# Industrial Development Subsidiary Agreement

## STUDY OF THE BRITISH COLUMBIA SOFTWARE INDUSTRY

March 1984

## Research Report

Province of British Columbia
Ministry of Industry and Small Business Development

Government of Canada
Gouvernement du Canada

Regional Economic Expansion
Expansion Économique Régionale

# STUDY OF THE

# BRITISH COLUMBIA SOFTWARE INDUSTRY

March, 1984

Prepared for:

Secretariat on Science, Research
and Development
Suite 301, 7671 Alderbridge Way
Richmond, B.C.
V6X 1Z9

Prepared by:

Touche Ross & Partners
Suite 906, 1177 W. Hastings Street
Vancouver, B.C.
V6E 2L2

Telephone (604) 682-2844
Telex 045-1293

**Canadian Cataloguing in Publication Data**
Main entry under title:
Study of the British Columbia software industry

On cover: Industrial Development Subsidiary Agreement research report.
Bibliography: p.
ISBN 0-7726-0070-8

1. Computer service industry - British Columbia. 2. Programming (Electronic computers) - Economic aspects - British Columbia. 3. Market surveys - British Columbia. I. British Columbia. Secretariat on Science, Research and Development. II. Touche Ross & Partners. II. British Columbia. Ministry of Industry and Small Business Development. IV. Canada. Dept. of Regional Industrial Expansion. V. Industrial Development Subsidiary Agreement (Canada)

338.4'70016425'09711
HD9696.C63C38 1984 C84-092136-5

**ACKNOWLEDGEMENT**

This study was funded by a grant from the research program of the Canada-British Columbia Industrial Development Subsidiary Agreement (IDSA) and by a grant from the Ministry of Universities, Science and Communications. The IDSA Agreement which provides a variety of programs for industrial development, is cost shared equally by the Governments of Canada and British Columbia through the Department of Regional Industrial Expansion and the Ministry of Industry and Small Business Development respectively. Programs under the Agreement are administered by the Ministry of Industry and Small Business Development and managed by a joint Federal/Provincial Committee.

The responsibility for the content of this report is the consultant's alone and the conclusions reached herein do not necessarily reflect the opinions of those who assisted during the course of this investigation or the Federal and Provincial Governments which funded the study.

TABLE OF CONTENTS Page No.

TABLE OF CONTENTS

## GLOSSARY OF TERMS USED

- Mainframe Computer - A general purpose computer with an internal memory size usually between 512,000 and 32,000,000 bytes. The cost for computers in this category ranges from $250,000 to several million dollars. They are capable of handling a comprehensive assortment of high level languages, of processing vast amounts of data and can accommodate hundreds of users.

- Minicomputer - Internal memory sizes range between 128,000 and 4,000,000 bytes. The cost of a basic system varies from as low as $15,000 to as high as $500,000, depending upon processor speed, size and number of peripheral devices. Computers in this category are generally capable of handling several high level languages and up to 64 users.

- Microcomputer - A small computer with internal memory size usually in the range of 4,000 to 640,000 bytes, typically costing less than $15,000. Personal computers for home and office use fall in this category. Such computers are typically single user.

- Applications Software - Computer programs designed to control the operation of data processing equipment in accomplishing some user specific task (e.g. payroll calculations, airline reservations, production scheduling, etc.). Applications software can be either custom developed or packaged.

- Systems Software - The basic level of software which controls the functions of the computer to enable it to utilize user-specific software programs. This category of software includes operating systems, language compilers, data base management systems and utility programs.

- Custom Software - Software programs in which the set of instructions is developed to fulfill specific, unique, user requirements.

- Packaged Software - Software programs that have been pre-developed and packaged for wide distribution within the marketplace. These programs are typically designed in such a fashion as to allow the user to select, from a list of functions, those which are specifically required.

- Operating System - An integrated set of programs which manages the resources of a computer system. Input and output control, error recovery, memory management, task and job scheduling and security can all be parts of an operating system.

- Language Compiler - A translation program that converts a high level language such as COBOL, FORTRAN, PASCAL, PL/I, etc. into machine level instructions that can be executed under the control of the operating system.

- Data Base Management System - A set of programs designed to organize, store and retrieve information from a computer-maintained data base. A data base is simply a collection of logically related data sets or files containing information in machine readable form.

- Utility Software - A commonly used routine, such as a sort, which is standardized and kept for the use of several applications to avoid the necessity of being specifically included in the design of each application program.

- Vertical Software Packages - Software packages developed to address applications specific to a particular industry. The term "vertical software markets" relates to markets for vertical packages.

- Horizontal Software Packages - Software programs developed to address applications that are common across a number of industries. The term "horizontal software markets" relates to markets for horizontal packages.

- Turnkey System - A term coined from the phrase "to turn the key". It implies all the equipment, software, training and installation support necessary to enable the user to operate the computer system.

## . INTRODUCTION

The spectacular growth of the computer software industry in recent years has sparked heightened levels of interest in the future opportunities it represents. Entrepreneurial individuals are attracted by the opportunity to establish themselves in a business of their own. Established companies see new possibilities for unprecedented growth and profitability. For many, however, there is considerable lack of clarity with respect to the specifics of where these opportunities are, how best to go about capitalizing on them, and what risk might be involved. Because of this lack of clarity, the Management Committee for the Canada-British Columbia Industrial Development Subsidiary Agreement has initiated this study in association with the B.C. Ministry of Universities, Science and Communications and the Research Secretariat of B.C. Its objectives have been as follows:

- To provide general information for B.C. software suppliers and potential suppliers, regarding industry growth rates, the current state of the software industry, B.C. suppliers' general position in it, and factors critical to success.

- To provide information on specific areas of software development which will be helpful to industry members in setting product development and marketing priorities.

- To identify and assess the constraints which could prevent or restrict B.C. suppliers' potential for sharing in the expanded opportunities in the software field in the 1980's.

- To identify types of initiatives or policy changes required in order that the chances of B.C. suppliers to share in the benefits of the industry's growth can be realized.

In collecting and analyzing data and opinions to fulfill the above objectives, a variety of methods have been used. These have included:

- A comprehensive questionnaire survey of B.C. software suppliers to provide both quantitative information and qualitative judgements on company profiles and on external issues. (See survey questionnaire in Appendix A.) The quality and completeness of the questionnaire responses received were excellent and we feel confident that those responding took the survey seriously and were conscientious about providing both valid, accurate data, and thoughtful views and opinions.

- Structured interviews and group meetings with B.C. software supplier representatives and B.C. software users. In collecting data from software suppliers, in addition to some 22 interviews, 2 structured meetings were held with software supplier representatives in Vancouver and Victoria. These meetings were held prior to the questionnaire survey so that information obtained could be used to design the questionnaire.

- Review of a large volume of special reports and articles to obtain both statistical data on markets and general information regarding trends and future directions.

- Interviewing of several knowledgeable "industry experts" in order to supplement factual data and published information with informed opinions and views regarding future directions.

The list of individuals with whom discussions were held included: Warren G. Culpepper of Culpepper and Associates, Atlanta, Georgia; Hillel Segal, Executive Director of the Association of Computer Users of America; Dr. Warren McFarlane of Harvard University; and senior executives of 5 large software firms, 3 in Eastern Canada and 2 in British Columbia.

- Interviews with representatives of computer retailing organizations.

- Contacts with major B.C. educational institutions to obtain information relative to supply of personnel.

- Discussions with systems consulting partners of Touche Ross & Co. from Canada, U.S., England, Mexico, France, Germany, Japan, South America, and Holland. These discussions were held in conjunction with other company activities and did not involve special travel.

The list of people and organizations whose co-operation helped us substantially is too long to permit detailed listing. We do feel it is important, however, to acknowledge specifically the efforts of the Software Industry Development Association for its help in providing data and in encouraging questionnaire responses.

# II. EXECUTIVE SUMMARY

## 2.1 THE SOFTWARE MARKETS

Software markets are expanding at a dramatic rate in most parts of the world. Growth is expected to be in excess of 30 percent per annum throughout the decade of the 80's. The Canadian market is expected to grow from an estimated $608 million in 1981, (the most recent year for which data was available) to $2.3 billion in 1986, an average annual growth of 31 percent. The American market annual growth rate during this period has been forecast at 34 percent - from $3.7 billion (U.S.) in 1981 to $16.2 billion (U.S.) in 1986. The American figures exclude custom software which, in 1981, was reported to be $1.5 billion (U.S.). Thus, the total North American market, which in 1981 was less than $6 billion, (U.S.), is estimated to be over $20 billion (U.S.) by 1986.

The nature of software markets is changing. The share of software revenues represented by applications packages is increasing rapidly with a forecast growth of 38 percent in Canada and 36 percent in the U.S. between 1981 and 1986. Custom software is expected to grow at only 24 percent per year in Canada and 28 percent per year in the U.S. Systems software is projected as growing at 34 percent per year in both countries.

The most significant change between present and future markets is expected to be in the mix of software revenues by machine size, with software for microcomputers growing at 48 percent in Canada and 50 percent in the U.S., mainframe software at 28 percent, and 31 percent respectively, and minicomputer software at 26 percent and 39 percent in the two countries. The trend toward increased importance of microcomputers tends to be a positive factor for B.C. suppliers.

Because of the dynamic nature of the computer and computer software industry, reliable identification of attractive market opportunities is difficult. Many new products appear daily. Speaking generally, however, the primary areas of opportunity are likely to be in the area of packages for microcomputers, and in vertical business markets which relate to B.C.'s economic base and sources of product development and testing opportunities (e.g. resource industries, engineering, education, service industries). Software for the home computer market is also a large opportunity but is more risky than some areas of business. Horizontal packages, which have applicability to a broad spectrum of users, are also a large opportunity but intensively competitive and require large investment.

## 2.2 POSITION OF B.C. SUPPLIERS WITHIN THE LARGER MARKETS

B.C. suppliers represent an insignificant share of the North American market, which could be considered to be the logical primary market area for a strong ambitious software competitor. To date, B.C. firms have relied mostly on B.C. markets for their revenue (approximately 80 percent). B.C. supplier penetration of American markets or of Eastern Canada (Ontario/Quebec represents three quarters of the Canadian total) has been very meager. Statistics Canada shows B.C.'s percentage of Canadian software revenues to be 9.6 percent in 1981.

## 2.3 TRENDS IN THE PROFILE OF THE SOFTWARE INDUSTRY

A number of industry experts have suggested that there will be a "shakeout" in the software industry. It is predicted that more and more of the industry will be dominated by fewer large companies who see their markets world-wide or at least North America-wide. High levels of expertise and resources will be concentrated on development and marketing of new powerful software packages. As this trend develops, geographic boundaries will decrease in importance, and buying patterns of software users will be more and more national/international.

## 2.4 THE B.C. SOFTWARE INDUSTRY PROFILE

The profile of the B.C. software industry is characterized primarily by small company size, heavy reliance on local markets, and inadequate resources and marketing capabilities to compete strongly in larger markets. Well over half of the companies responding to our survey reported revenues of less than $100,000 in 1982, with 81 percent of 1982 revenues coming from the local B.C. market. Likewise, over half of the respondents had total software related employment of 5 people or fewer. Most marketing methods and practices used by B.C. suppliers tend to be more appropriate for local markets than for external ones. Financial resources are seen by approximately 80 percent of respondents as representing some degree of constraint on future success. In the last 3 years, the growth of the larger companies in our survey sample has been moderately healthy, with over half averaging approximately 15 percent per year. The smaller companies, which represent the norm for the B.C. industry, had quite low growth. Although over 25 percent of the sample averaged 15 percent per year, 30 percent experienced no change and 17 percent decreased in size. This tends to fit with the aforementioned trends toward domination by fewer larger companies.

