.1 percent over the 1990-96 period, while national employment increased by 3.9 percent. As

a result of these diverging trends in employment, instead of the high

rate of unemployment prevailing in the economy, the software and computer services industry is suffering a shortage of qualified workers. From a regional perspective, Ontario had 48.9 percent of the 137,300 jobs in 1996, while Quebec had 22.4 percent, British Columbia 11.4 and Alberta 10.8, with the remaining 6.5 percent divided among the other provinces.

# Trade

There are virtually no reliable trade statistics on software and computer services, anywhere in the world. Customs duties are applied only to the value of the carrier medium, which is a minute fraction of the value of the software. Software shipped electronically is not recorded at all. Statistics Canada<sup>11</sup> is one of the few agencies which has gathered trade data on computer services. Between 1992 and 1996, receipts (exports) grew at a CAGR of 19.4 percent from \$775 million to \$1.6 billion, while payments (imports) increased at a CAGR of 8.2 percent from \$421 million to \$577 million. Consequently, the positive trade balance almost increased threefold from \$354 million to \$998 million.

Table 3: Computer Services Trade (\$ millions)\*

|          | 1992 | 1993 | 1994  | 1995  | 1996  |
|----------|------|------|-------|-------|-------|
| Receipts | 775  | 995  | 1,072 | 1,307 | 1,575 |
| Payments | 421  | 382  | 526   | 508   | 577   |
| Balance  | 354  | 614  | 546   | 800   | 998   |

\* This table does not include computer software royalties and licenses.

Another source of information on export is the foreign revenues reported by the companies in the Branham Top 200. In 1997 foreign sales of the Top 100 Canadian software companies were \$2.2 billion, 84.7 percent of their total revenues. The Top 50 Canadian computer services companies had foreign revenues (which are not necessarily exports) of \$215.1 million, 12.7 percent of revenues.

# 2.5 Canadian Competitiveness

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Competition in the software and computer services industry is global in scope, not local. There is no OECD country which does not have a software and computer services industry of some description. Many developing countries, notably India, have rapidly growing computer services industries. The Canadian market is too small to generate adequate returns in a business whose high risk requires high returns on investment. Consequently, in order to succeed, Canadian firms must compete on a global basis.

The balance of trade can be used as a measure of international competitiveness. Canada has had a positive trade balance in computer services for the past five years, in the \$354-998 million range. The spectacular growth of the software products companies, based almost entirely on their sales in foreign markets, is a clear indicator that they are competitive in the product markets in which they specialize.

Another measure of Canadian competitiveness is a comparative study undertaken by Reuben and Yourdon in 1995. Using the real output measure thousands of lines of code per employee per year, it found that Canada was the leader among seven countries in software development. The survey indicated that Canadian programmers generally excel in highly regarded characteristics like computer language training and telecommunications access. However, the researchers found that Canadian firms had some quality management shortcomings.

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# 3. CHANGING CONDITIONS AND INDUSTRY RESPONSE

# 3.1 Technological Change

The software and computer services industry is undergoing one of its periodic technological transformations, comparable to the rise of the PC in the early 80's and the emergence of *Windows* as the computing platform of choice a decade later. The motivating force this time is the Internet, whose enormous growth has upset all previous forecasts for the information technology industry. The Web browser, which was commercially introduced as recently as 1994, is becoming the user interface of choice for computing. It is becoming essential for applications of all descriptions to be Web-enabled. Java, Sun Microsystems' platform independent, object oriented programming language, is being depicted as the solution to all programming problems. Whole new categories of software, like text search and retrieval software and encryption, are enjoying rapid growth. The network computer (NC) is being marketed as a replacement for the full-featured PC. There is controversy over whether object-based miniprograms available over the Net will replace the enormous "fatware" programs which currently prevail. "Push" technology, which automatically delivers desired Web content directly to the user's PC, is the latest addition to Internet technology.

Beyond its technological challenges, the Internet presents opportunities to radically revise the way business is done. The need to be first to market, to capture the leading market share before competitors can react, has never been more critical. No software company is any longer without a Website, because the Web has become a key communications and marketing tool. Some companies use it as their sole distribution medium. As bandwidth increases the 'Net's usefulness as a software distribution channel rises. Companies can avoid the cumbersome, expensive and overloaded wholesale-retail channels on which they have been forced to rely. Electronic commerce is expected to emerge as a major use for the 'Net. IDC predicts that goods purchased online by businesses will grow from \$1.7 billion (U.S.) in 1996 to \$231 billion (U.S.) in 2001.