## 2.5 MATCHING CAPABILITIES AND STRENGTHS WITH FUTURE OPPORTUNITIES

Looking at the long term, there is reason for considerable concern regarding the future of the British Columbia software industry in general. While survey respondents expressed optimism regarding growth, and while the markets are growing rapidly, the B.C. industry profile does not match the picture painted for the future which postulates domination by large companies, a higher proportion of B.C. software likely to be purchased elsewhere, and a need to be able to penetrate larger markets.

The typical B.C. software supplier has very few competitive advantages as compared to competitors located in major geographic centres of software development. B.C. has the ability to attract talented people because of the environment and quality of life, a supply of well-trained technical people, and proximity to a few sources of opportunities for product development and testing in industries already mentioned. However, on the negative side, we are far from major markets, and far from major centres of technological development and testing of products for vertical markets. Access to government business is also lower than in many other areas.

If the trend to domination by fewer, larger companies continues along the lines predicted, B.C. suppliers are in a position akin to David fighting Goliath. Either answers will have to be found on how to ensure rapid growth, or new methods of combining resources will need to be introduced.

## 2.6 SHAPING THE FUTURE PROFILE OF THE INDUSTRY IN B.C.

If it is possible to shape the future profile of the industry in B.C., there are essentially 2 possible directions in which to go. The first is to encourage those companies which are already large or have a demonstrated capability to become large. The second is to find ways of making smaller companies viable. The comments later in the report are based mostly on the latter, because of the large preponderance of smaller companies in B.C.

There are a number of factors and conditions which need to change if more B.C. companies are to enjoy a share of the exciting growth in software markets. The most critical of these are upgrading of marketing resources and expertise, increased investors confidence, software suppliers' ability to obtain financing, and improved competencies related to business planning and management.

The final section of the report suggests a number of possible ways of influencing these changes. What is required beyond this point is the establishment or appointment of an organizational mechanism to evaluate change possibilities and to initiate action. This will probably need to be a joint public and private sector approach.

The information obtained during the study suggests that speed is important. For some B.C. suppliers, it may already be too late, in spite of the exciting growth of the markets.

# III. THE SOFTWARE MARKET

## 3.1 INTRODUCTION

The results of our study indicate that geographic boundaries are not very meaningful for defining software markets. Thus, to define markets and opportunities, this section will start with data and observations relative to the market beyond B.C. and will focus primarily on North America which, at present, is reported to be over two-thirds of the world market for software. For a variety of reasons, the non-North American market is considered insignificant in terms of the purpose of this study. It shall then move to a focus on markets more realistically likely to be available to strong B.C. competitors, and from there to discussion of specific types of opportunity likely to represent attractive priorities for software suppliers in general. In this section of the report, minimum consideration is given to the ability of B.C. suppliers to compete for these opportunities. This will be addressed in a later section, and the range of opportunities narrowed down to reflect the realities of B.C. supplier constraints, strengths and advantages.

## 3.2 THE LARGER MARKET OVERVIEW

### . Introduction

Estimated growth of computer software markets vary considerably. Most sources predict a growth rate well in excess of 30 percent per annum throughout most of the eighties. The world market is probably between 13 and 15 billion dollars (U.S.) in 1983, of which B.C. suppliers represent only a fraction of 1 percent. Since North America is estimated to be over two-thirds of the world market, B.C. suppliers' share in North America is far less than 1 percent. (Statistics Canada reports indicate that B.C. represents 9.6 percent of Canadian volume.) Thus, for meaningful analysis of software markets which can realistically be expected to be available to B.C. suppliers, it is important to break them down into smaller segments. The breakdowns we have used for this analysis are type of hardware (mainframe, mini, micro), type of software (systems software, custom application software, and packaged application software), supplier type, industry sector, and Canada/U.S.

- Hardware Purchases

In assessing future software markets, it is important to consider first a few trends in the hardware market which will affect software growth. Software sales tend to lag hardware trends as the equipment purchasers expand their usage to new applications over time and as software manufacturers take time to develop new products in reaction to new hardware announcements. It is valuable, then, to study the forecast changes in hardware to predict the future of software.

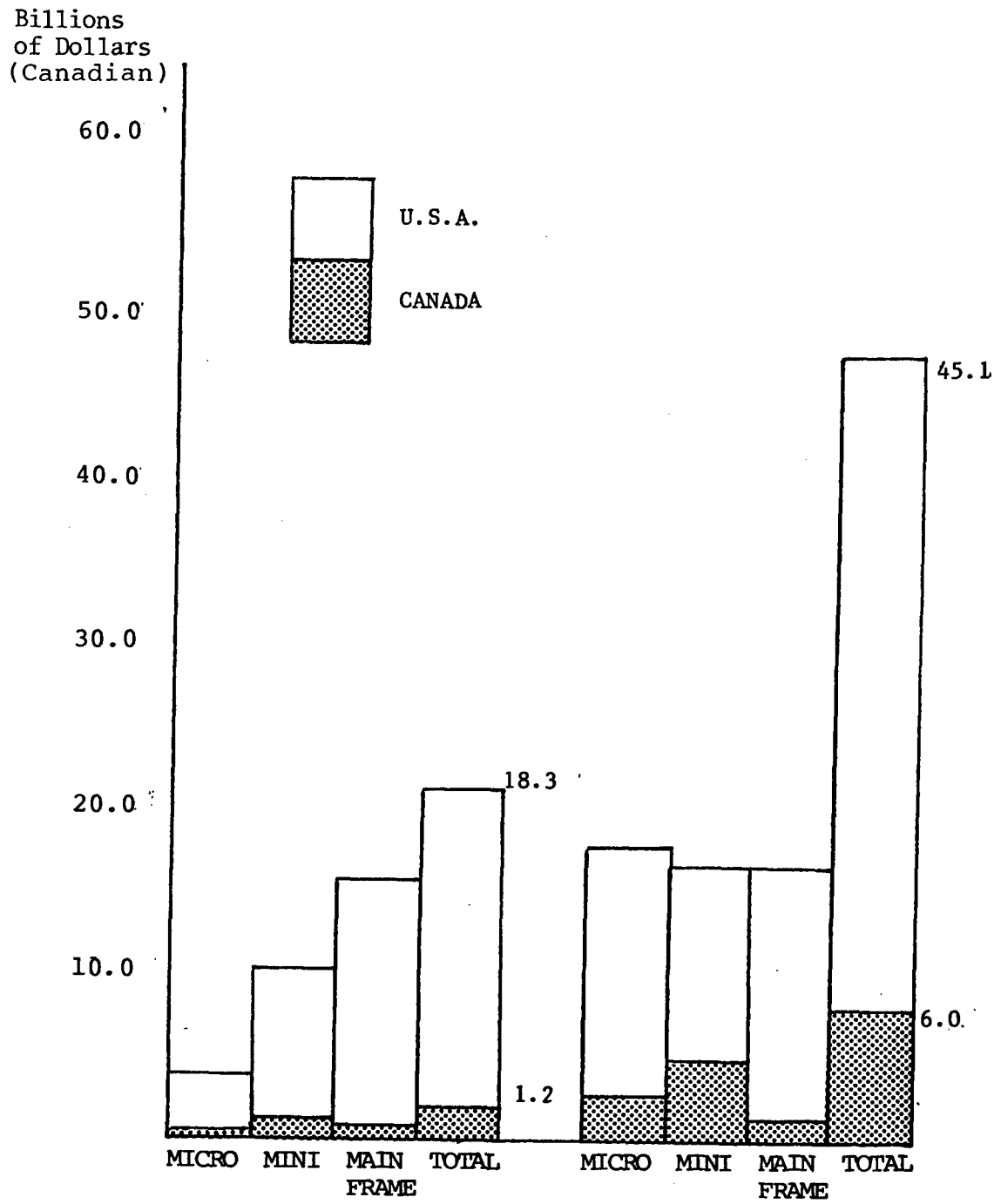
The type of hardware being purchased is changing in mix, with the current dominance of large mainframe hardware tending to even out over time to a more balanced mix of micro, mini and mainframe-sized equipment. Figure 1 clearly shows a tremendous growth in the value of microcomputers to be sold, as the micro end of the market is currently very small. The figures, taken from International Data Corporation (IDC), predict an overall annual growth rate for the computer industry of 12 percent to 1986. The mature mainframe market will grow at 7 percent, whereas the microcomputer market is forecast to grow at over 40 percent. IDC's forecast for the world microcomputer market is considered very conservative by some forecasters. Indeed, one industry expert suggested that 300 percent is a more accurate figure to predict market growth outside North America. A more optimistic view of the world market for microcomputers is also given by Future Computer Inc., which projects growth of the sector at 57 percent per year to 1986.

- Software Purchases

It is interesting to note that the value of software for the different types of hardware is also somewhat different. Whereas a large mainframe user may spend 25 percent of hardware value on software (Frost & Sullivan; Arthur D. Little), a microcomputer owner's subsequent software expenditures will be 60 to 100 percent of hardware value (Future Computing; Weil). These percentages would place the 1986 world software market at between $22 and $30 billion (U.S.) per year based on IDC's 1986 forecast of hardware expenditures. This estimate is consistent with other forecasts for the software industry, (IDC, Future Computing, Frost & Sullivan, etc.) if we assume that the U.S. continues to comprise approximately 66 percent of the world market in hardware and software.

Figure 1

NORTH AMERICAN HARDWARE REVENUES 1981 - 1986

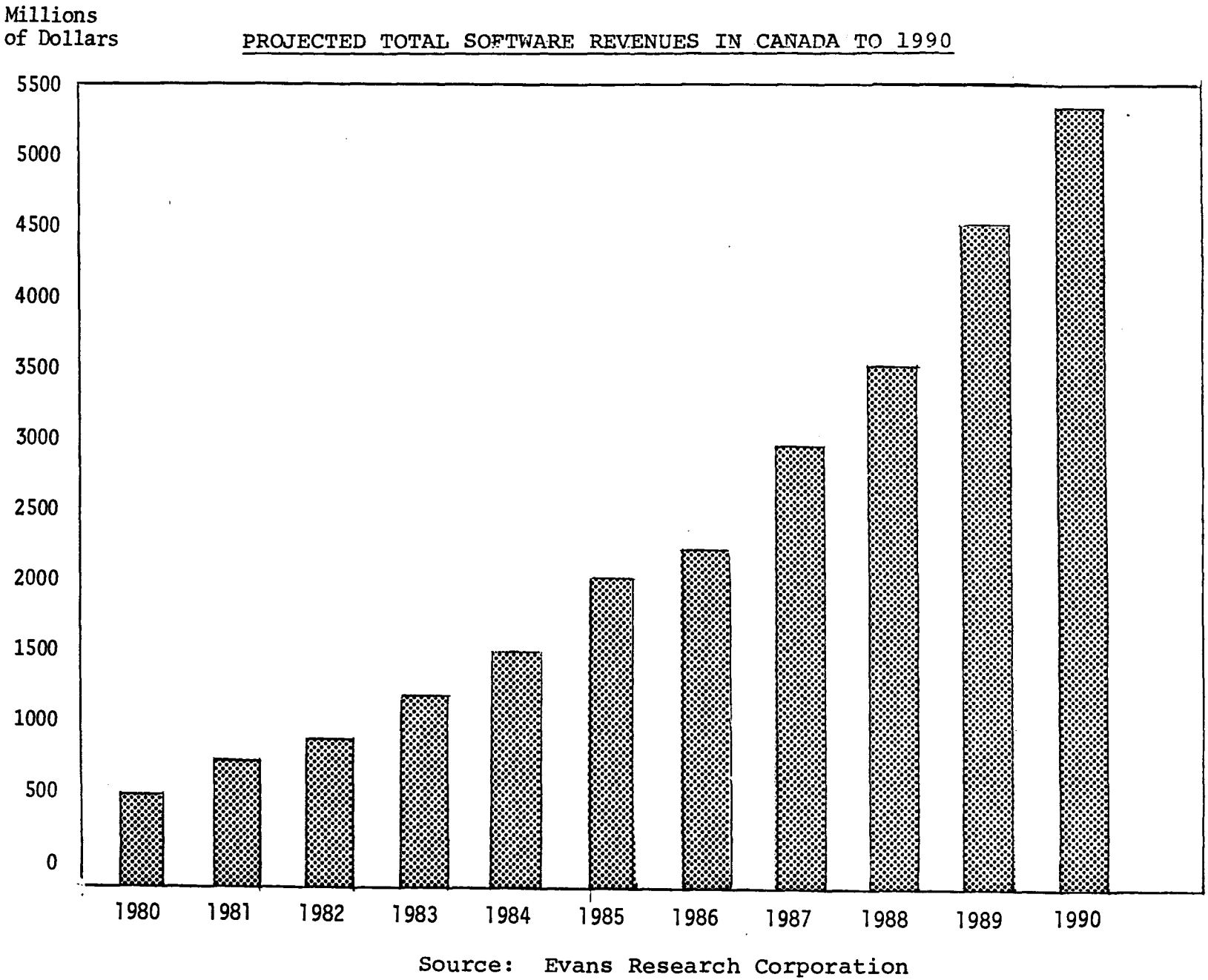



Sources:
U.S. - International Data Corporation Canada - Evans Research Corporation

On the surface, it could be argued that the outlook for B.C. suppliers is very healthy, given these healthy industry projections, and our close proximity to the U.S., with its two-thirds of the world market. When the markets are broken down in more detail and current technological developments and market trends taken into account, the outlook becomes less optimistic. As the emphasis on package software increases and the industry becomes more concentrated, it will become difficult to compete. The present, probably high, excess of B.C. software imports over locally developed products seems likely to increase on the basis of trends forecast by industry experts and on the basis of our analysis of the data collected in this study.

## Canadian Software Revenues

Figure 2, on the following page, shows that Canadian software revenues from 1980 through 1990 are forecast to grow over 10 times in this decade. The percentage represented by each province is shown in Figure 3. The fact that over three-quarters of Canada's software is supplied by Eastern Canadian firms needs to be carefully considered by B.C. suppliers when developing future strategies. Very likely, part of the reason for the large market share enjoyed by Ontario suppliers is their proximity to large markets and to sources of product testing. This disadvantages may be difficult to overcome.

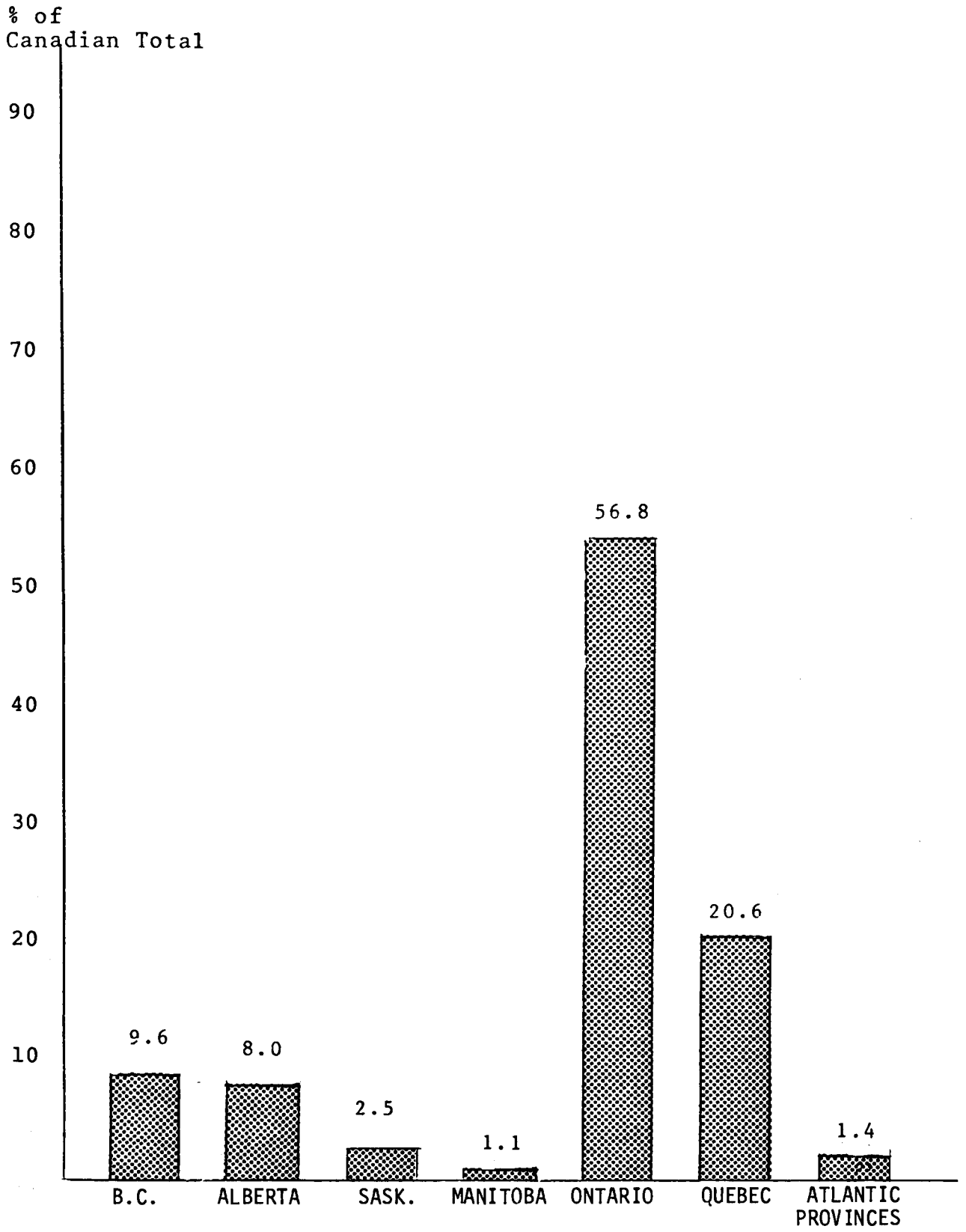



Source: Evans Research Corporation

Figure 2

Figure 3

PROVINCIAL PERCENTAGES OF TOTAL CANADIAN SOFTWARE PURCHASES, 1981




Source: Statistics Canada 63-222-1981

## 3.3 SOFTWARE REVENUES BY HARDWARE SIZE

Assessing and forecasting software revenues by machine type and by type of software has turned out to be a most difficult task. Data and forecasts from various sources vary considerably. Different organizations also use different product divisions for surveying and reporting market volumes and estimates. Thus, the market estimates contained on the following pages must be considered approximate.

What is clear, from all sources of data, is that the software market is growing very rapidly, and that future markets will differ significantly from those of the past. Market projections for the different types of hardware vary widely in their rates of growth and in their maturity. The mainframe market is fairly mature while that for micros is relatively new and expanding rapidly. Since software trails the changes in hardware mix, there is projected to be a continued high demand for software to support the installed base of the larger machines. Market maturity is also reflected in the size of software companies supporting each market. The ADAPSO Computer Services Industry 1982 report found that software revenues related to large mainframes come almost exclusively from well-established software vendors with annual revenues in excess of $1 million (U.S.), whereas microcomputer software is mostly supplied by smaller firms. This will later be shown to be particularly significant for B.C. which has a high proportion of smaller firms who already derive a much higher percentage of their total revenues from micro software than software suppliers in general.

The following tables show an estimate of the software market by machine size for Canada and the U.S. respectively for 1981 to 1986. The 1986 U.S. figures are from International Data Corporation and are consistent with the Frost & Sullivan survey. Market forecasts prepared by Future Computing Inc. are slightly higher than those shown. The Canadian total market figure is from a recent survey by Evans Research Corporation. The Canadian breakdowns by machine size have been developed by pro-rating the American percentages by machine size to the Canadian total.

**CANADIAN SOFTWARE REVENUES BY SIZE OF HARDWARE**

(Millions of Dollars)

| | 1981 | | 1986 | | Annual Growth |
|---|---|---|---|---|---|
| | $ | % of Total | $ | % of Total | |
| Micro | 32 | 5.3 | 217 | 9.3 | 48% |
| Mini | 131 | 21.5 | 594 | 25.3 | 26% |
| Mainframe | 445 | 73.2 | 1,535 | 65.4 | 28% |
| Total | 608 | 100.0 | 2,346 | 100.0 | 31% |

## U.S. SOFTWARE REVENUES BY MACHINE SIZE

(Millions of U.S. Dollars)

| | 1981 $ | 1986 $ | Annual Growth |
|---|---|---|---|
| Micro | 200 | 1,500 | 50% |
| Mini | 800 | 4,100 | 39% |
| Mainframe | 2,700 | 10,600 | 31% |
| Total (Allocated) | 3,700 | 16,200 | 34% |

The 1986 forecasts contained in the above table are derived from actual U.S. surveys of users and suppliers. They do not appear to be consistent with comments made in our interviews with industry experts and our review of the literature. Generally what we have heard and read would suggest that the growth rate for microcomputer software will be significantly greater than the 50 percent per year suggested by the above figures. Since microcomputers and related software packages are at such an early stage of development, it might be advisable to monitor these changes in software mix over the next few years.

### 3.4 SOFTWARE REVENUES BY SOFTWARE TYPE

In terms of a breakdown by type of software, the three divisions generally used for compiling market information are as follows:

- Definition:

1. Systems Software: This has been called the "brains" of the computer. It includes operating systems, language compilers, database management systems and other utilities which make the hardware capable of performing instructions.

2. Application Packages: These are sets of instructions for performing specific functions for users such as payroll, accounts payable, airline reservations, production scheduling, etc. They are usually sold as pre-packaged solutions, where the same set of instructions can be used by several different user organizations, with or without modification.

3. Custom Software: This is more of a service, where software companies employ professionals to develop software particular to specific user's needs. (This third type of software service has generally been excluded in software industry data from U.S. sources but included by Canadian sources. For comparison purposes, it is shown for both Canadian and American markets below.)