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Providing the programs and tools which will allow vendors in all industries to exploit the marketing and distribution opportunities of the 'Net will be an enormous market. The worldwide market for Internet related products and services will grow to \$100 billion (U.S.) by 2000, according to IDC, and \$303 billion (U.S.) by 2002, according to INPUT.

# 3.2 Human Resources

A major constraint facing the software and computer services industry is a shortage of skilled professionals. As in other aspects of the industry, there are measurement problems in employment. Statistics Canada reports that the software and computer services industry employed 137,300 people in 1996. However, this understates the number of people in software related jobs because of the distinction between software as an industry and software as an activity. A significant amount of software and computer service work is performed outside the industry itself, by in-house software workers in every industrial sector. According to Statistics Canada<sup>12</sup>, by the fourth quarter of 1997, there were 267,000 computer programmers and systems analysts and their average salary was \$843 per week.

According to the Software Human Resources Council (SHRC) combined industry and in-house software employment was 173,000 in 1994. Its study, *Software and National Competitiveness*, indicated that in 1991 two-thirds of software workers were employed in-house, and one-third in the industry. By 1994 this ratio had been reversed. The main factors which account for the change were the trend toward outsourcing computer operations and the rapid growth of the software products industry.

The SHRC study projects that employment of software workers will continue to grow dramatically to reach an anticipated 325,000 people by 2000. This would make software one of Canada's leading occupations, but this growth may be hampered by a lack of skilled workers. Many software firms reported unfilled positions in 1994. According to the SHRC survey, 39 percent of software companies reported unfilled positions for software workers, as compare to

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only six percent of the in-house software operations. Overall, the 1994 vacancy rate was estimated to be around four percent, which translates into 6,900 vacant positions. SHRC forecasts that the shortage of software workers will rise to 20,000 by 2000.

Canada is not unique in suffering a shortage of software people. Most industrialized countries face the same problem. The Information Technology Association of America<sup>13</sup> estimates that there were 346,000 vacant information technology positions in the US in 1997. The tight supply of skilled workers has caused an increase in international recruitment competition. Increased recruiting in Canada by large American companies has created concerns in the Canadian industry. Canadian firms, which are mostly SME's, fear that they will not be able to hire the brightest Canadian graduates because they cannot compete with the salaries and other benefits offered by American companies. Retaining their existing talent is also a problem. It is feared that a number of highly qualified Canadians are emigrating to the US.

A study of a sample of 41 Canadian and 52 American companies found US compensation 38 to 65 percent higher for most occupations<sup>14</sup>. Skill shortages will remain a feature of the software and computer services industry because rapid growth is guaranteed to generate strong demand for workers. In addition, rapid technological changes generate demand for new skills which did not previously exist. To ensure that the proper quantity and quality of skills are developed, industry will have to partner with learning institutions to create longer term plans to meet its needs.

The skills shortage is being addressed by governments, industry associations, learning institutions and voluntary organizations. These organizations are working together to deliver initiatives in three broad categories: basic computer literacy; linking learning institutions with industry; and training and retraining software workers. An example of the first type is Industry Canada's *SchoolNet* program, whose aim is to connect all schools to the Internet. The SHRC's *Youth Programs*, which foster linkages between educators and employers, are of the second type. Its *Skills Gap* program, of the third type of initiative, is designed to develop products and services to help the software industry upgrade and retrain its workers.

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These projects are designed to ensure that Canada has a qualified labour force which can respond to the demands of the new information era. Canadians must actively participate in the development of a new economic structure to ensure Canada remains on the leading edge of technology. If Canadians are not proficient in the use of information technology they risk being left behind in the 21st century.

Management skills are also an issue. There is an old software industry axiom that when you have the product in the box ready to ship, you still have only ten percent of a business. Software entrepreneurs face management problems far more complex than the typical small businessperson. They must develop a product in a rapidly advancing technology and market it to an export market where both product life cycles and prices are declining. If they succeed, they are faced with the myriad problems inherent in managing a fast growing business. In Canada, the shortage of people skilled in marketing, sales and finance has been more severe than the shortage of programmers. It is being eased somewhat by the fact that after a decade of growth a pool of experienced managers is developing. Nonetheless, building a good management team remains one of the biggest obstacles to converting a good idea into a good business.