. Software Revenues

Estimates of 1981 volumes and forecasts for 1986 are shown below.

**CANADIAN SOFTWARE REVENUES BY TYPE OF SOFTWARE**

(Millions of Dollars)

| | 1981 | | 1986 | | Annual Growth |
|---|---|---|---|---|---|
| | $ | % of Total | $ | % of Total | |
| Systems Software | 174 | 28 | 741 | 32 | 34% |
| Application Packages | 161 | 27 | 798 | 34 | 38% |
| Custom Software | 273 | 45 | 807 | 34 | 24% |
| Total | 608 | 100 | 2,346 | 100 | 31% |

Source: Evans Research Corporation

**U.S. SOFTWARE REVENUES BY TYPE OF SOFTWARE**

(Millions of U.S. Dollars)

| | 1981 | | 1986 | | Annual Growth |
|---|---|---|---|---|---|
| | $ | % of Total | $ | % of Total | |
| Systems Software | 2,800 | 54 | 11,900 | 56 | 34% |
| Application Packages | 900 | 17 | 4,300 | 20 | 36% |
| Custom Software | 1,500 | 19 | 5,100 | 24 | 28% |
| Total | 5,200 | 100 | 21,300 | 100 | 33% |

Source: International Data Corporation

As demonstrated by these two tables projected growth rates for Canada and the U.S. by software type are fairly similar although custom software represents a significantly larger percentage of the total in Canada than it does in the U.S. The custom software market, shown with lower growth in these projections, is considered by many industry experts to be about to decline. In a recent article in Canadian Datasystems (May '83, pages 74-77), Canadian software vendors made the following comments:

. "(I foresee)...more off-the-shelf product buying...with an accompanying decline in the need for customizers", Peter Bullock, President of Bullock Systems, Toronto;

. "...the software market is moving very firmly toward product at the expense of consulting services and customization." Ross Harlow, General Manager of Computer Associates in Canada.

The general consensus is that, particularly in the smaller computer markets, application software packages will be the biggest growth area in the future. This is graphically illustrated in Figure 4 which shows the dollar value of the Canadian software industry by type of software to 1990. The clear bar, representing applications packages, quickly outgrows both systems software and custom software to become the major portion of industry revenues by early 1987. This is also illustrated in Figure 5 which, instead of dollar value shows percentage of market share. This latter graph also shows that the growth of applications packages is almost entirely at the expense of custom development market share.

However large the growth in the application area, software suppliers generally should not overlook the fact that systems software is also undergoing considerable growth and remains a significant portion of a large market in 1986 and beyond.

## 3.5 SOFTWARE MARKETS BY SUPPLIER TYPE

Broadly, one can classify software suppliers into two categories: hardware manufacturers whose primary purpose is to sell the hardware that they make and independents whose revenues are generated primarily through the sales of software and services.

Currently, hardware manufacturers account for only a slightly higher proportion of total Canadian software then independent suppliers. In the U.S., this difference is considerably greater. In both countries, a shift is expected in the direction of a higher proportion by independents and a lower one for hardware manufacturers. The specific figures for 1981 and projections for 1986 are shown below:

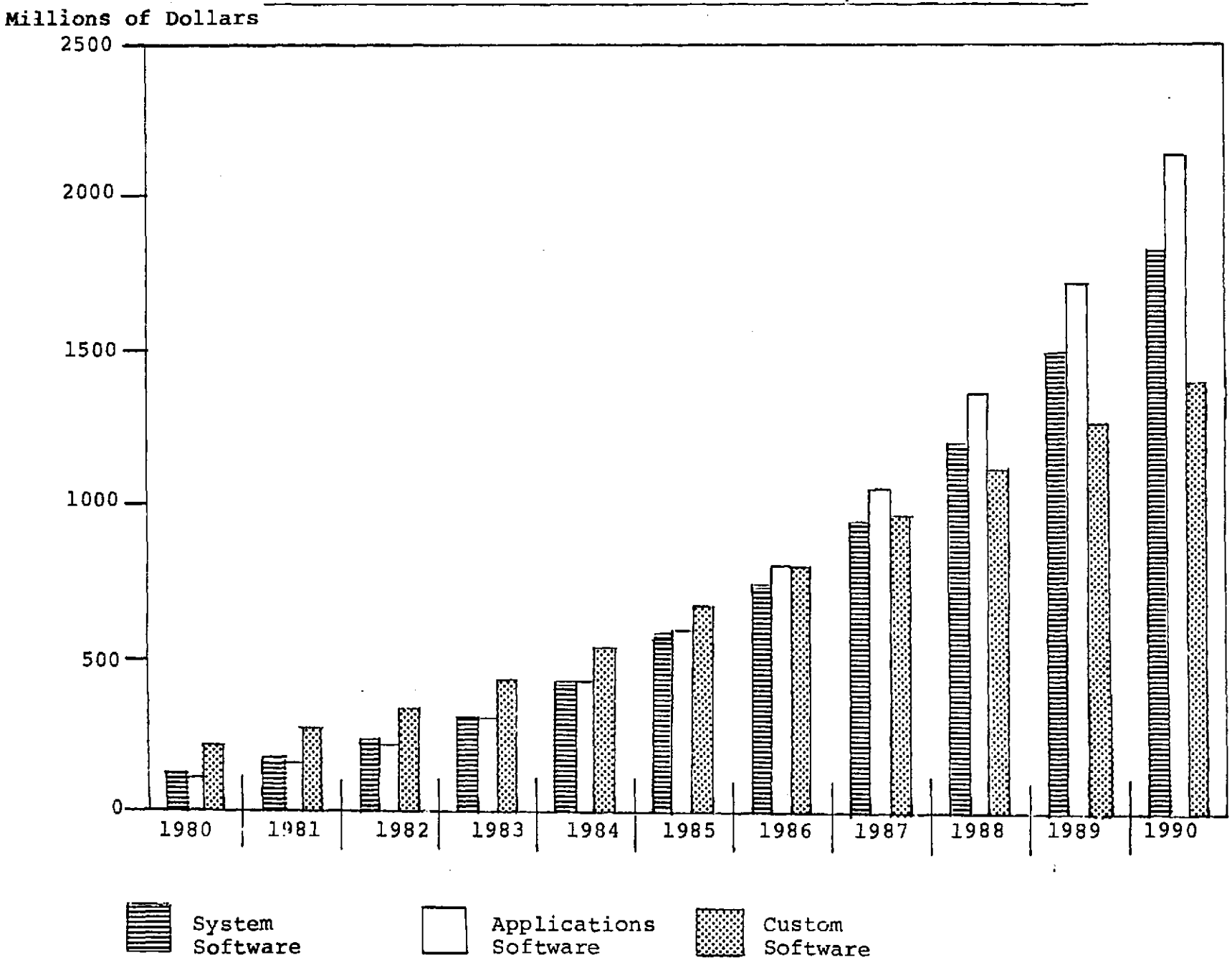
**CANADIAN SOFTWARE MARKET BY TYPE OF SUPPLIER**

(Millions of Dollars - Including Custom Software)

| | 1981 $ | % of Total | 1986 $ | % of Total | Annual Growth |
|---|---|---|---|---|---|
| Hardware Manufacturers | 331 | 50.4 | 1,056 | 45.0 | 26% |
| Independents | 277 | 49.6 | 1,290 | 55.0 | 36% |
| Total | 608 | 100.0 | 2,346 | 100.0 | 31% |

Source: Evans Research Corporation

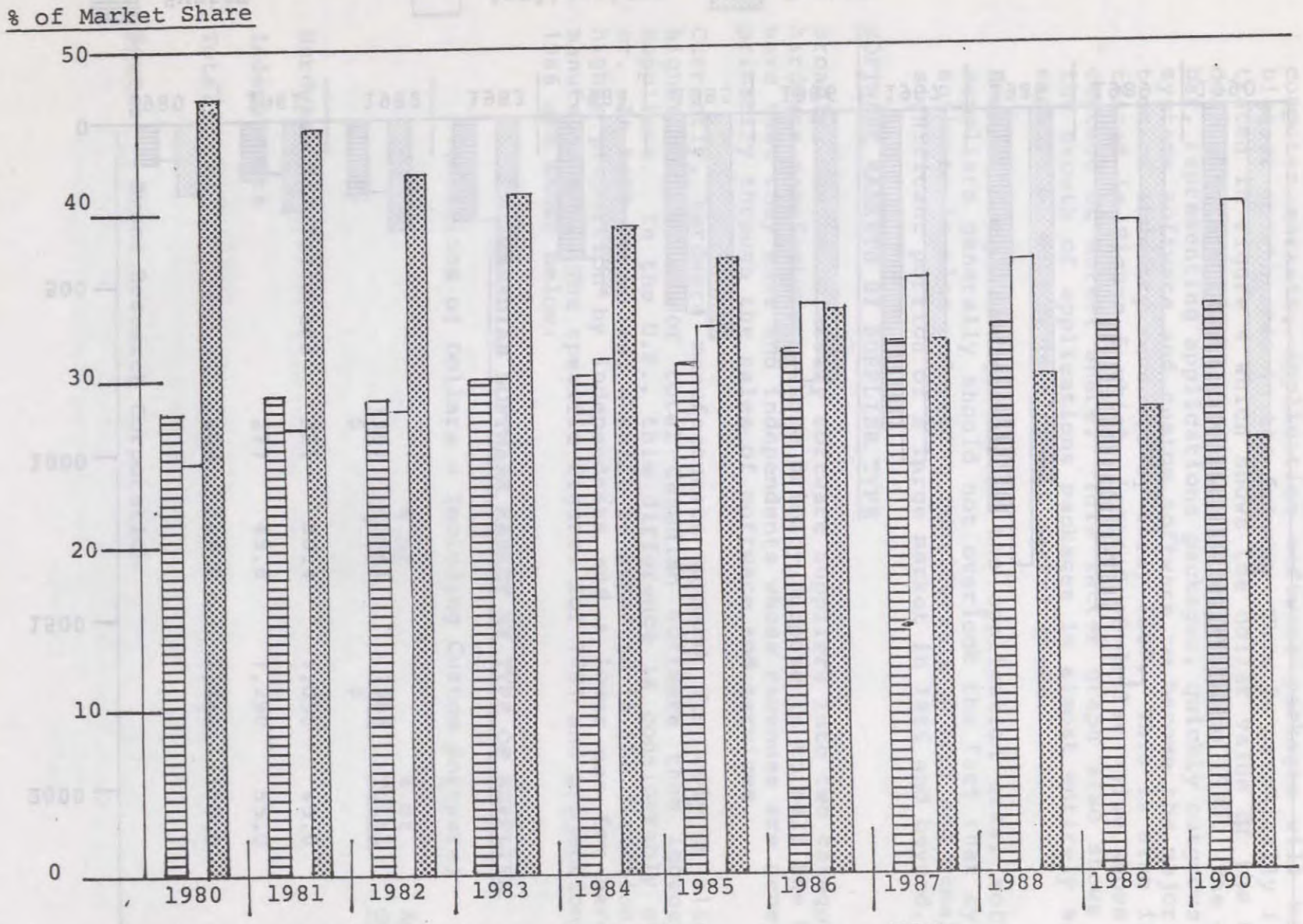
CANADIAN SOFTWARE INDUSTRY BY SOFTWARE TYPE, FORECAST TO 1990




Source: Evans Research Corp.

Figure 4

SHARE OF THE CANADIAN SOFTWARE MARKET BY SOFTWARE TYPE TO 1990




Source: Evans Research Corporation

Figure 5

**U.S. SOFTWARE MARKET BY TYPE OF SUPPLIER**

(Millions of U.S. Dollars - Excluding Custom Software)

| | 1981 $ | % of Total | 1986 $ | % of Total | Annual Growth |
|---|---|---|---|---|---|
| Hardware Manufacturers | 2,200 | 60.0 | 8,600 | 53.0 | 31% |
| Independents | 1,500 | 40.0 | 7,600 | 47.0 | 38% |
| Total | 3,700 | 100.0 | 16,200 | 100.0 | 33% |

Source: International Data Corporation

Figure 6 shows a considerable variation by category of software. Hardware manufacturers dominate the systems software category, supplying 83 percent in 1981. The situation is reversed in the application software category, with independents supplying 74 percent. By 1986, both in Canada and the U.S., independents are expected to surpass hardware manufacturers in terms of the proportion of total software supplied. The most significant part of this change is expected to be an increase in the dominance of the application software category by the independents.

These figures and trends are quite significant when analyzing future software opportunities for Canadian suppliers. Since systems software is and will continue to be supplied by foreign-based hardware manufacturers, this portion of the market can be virtually excluded as an opportunity for B.C. companies. The applications and utility categories represent more realistic possibilities for future growth.

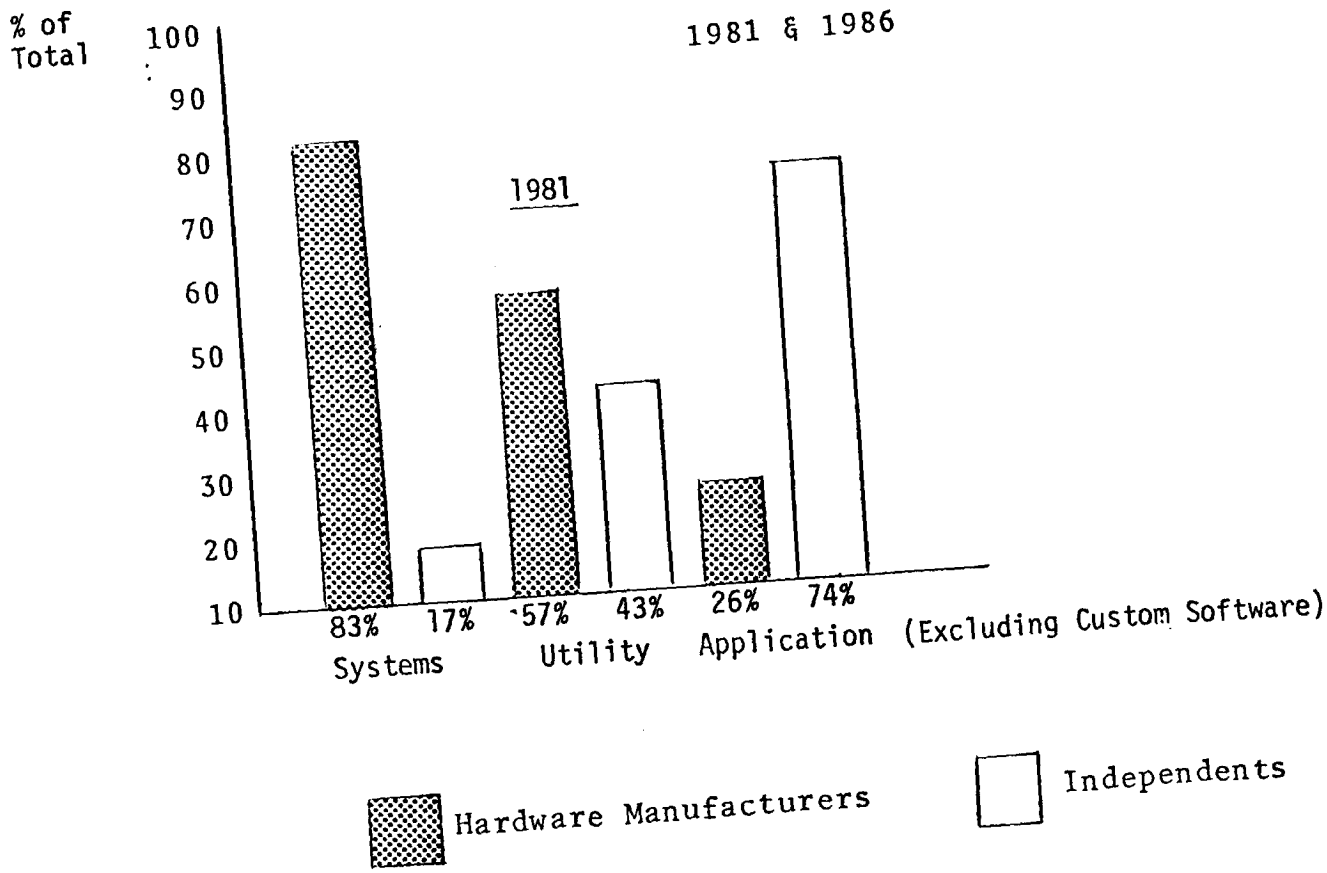
## 3.6 SOFTWARE MARKETS BY INDUSTRY SECTOR

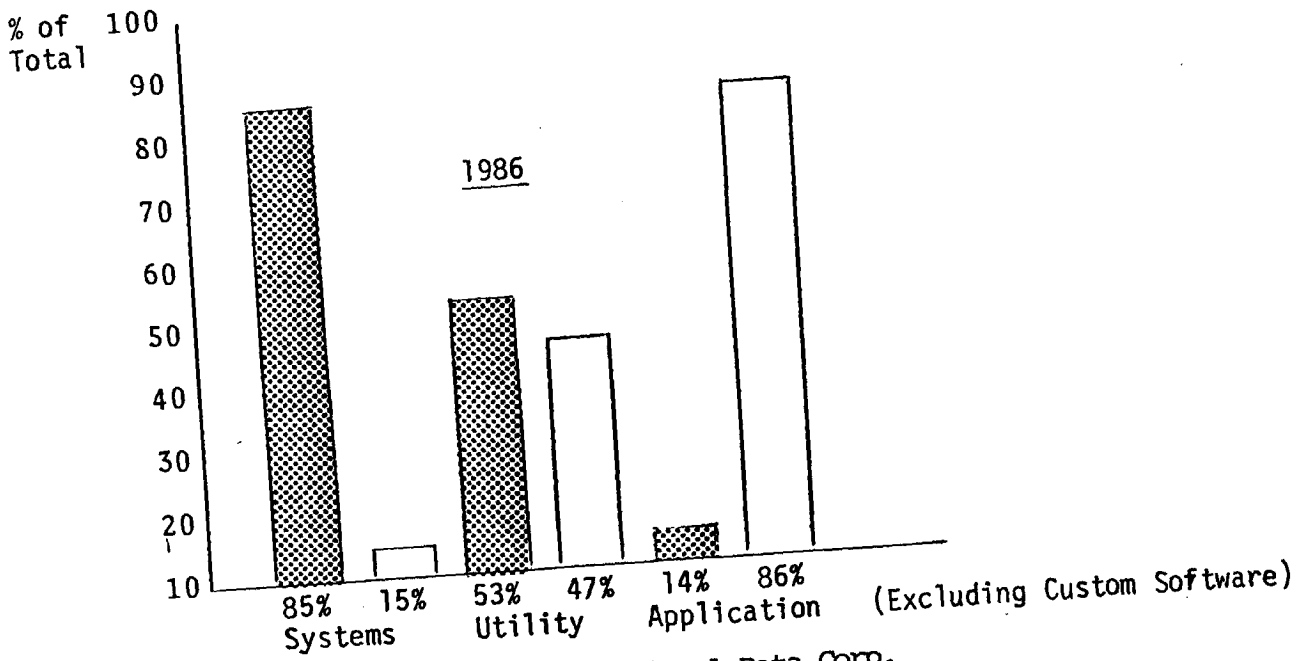
Little meaningful data was available regarding breakdowns of software revenues by industry sector. In order to provide some perspective on this aspect of software markets, Figure 7 shows the 1981 - 82 distribution of computer installations in Canada plus the annual growth rate between 1970 and 1982. In examining this data it is important to keep in mind that it shows the number of installations, rather than the dollar value. It is highly probable that the picture would be somewhat different if data were available on the dollar value of computer installations by industry sector. Notwithstanding, for purposes of this analysis of the Canadian market, the sectors which represent the largest demand for software have been manufacturing, government, services, service bureau and distribution industries.

Figure 6

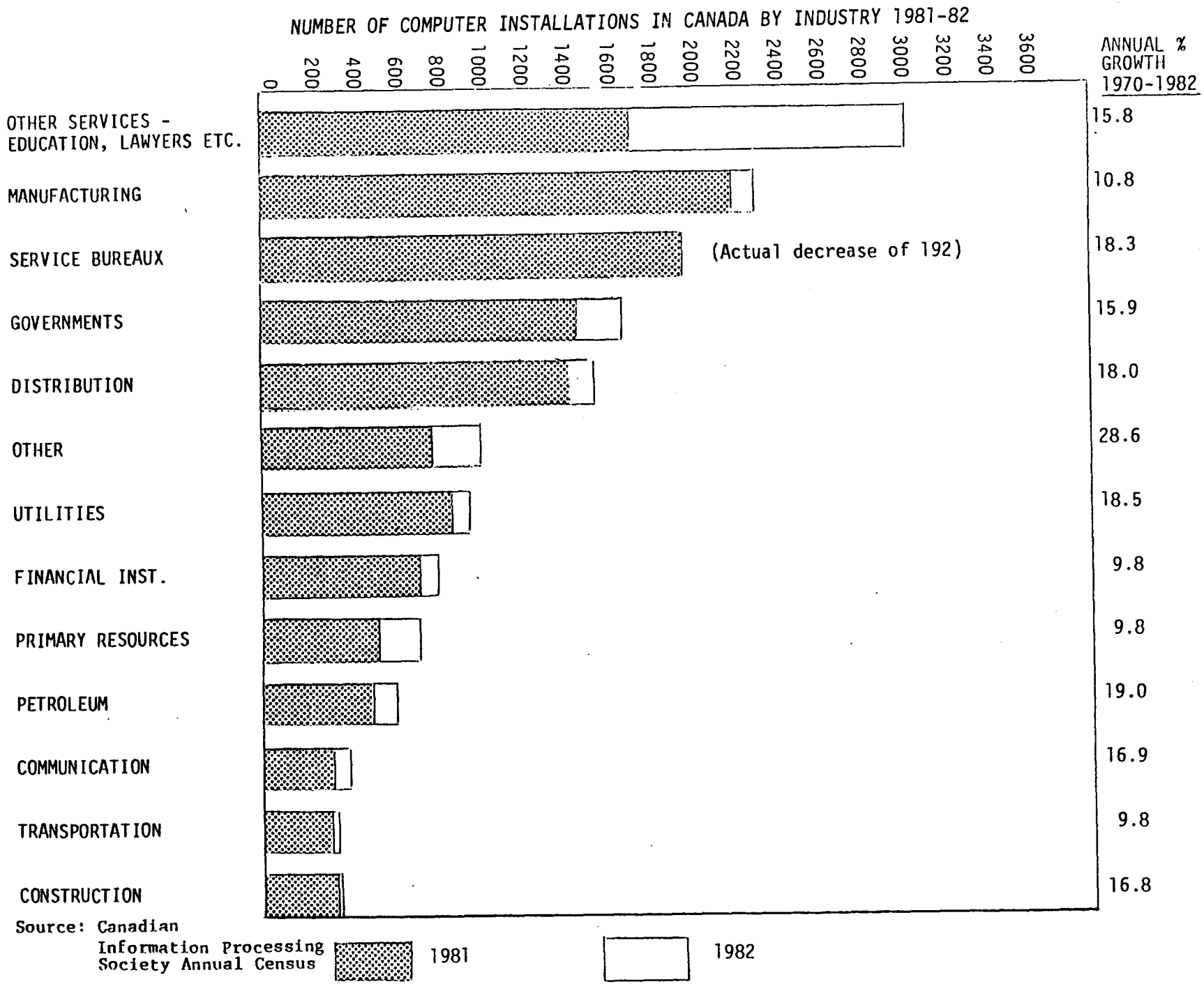
COMPARISON OF SOFTWARE SUBMARKETS - U.S.A.