The industry's training requirements present a large business opportunity for Canadian new media learning materials suppliers. Computer-based training and distance learning can contribute in a major way to solving the skills shortage. Some suppliers are already working with the SHRC to develop distance learning tools for software professionals.

# 3.3 The Year 2000 Challenge

The Year 2000 business continuity problem, known also as the "millennium bomb" or "millennium virus", is the result of a half century's practice of using two digit year dates ( ie. "98", "99", "00") in a wide range of information technology systems and products. Systems will interpret year 2000 dates as 1900 dates, and fail, or more seriously, keep running but produce

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expensive or dangerous errors.

While technical solutions to the problem are understood, the fixed deadline in 1999 for systems conversions and the sheer size of the task pose major concerns. According to IBM, there are 400 billion lines of code worldwide for the commercial sector alone, government and military code holdings may double this amount. Experience has shown that the assessment, repair and testing of systems can be very time-consuming. If organizations do not take action soon, many may find themselves unable to finish the job by the end of the century.

The costs of repairs faced by Canadian firms will be substantial. The Information Technology Association of Canada (ITAC) estimates the total cost to Canadian organizations at \$30 to \$50 billion.

Compounding the problem is a growing shortage and the rising cost of the skills needed to manage the Year 2000 problem. This presents the possibility that late starters may find needed resources unobtainable by the time they have determined their needs. Canadian firms failing to develop and implement effective Year 2000 strategies may experience not only systems failures, but business interruptions, financial losses, and failures as well.

The key challenge for the Canadian software and computer services industry arises from the fact that too many executives have still not understood that they are probably underestimating the scope of the challenge they face in their own firms. A study published in July 1998 by Task Force Year 2000<sup>15</sup> reports that 70 percent of Canadian businesses are taking action to address the Year 2000 problem but only 18 percent have taken a formal approach. The problem is especially acute among the medium and small-sized firms, where 63 percent of the mid-sized firms and 85 percent of the small firms have still not taken formal action. The Canadian software and computer services industry must make every effort to inform its clients of the Year 2000 business risks to which they are exposed, and work closely with them to prevent avoidable business interruptions, financial loses, or business failures.

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# 3.4 Investment and Financing

Historically, it has been very difficult for software and computer service companies to obtain either debt or equity financing. Financiers accustomed to dealing with manufacturers could not fathom the dynamics of a knowledge based industry which depended for success on people, not plants and equipment. Even the venture capital community had great difficulty coming to grips with software.

The situation has improved greatly in recent years as the sheer success and growth of the industry has attracted the attention of the financial community. The banks have established specialized knowledge based industry lending units. They no longer routinely refuse to finance accounts receivable from American clients, simply on the grounds that they are foreign. Instead they endeavour to provide the export financing essential to software company success.

Venture capital (VC) has flowed into the industry, rising from \$29 million in 39 deals in 1992 to \$88 million in 102 investments in 1996. This is a mere fraction of the \$1.5 billion (U.S.) of VC which flowed into the US software industry in 1996, but it represents significant progress. The Canadian software and computer services industry has participated in the recent stock market boom in initial public offerings (IPO's), raising \$503 million between 1993 and 1996<sup>16</sup>. The capital raised has allowed the companies to pursue aggressive marketing and acquisition programs. The success of these IPO's has also made the industry more attractive to VC's.

The industry has also participated fully in the worldwide boom in mergers and acquisitions. M&A activity in the IT industry in general, and the software industry in particular, has been driven by rapid technological change and the need to quickly establish a dominant position in new products and markets. Even the largest companies no longer attempt to compete in every market with their own technology. Markets change so rapidly that internal product development simply takes too long to allow this luxury. Giants like Microsoft and IBM have become vigorous acquisitors as

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they seek to grow in new markets.

Canadian companies have been active on both sides of deals, as acquirors and acquirees. Information gathered by Industry Canada shows that, in 1996, eleven Canadian software and computer services firms were acquired by foreign companies, in transactions valued at \$259 million. In the same year, Canadian companies spent \$610 million to acquire fifteen foreign companies, and \$31 million for six other Canadian companies.