HARDWARE VENDORS AND INDEPENDENTS




Source: International Data Corp.




Source: Canadian Information Processing Society Annual Census

Figure 7

Canada has undergone approximately 15 percent compound growth per year in the number of computers installed across the country since 1970. The distribution of this hardware across industry sectors has shifted, however. The manufacturing, transportation and financial sectors have not grown as rapidly as other sectors in terms of the number of computers installed over the last 12 years. This probably, at least in the case of the financial sector, is more a reflection of the sector's EDP maturity, in the sense that it acquired computers earlier than other sectors. More recent growth, indicated by the expansion in computer installations from 1981 to 1982, points to the "other service" industries, government, and primary resource as high growth areas in Canada, and of particular importance to B.C. suppliers.

Figure 8 shows a distinct similarity between the U.S. and Canada in the industry sector spread of number of computer installations. Some differences exist in that Canada appears to achieve some economies of scale in the banking, finance and insurance sector, and has a higher proportion of computers in the education and other service sectors than in the U.S. Education alone accounts for almost half the computers in the "education and other service" sector in Canada.

Figure 9 illustrates the industry sector growth rates for Canada and the U.S. Except in the fields of education and government, the number of computers installed is not growing as quickly in Canada as in the U.S. Canada appears to be computerizing the education process at a much higher rate than its neighbour to the south. Both are showing very healthy growth however, as indicated by the following quotations from recent periodicals.

. "The computer-based training market in industry is really beginning to boom..." (Business Week, March 28, 1983, page 88);

Insurance is an area which is generally expected to evidence high growth in the future as smaller computers bring computerization within reach of insurance agencies.

. "More than 25,000 independent insurance agencies in the U.S. will spend $880 million in the 1982-87 period to buy computer systems for their offices..." (Canadian Datasystems, June 1983, page 47).

Figures 8 and 9 show computer installations in manufacturing to be an area of high expected growth. This is attributable in large part to computer assisted design/computer assisted manufacturing software and hardware becomes less expensive and more widely accepted.

Figure 8

CANADIAN VS. U.S. INSTALLED COMPUTERS

APPROXIMATE % BY INDUSTRY SECTOR - 1982

| | Canada | U.S. |
|---|---|---|
| Manufacturing, Mining & Construction | 25 | 24 |
| Transportation, Utilities | 9 | 10 |
| Wholesale, Retail Trade | 10 | 9 |
| Banking, Finance & Insurance | 5 | 17 |
| Computer Services | 11 | 16 |
| Education, Other Services | 29 | 11 |
| Government | 11 | 13 |
| TOTAL | 100 | 100 |

Sources: - U.S.A., International Data Corporation
- Canada, CIPS 1983 Census

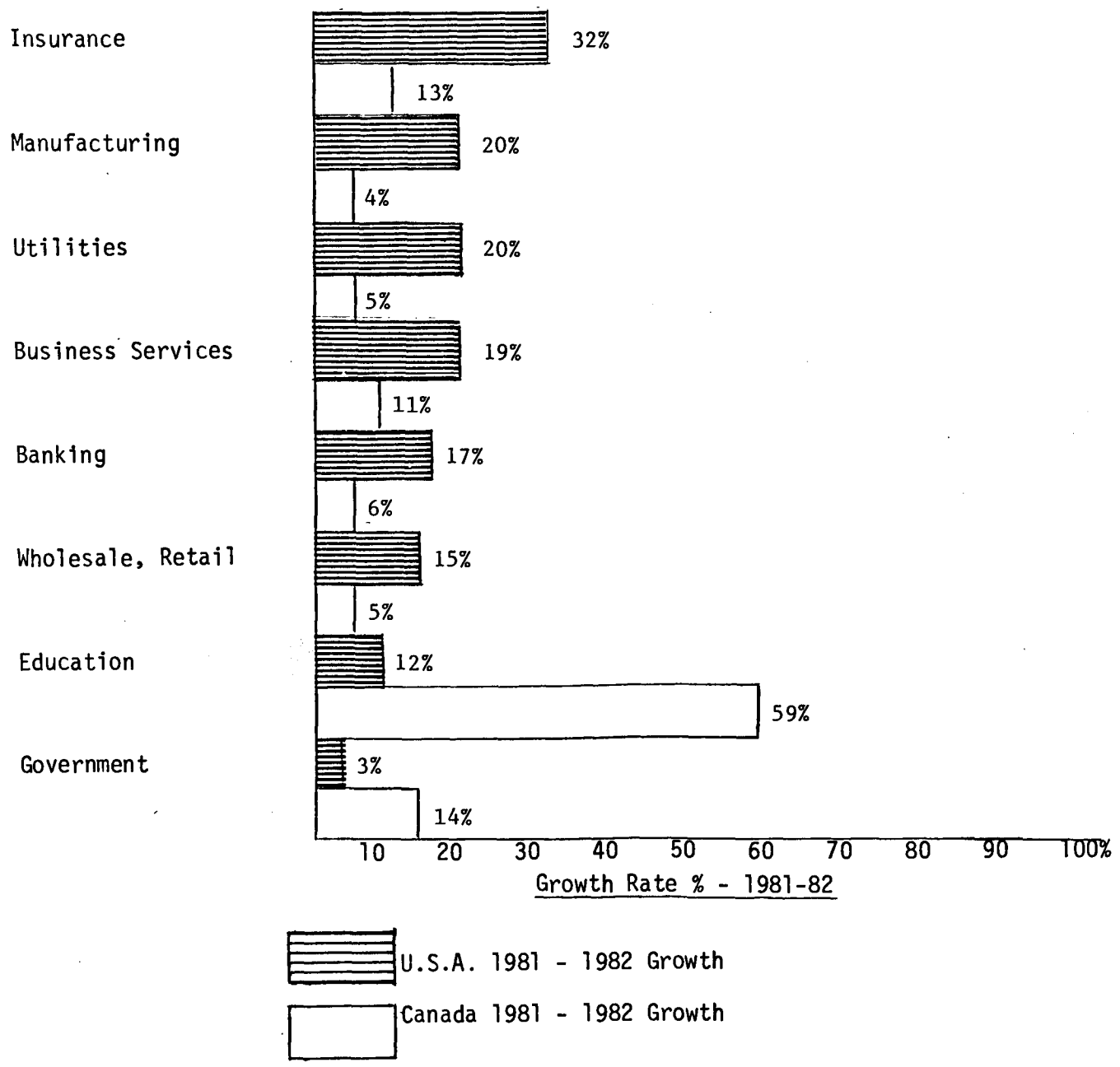
Figure 9

COMPARISON - GROWTH IN NUMBER OF COMPUTER INSTALLATIONS

BY INDUSTRY SECTOR

CANADA/USA

1981 - 1982




Sources: U.S.A. - International Data Corporation
Canada - CIPS 1983 Computer Census

- "Computer-aided design and manufacturing (CAD/CAM) will be the fastest growing application...a new low-end CAD/CAM market holds great promise in the '80's." (Computerworld, February 7, 1983).

This growth, although already apparent in the U.S., has yet to really make its mark in Canada.

## 3.7 SOFTWARE MARKETS BY TYPE OF APPLICATION

Application packages, which address the needs of more than one industry sector for common functions such as accounting and payroll, are a large and growing market. The Canadian representative for Peachtree Software, a microcomputer software supplier, recently observed that:

- "...vertical (industry specific) packages don't move as fast as general packages suitable for all types of use..." (Canadian Datasystems, May, 1983, page 77).

Utility application software such as data management, report generators, program design, graphics, etc. is one of the areas where considerable growth is expected. Figure 10 shows the expected growth rates for utility application software to 1985. The largest growth is expected to be in data management software such as database and file handling systems. The next most promising opportunity lies in report generator software which would take information from files and databases and produce useful reports for businesses. These opportunities, however, are generally reserved for larger software suppliers, due to the complexity of the application and the corresponding need to invest large amounts of time, effort and funding to develop marketable products and gain acceptance of them in the market place.

In surveying the literature, there is a fair amount of consensus about the types of applications software packages that represent large growth opportunities for the future. The applications most often mentioned are accounting, word processing, electronic spreadsheet and database and file handling systems.

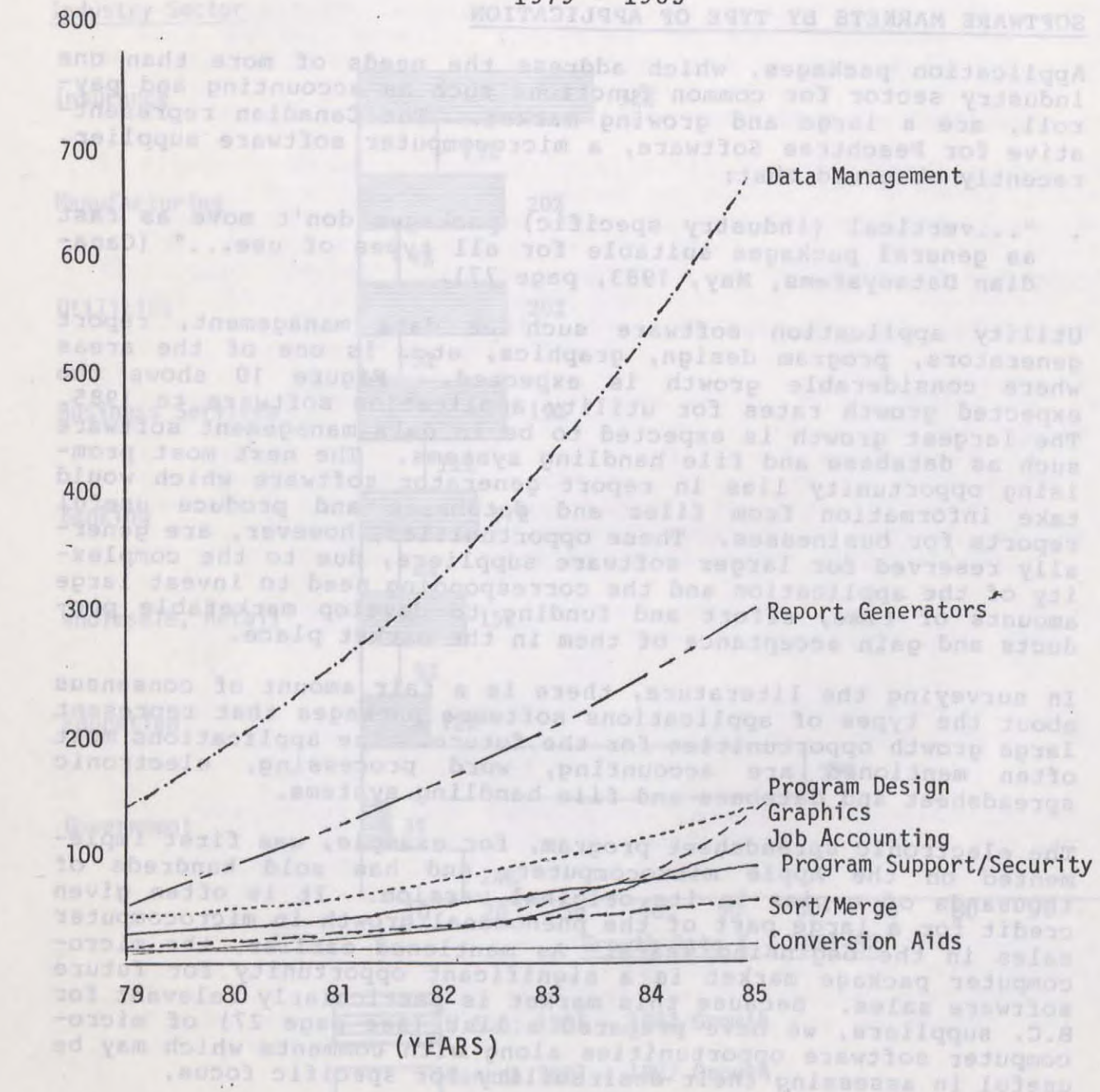
The electronic spreadsheet program, for example, was first implemented on the Apple microcomputer, and has sold hundreds of thousands of copies in its original version. It is often given credit for a large part of the phenomenal growth in microcomputer sales in the beginning years. As mentioned earlier, the microcomputer package market is a significant opportunity for future software sales. Because this market is particularly relevant for B.C. suppliers, we have prepared a list (see page 27) of microcomputer software opportunities along with comments which may be useful in assessing their desirability for specific focus.

Figure 10

COMPARISON OF GROWTH IN UTILITY SOFTWARE

BY TYPE OF APPLICATION

1979 - 1985




Source: International Data Corporation

- Database, Spreadsheet, Word Processing Applications

  Because of the universality of potential uses these applications represent a very large market. At the same time, they are subject to stiff competition, require extensive sophisticated product development, large investment, and comprehensive marketing effort. Thus, they are not likely to be a major part of the development strategy for many B.C. suppliers.

- Vertical Business Applications

  The development of products for a specific narrow segment of the market presents fewer opportunities for extraordinarily large volumes than the forementioned applications. While there will also be many competitors in this arena, the range of possibilities is more diverse since it is a "multi-niche" area of the market. Thus, for the imaginative software developer who acquires depth of understanding of the potential users' specific problems and requirements, such applications represent an attractive potential for B.C. suppliers.

- Accounting Applications

  Much of what has been said about spreadsheet and database applications applies also to accounting products. The market is large, the competition intense and the risk fairly high.

- Education Applications

  As mentioned earlier, this is a significant market, which is not yet at an advanced stage of development. It is one that has fewer limitations for B.C. suppliers than some other categories in terms of proximity to opportunities for product testing. The key limitations here will be related to curricula differences between jurisdictions.

- Entertainment Applications

  This is a large area of opportunity for creative software developers, but which, on the negative side, entails fairly high risk and substantial investment for product development and launching.

- Scientific and Engineering Applications

  This area appears to fit well with the situation of many B.C. suppliers. It is relatively easy to enter, the province is the home of a number of world class engineering firms and the market is still at a fairly early stage of development.

- Local Area Network Software

  On the surface, this appears to be an attractive opportunity since local area networks are at an early stage in terms of market popularity. Given that large investment and sophisticated complex product development is required, and the fact that several products have already been developed which are well-established and have gained favourable acceptance amongst users to date, it may not be ideal for B.C. suppliers.

## 3.8 IMPLICATIONS OF MARKET TRENDS FOR B.C. SOFTWARE SUPPLIERS

In summary, the market for British Columbia software suppliers has been identified as being North America-wide and, within this vast and growing market, there are particularly attractive higher growth segments. More specifically, microcomputer-based packaged application software is forecast to undergo extremely healthy expansion in sales in the future. Industry sectors such as education, insurance and manufacturing are potentially very large submarkets for both vertical and horizontal packaged software such as accounting, productivity and data manipulation applications.

Regardless of areas considered for specific concentration, one factor which is common to all is the importance of market distribution and the need for marketing competence. Perhaps of even greater significance for the future prosperity of B.C. suppliers is the competitive make-up of the industry which is foreseen for the future. As expressed by one industry representative in the May, 1983 issue of Canada Datasystems magazine:

- "These new generation software packages will come to depend on a handful of world-class software shops with only a few crumbs left for the rest. The high hopes of two years ago, of Canada becoming a leading supplier of software to the world will be dashed on the rocks of the new software with massive dislocation nationwide as companies, which though they could make a living that way, find they have to look for something else.".

For the B.C. software industry, it is to be hoped that these dire predictions do not come true. There are, however, sound reasons for believing they could happen. The predictions represent useful background thoughts when reviewing the following section which provides information on the make-up of the industry in B.C. and additional data on business practices and problems.

# IV. THE SOFTWARE INDUSTRY IN BRITISH COLUMBIA

## 4.1 INTRODUCTION

Most of the information contained in this section was obtained via questionnaire survey, interviews and group meetings with representatives of B.C. software companies. Two hundred and thirty-nine questionnaires were sent out. Of these, seventy-four were returned completed. Thirty-one were returned unopened due to changes of address or discontinuation of business. Three were returned too late for inclusion.

As already mentioned, we have no reliable way of assessing the extent to which the mix of companies returning questionnaires corresponds to the total industry profile in terms of company size and type. We are inclined to believe that this sample contains a higher proportion of large companies than the total provincial profile.

The quality of questionnaire completion appeared to be high. Very few "No Response"'s were recorded. This is a strong indication that those completing the questionnaire were serious and conscientious about the survey. Also, these results are probably due, at least in part, to careful survey pre-testing and to valuable suggestions made by the Study Steering Committee. A copy of the questionnaire is included in Appendix A.

## 4.2 TYPE OF BUSINESS

Of those completing the survey, the distribution by "Primary business of your company", was as follows:

| | No. of Respondents |
|---|---|
| Software development | 37 |
| Computer hardware | 8 |
| Turnkey systems | 12 |
| Service bureau | 9 |
| Other | 8 |

Of the 74 responses, 57 have their head office based in B.C., while 14 have head offices elsewhere. Of the 57 B.C. based companies, 10 have one or more branches elsewhere.

## 4.3 EMPLOYMENT LEVELS

Software companies in B.C. are mostly small in terms of people employed. Distribution of employees by size of company was as follows:

| Company Size | Number of Co.'s | % of Co.'s | % of Total Employment |
|---|---|---|---|
| Small (0 - 5) | 40 | 54% | 13% |
| Medium (6 - 15) | 22 | 30% | 26% |
| Large (Over 15) | 12 | 16% | 61% |

Note: These figures relate only to B.C. employees involved in software.

The above data is very significant in light of the software market trend toward dominance by large companies. It should also be noted that several of the companies classified as large for this analysis are fairly small by comparison with leading "world-class" competitors. The fact that 54 percent of the reporting firms have 5 employees or fewer is a reason to be concerned about the future of the industry in B.C.

Of the small companies reporting, the anticipated employee growth reported was from an average of 2.5 employees in 1983 to an average of 6.5 by 1986.

Medium-sized companies expect to increase from an average of 9.4 to an average of 14.1.

Large companies expect to grow from a 1983 average of 39.5 to 79.4 in 1986.

In terms of actual growth in employment levels between 1980 and 1983, the responses were as follows:

| % Increase 1980-83 | Small Co.'s (0-5) | Medium Co.'s (6-15) | Large Co.'s (Over 15) | Total |
|---|---|---|---|---|
| Increased over 50% | 25.0% | 32.0% | 50.0% | 31.1% |
| Increased 10 to 49% | 7.5% | 27.2% | 33.3% | 17.6% |
| No Significant Change | 30.0% | 18.2% | - | 21.6% |
| Decreased 10 - 50% | 15.0% | 9.1% | 8.3% | 12.2% |
| Decreased over 50% | 2.5% | 13.5% | - | 5.4% |
| No Response | 20.0% | - | 8.4% | 12.2% |

Clearly, the large companies are growing at a much faster rate than the smaller ones. This is consistent with references made earlier to the trend toward dominance by large companies.

The slower growth rate of the smaller companies suggests that new entries to the market are probably having difficulty progressing far beyond the survival level. This hypothesis is supported by later data on revenues.

The survey also collected information on deployment of staff by 4 different categories. The average number of employees in each of these categories is shown below for each size of company.

| Staff Category | NUMBER OF EMPLOYEES Small Co.'s | Medium Co.'s | Large Co.'s |
|---|---|---|---|
| Software Technical | 1.2 | 5.0 | 18.6 |
| Marketing and Sales | .7 | 1.9 | 5.5 |
| Management/Administration | .6 | 1.9 | 8.3 |
| Other | .3 | .5 | 4.6 |
| TOTAL | *2.8 | 9.3 | *37.0 |

* The actual total average for small companies was 2.5 employees and for large companies 39.5. These discrepancies are a result of minor errors in reporting by respondents.

The large companies in the sample are clearly in a position to allocate substantial manpower resources to marketing and to other aspects of managing their business. The smaller companies are severely limited in this respect. Thus, the "large get larger" trend illustrated by the 1980-83 growth rates on the previous page is likely to continue, making it even more difficult for smaller organizations to compete.

## 4.4 LEVELS OF B.C. SOFTWARE REVENUES

Our questionnaire contained 10 breakdowns of 1982 revenue levels, but to simplify reporting, these have been grouped into the categories shown in Figure 11.

In the total sample, over 63 percent of the reporting companies had revenues of less than $100,000 and 15 reporting companies had revenues of less than $50,000 in 1982. Since few companies have been in business for under 2 years, it is unlikely that these low revenues are attributable to newness and start-up problems.

The significance of these figures is simply that the majority of B.C. software suppliers are too small to be able to fund the kind of development and marketing required to take advantage of major opportunities in the market place. In our opinion, they are also likely to have considerable difficulty in obtaining adequate funds for this purpose from lending agencies.