Financing problems persist for companies seeking equity investments in amounts in the \$250,000 to \$1,000,000 range. There is a financing gap there which remains to be closed. That being said, Canadian software entrepreneurs who can back a good business plan with a sound management team have a far better chance of obtaining the requisite financing now than they did only a few years ago.

# 3.5 Sustainable Development

The main contribution that software and computer services make to sustainable development is indirect, through the enabling effect. Software provides industry, government and consumers with tools to increase efficiency and reduce the environmental impact of their activities. New technologies and applications have made it possible for firms and governments to become more efficient in the way they use natural, technological and human capital. By adopting IT, they have been able to become more globally competitive, and to do so while addressing increasingly complex environmental pressures. Supported by advances in software, geographical information systems promote sustainable development in the forestry industry by managing and monitoring forest regeneration processes more efficiently. Materials Requirement Planning and Manufacturing Resource Planning are examples of software which reduces waste and increases efficiency in the manufacturing process. Computer Aided Design and Engineering have significantly bolstered productivity in design departments and reduced consumption of input materials. Software aids the transportation and logistics industry by providing increased

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efficiencies in fleet scheduling and load optimization as well as reducing negative impact on the environment.

The shift to a knowledge based economy, propelled by software, could potentially reduce pollution and congestion through telework, teleshopping and electronic commerce. Consumers can now work, bank and shop at home and thus avoid making many journeys. Software may become an important tool in the delivery of foreign policy. International development can be facilitated by creating knowledge based networks where information can easily be exchanged between the private, public and parapublic sectors. The Department of Foreign Affairs and International Trade is developing a Canadian International Information Strategy, one of whose objectives is to to sist less developed countries to become better connected to the information highway. Through information and communications technology, Canada can become more influential internationally.

#### 4. GROWTH PROSPECTS

#### 4.1 Demand Outlook

Growth in global demand for software and computer services has been driven by continuous and rapid technological advances in computer hardware and software. Moore's Law, which states that the number of transistors on a chip doubles every eighteen months, continues in force. More powerful hardware, linked by more elaborate networks, allows more complex PC software to perform sophisticated tasks which were previously exclusively the realm of scientific supercomputers. The resulting improved functionality has triggered strong demand for more powerful microcomputers, expanded networks, new and updated software and more professional expertise and services.

Global competitive forces are driving companies in all industries to pursue the maximum use of their knowledge resources to cut costs and improve service to clients. To achieve their targets companies are relying on improved software, and on new products made possible by increased computing capacity. The pressure to maintain the pace in IT is persuading many to outsource their information management operations. Computer services are becoming increasingly sophisticated and important in meeting customers' needs.

INPUT forecasts that the world market for software and computer services will grow at a CAGR of 13.5 percent from 1997 to 2002, reaching \$1 trillion. This growth will be driven by companies' need to upgrade capabilities and reduce costs while supporting a higher volume of business. Trends pushing expansion include the growing use of network applications, especially the Internet, the implementation of client-server technology, reengineering, downsizing, electronic commerce and the increased use of digital graphics like video.

Within the overall software and computer services market, worldwide demand for application software products, the Canadian industry's greatest strength, will grow at a 16 percent CAGR

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over the 1997-2002 period to \$161.1 billion (U.S.). System software products, where Canada has a number of leaders, will grow 11 percent annually to \$94.5 billion (U.S.). On the services side, network services are forecast to grow 18 percent annually to \$101.8 billion (U.S.), outsourcing 20 percent to \$142.8 billion (U.S.) and systems integration 18 percent to \$83.9 billion (U.S.). Canadian computer service companies are strong in the latter two areas.

In geographic terms the North American market, 51 percent of world demand, will have a 1997-2002 CAGR of 16 percent. Europe, a quarter of the world market, will grow at 10.5 percent, and Japan, about 17 percent of the market, at 8 percent. The rest of the Asia-Pacific region, Latin America and Middle East-Africa have forecast growth rates approaching 17.5 percent, but they are small markets in which software piracy is rife.

The Canadian market, which is important to the services companies, is forecast to expand 14 percent annually to \$26.8 billion (U.S.). The fastest growing segment will be outsourcing, growing at 24 percent to \$11.4 billion (U.S.). Network services will grow at 16 percent to \$1.2 billion (U.S.); applications software 14 percent to \$2.4 billion (U.S.); and professional services will expand at 12 percent, to \$3.7 billion (U.S.) and systems integration at 10 percent, to \$2.3 billion (U.S.).

# 4.2 Key Industry Strengths

The Canadian software industry has demonstrated that it can succeed in the fiercely competitive global market. Its ability to deliver high quality applications has allowed it to compile a superior record of growth in revenues, profits and jobs. It has maintained a high level of R&D in pursuit of superior products. Compared to most Canadian industries, its record must be adjudged outstanding. This achievement has been possible despite a shortage of skilled software workers, an inadequate pool of experienced managers, and inadequate financing.

While the shortage of programmers does not look like being resolved in the immediate future, the situation with respect to the latter two handicaps has improved. The sheer growth of the industry has expanded the pool of managers. Corporate takeovers and spinoffs have prompted many to establish new software businesses. Financing is less of a problem because financial institutions are now knowledgable about the industry, and less hesitant to come to the table.

The industry is in a good position to meet the many challenges which the global market presents.

#### 4.3 Challenges and Opportunities

In the software and computer services industry, each challenge represents an opportunity, they are two sides of the same coin. A lot in this industry revolves around the growth and evolution of the Internet. The pace of change is frenetic, with "Web-years" now measured as only two to three months in calendar time. There is tremendous uncertainty over which browser technology will become the standard, which software language will dominate, which operating system will be the network leader, and whether the "thin client" NC will displace the PC. In the brief history of the software industry, it has been demonstrated that the introduction of major new technology can completely transform the industry. The pace of growth accelerates. New leaders emerge and former champions founder. The challenge for the industry is to seize the opportunities which this transformation presents.

Whole new market segments will appear as the technology becomes affordable. Telehealth, distance learning and teleworking are in their infancy. They are forecast to grow at an extremely rapid pace in the next decade. Electronic commerce is now limited largely to electronic data interchange, the use of proprietary systems to link large buyers to their suppliers. It will become ubiquitous as all manner of sellers offer their products over the Internet. While these are still small markets, Canadian companies are prominent in several of them. For example, electronic commerce is impossible if buyer and seller cannot be confident of the privacy and security of their transactions. About three dozen young Canadian companies offer encryption and other security

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products which will enable electronic commerce.

The Canadian software industry is a heavy investor in the R&D essential to staying ahead in an industry characterised by rapid technological change. There is no doubt of its technical competence, but good technology does not suffice to ensure success in the global market. In emerging markets, where market shares are determined very early, the rewards go to the leader. The product must be marketed skilfully and aggressively if it is to capture the dominant market share essential to profitable success. In this context, the 'Net is a tool rather than a product opportunity. A host of experiments in marketing software over the 'Net is underway. Some marketers contend that URL (Universal Resource Locator, or Web address) really means "Ubiquity now, Revenues Later". Several Canadian companies have already chalked up successes with innovative 'Net marketing programs.

The pace of change, in both markets and technology, is so rapid that no company, even the largest, can hope to do everything itself. Strategic alliances are the key to achieving rapid growth with limited resources. Canadians have proven adept at forging the partnerships which have given them access to both complementary technology and diverse geographic markets.

If the industry is to continue to grow it must address its human resource problems. To expand the supply of programmers it must persuade more young people that a career in the software industry is attractive. It must ensure that training in the latest technology is provided to its employees. It must recruit and develop managers skilled in marketing, sales and finance. To succeed in this exercise it must work closely with governments, academic institutions and associations.

On the computer services side, the Year 2000 computing problem, or "millennium bomb" presents significant business opportunities for computer services firms nimble enough to secure and retain already scarce Year 2000 expertise and to position themselves in this time-limited market. With Canadian firms and governments facing repairs bills which will amount to many billions of dollars, this is a market place of dramatic opportunity and growth. Computer services

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firms who succeed in dealing with the requirement for their clients may then look forward to longterm business relationships based on ongoing outsourcing and software maintenance services.

# 4.4 The Bottom Line

The Canadian software and computer services industry has compiled an enviable record over the past decade. It now faces an enormous challenge as the transformation wrought by the Internet changes the dynamics of the business. There is a multitude of exciting opportunities, each with its concomitant risks. Those who rise to meet the challenge will achieve growth and success. There is plentiful evidence that the Canadian companies are doing just that.

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