## REVENUE LEVELS OF B.C. SOFTWARE SUPPLIERS

| 1982 Revenue Category | | Number of Companies | Percentage of Respondents At Various Levels Of B.C. Software Revenues |
|---|---|---|---|
| **COMPANIES WITH B.C. OPERATIONS ONLY** | | | |
| Very small | Under $100,000 | 26 | 63% |
| Small | $100,000 - 499,999 | 9 | 22% |
| Medium | $500,000 - 999,999 | 6 | 15% |
| Large | Over $1,000,000 | 0 | - |
| No Response | | 0 | - |
| **B.C. BASED COMPANIES WITH OTHER BRANCHES** | | | |
| Very small | | 0 | - |
| Small | | 7 | 58% |
| Medium | | 2 | 17% |
| Large | | 3 | 25% |
| **EX B.C. BASED COMPANIES WITH LOCAL REPRESENTATION** | | | |
| Very small | | 3 | 25% |
| Small | | 3 | 25% |
| Medium | | 3 | 25% |
| Large | | 3 | 25% |

Figure 11

- B.C. Supplier Revenues by Software Type

Figure 12 shows a comparison of revenue percentages by type of software, between the B.C. sample and the overall Canadian and U.S. markets, as well as changes expected by 1986.

The most significant figure shown on these graphs is the 8 percent proportion of systems software revenues of B.C. companies as compared to 29 percent for Canada in total and 55 percent for the U.S. Of the B.C. revenues a very significant share was done by companies whose head office is located elsewhere. Further penetration of this segment of the market is unlikely to take place unless a hardware manufacturer locates manufacturing or major research in this province.

Not shown in these graphs but of some significance, is the fact that larger B.C. companies are highly reliant on custom software. About 64 percent of their revenues are derived from custom software as compared to 48 percent in the total B.C. sample and 45 percent for Canada in total. With the anticipated heavy shift to more application packages, these companies could find opportunities for future growth somewhat limited if they continue their high dependency on custom software. In the main, these are also the companies with the technical capability, borrowing power and marketing capability to move effectively into package development should they choose such a direction. Responses to the question regarding anticipated changes in this mix do not suggest strong intentions to do so. In fact, the most substantial change anticipated was a significant decline in systems software revenues by these large companies.

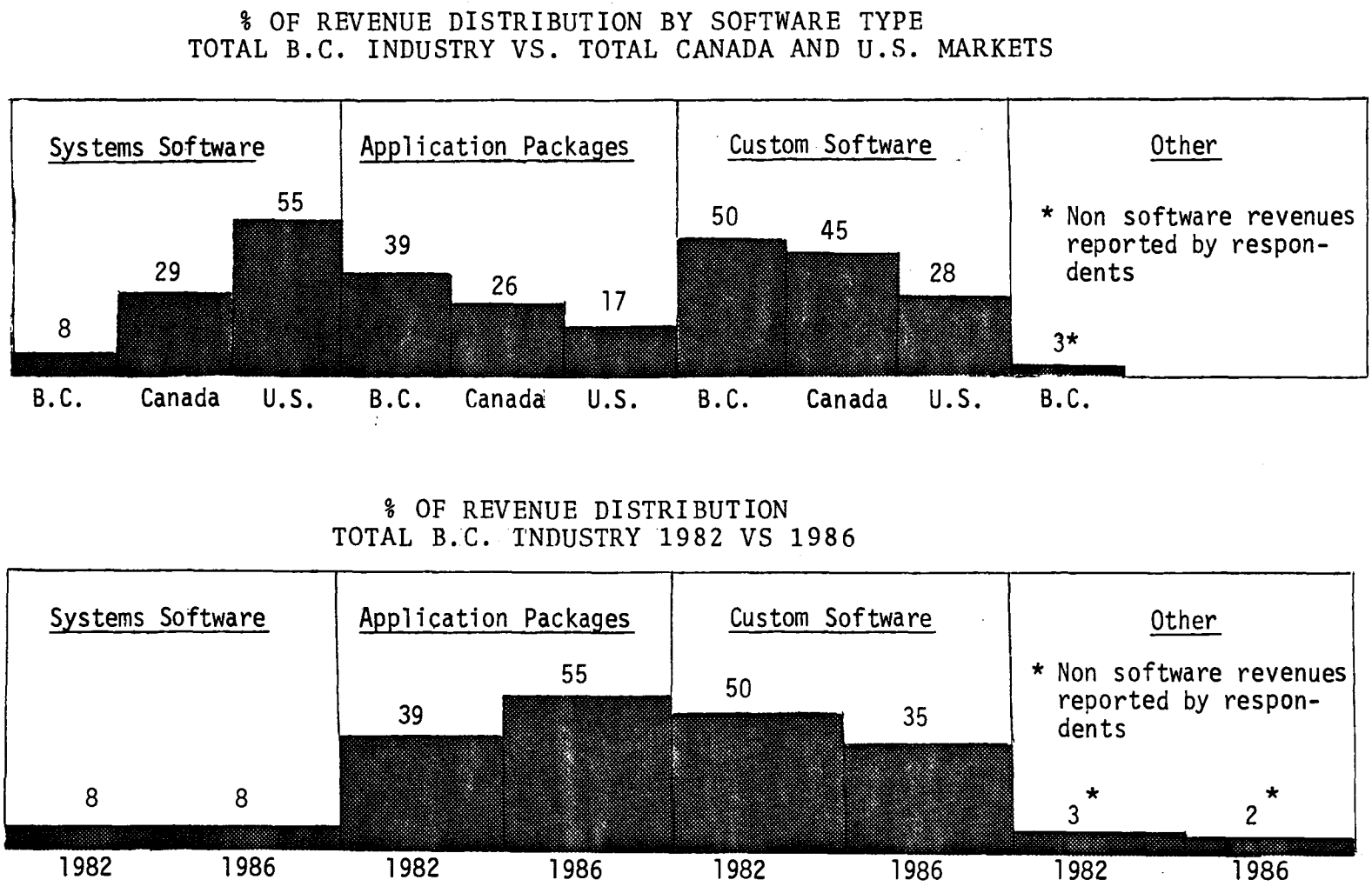
- Revenue Percentages by Hardware Size

The proportion of B.C. revenues represented by software for the 3 sizes of hardware are shown by size of company.

% OF 1982 REVENUES

| Hardware Size | Very Small Companies | Small Companies | Medium Companies | Large Companies | *Total Canada |
|---|---|---|---|---|---|
| Mainframe | 19 | 15 | 35 | 39 | 73 |
| Mini | 45 | 57 | 44 | 51 | 22 |
| Micro | 36 | 28 | 21 | 10 | 5 |
| TOTAL | 100 | 100 | 100 | 100 | 100 |

## PERCENTAGES OF SOFTWARE REVENUES BY SOFTWARE TYPE




Sources: B.C. - Touche Ross & Partners Industry Survey
Canada - Evans Research
U.S. - International Data Corporation

Figure 12

B.C. software companies of all sizes are much more heavily dependent on software for minicomputers than Canadian companies in general. In light of the predictions of many experts that the minicomputer software market share will decline substantially, a major shift will be required. There also appears to be reason for concern that, at least to date, it is primarily the smaller companies that are emphasizing microcomputer software. Since these are the companies with limited financial resources and marketing manpower, there is little reason for optimism about their ability to compete in this heavily package-oriented segment of the market. Only a few of the larger companies, with greater resource power, have as yet moved strongly in the direction of microcomputer software.

## Geographic Sources of B.C. Software Company Revenues

B.C. suppliers rely very heavily on the B.C. market as the prime source of their business and generally have made no significant penetration of any other market. This does not vary substantially by company size, although the large companies record greater volumes in other markets than the smaller ones. The distribution of 1982 revenues was as follows:

| | Total Sample Average % of Revenue | Large Company Only % of Revenue |
|---|---|---|
| B.C. | 81.3 | 75.0 |
| Prairies, N.W.T., Yukon | 4.0 | 4.3 |
| Eastern Canada | 7.3 | .5 |
| Washington, Oregon, California, Alaska | 2.0 | 6.5 |
| Rest of U.S.A. | 4.5 | 5.7 |
| Outside North America | .9 | 8.0 |

The low percentage of Eastern Canada revenues shown for large firms is misleading. Most of the large responding firms are based in Eastern Canada and have substantial revenue there which do not show in our results since our questionnaire asked for revenue of B.C. branches only. What is not readily obvious from the above percentages is that the total revenues derived from outside Canada by the 6 largest companies is several times that of all of the others. Companies with revenues under $1 million are not really operating in American or international markets. Responses regarding intentions to penetrate non-B.C. markets further indicate only moderate planned shifts in this direction. The stronger responses came from the companies who are already doing business elsewhere. Western U.S.A. was seen as the market of greatest interest, with Eastern Canada just slightly behind.

- Revenues By Industry Sector

  In terms of sources of revenue for B.C. software suppliers by industry sector, the survey reveals nothing particularly significant. The most frequently mentioned sectors in terms of revenues were wholesale trade and government, followed closely by finance, insurance, real estate and retail trade, with communications, forestry and manufacturing also receiving a significant number of mentions. As might be expected, on the basis of the data presented earlier, this fits more closely with the nature of the B.C. market than with that of the larger market place.

## 4.5 MARKETING PRACTICES AND METHODS OF B.C. SOFTWARE COMPANIES

Our prime conclusions regarding the marketing practices and methods of B.C. companies are as follows:

- Most companies rely heavily on reactive marketing methods. As show in Figure 13, personal contacts, referrals and repeat business are considered the most important revenue generation activities by the total sample of respondents. This is not the case with the large companies in the sample. These firms consider their direct sales force to be their most important generator of business.

- The responses shown in Figures 13 and 14 strongly suggest that marketing methods which are oriented toward securing customers outside B.C. (media advertising, distribution through wholesalers or third parties, exhibits at trade shows and conferences) are generally seen as of low importance to responding B.C. companies. Replies related to media advertising and to use of third party distributors were mostly in the "Little or No Emphasis" range, with only a few companies indicating even occasional use of either. This is likely to require significant change if B.C. software suppliers are to compete in the highly competitive package-oriented markets of the future.

- Members of the industry have a problem with regard to advertising. The large companies reported very little media advertising. This is probably misleading inasmuch as advertising by some of these firms is likely initiated by the ex B.C. home office and the costs are shown elsewhere. Smaller firms spend between 2 percent and 2.5 percent of revenues on advertising but this advertising has little potency because of the very few dollars this represents. Most are also too small to afford professional advertising assistance. Brochures and trade magazines are the preferred media, which seems appropriate to the circumstances of most firms.

- The survey data suggest that formal requests for proposals tend to go mostly to the larger companies. This undoubtedly relates largely to the size of projects involved and the resources required to do them, but it may also be related to low concerns about proactive marketing and/or inadequate marketing competence amongst smaller companies. Our interviews lead us to the conclusion that it is all of these things.

- The larger companies, whose organizations are more mature, see very little need for change in marketing methods in the future. The smaller companies appropriately recognize the need to make changes but are uncertain regarding how and when.

In summary, the survey responses show marketing efforts to be those that are most appropriate for local markets, and more effective for custom software development then for packages. As geographic boundaries become less important, and powerful packages more important, this will need to change.

Figure 13

RELATIVE IMPORTANCE IN GENERATING B.C. SOFTWARE REVENUES

TOTAL SURVEY RESULTS VS COMPANIES WITH OVER 1 MILLION IN SOFTWARE REVENUES

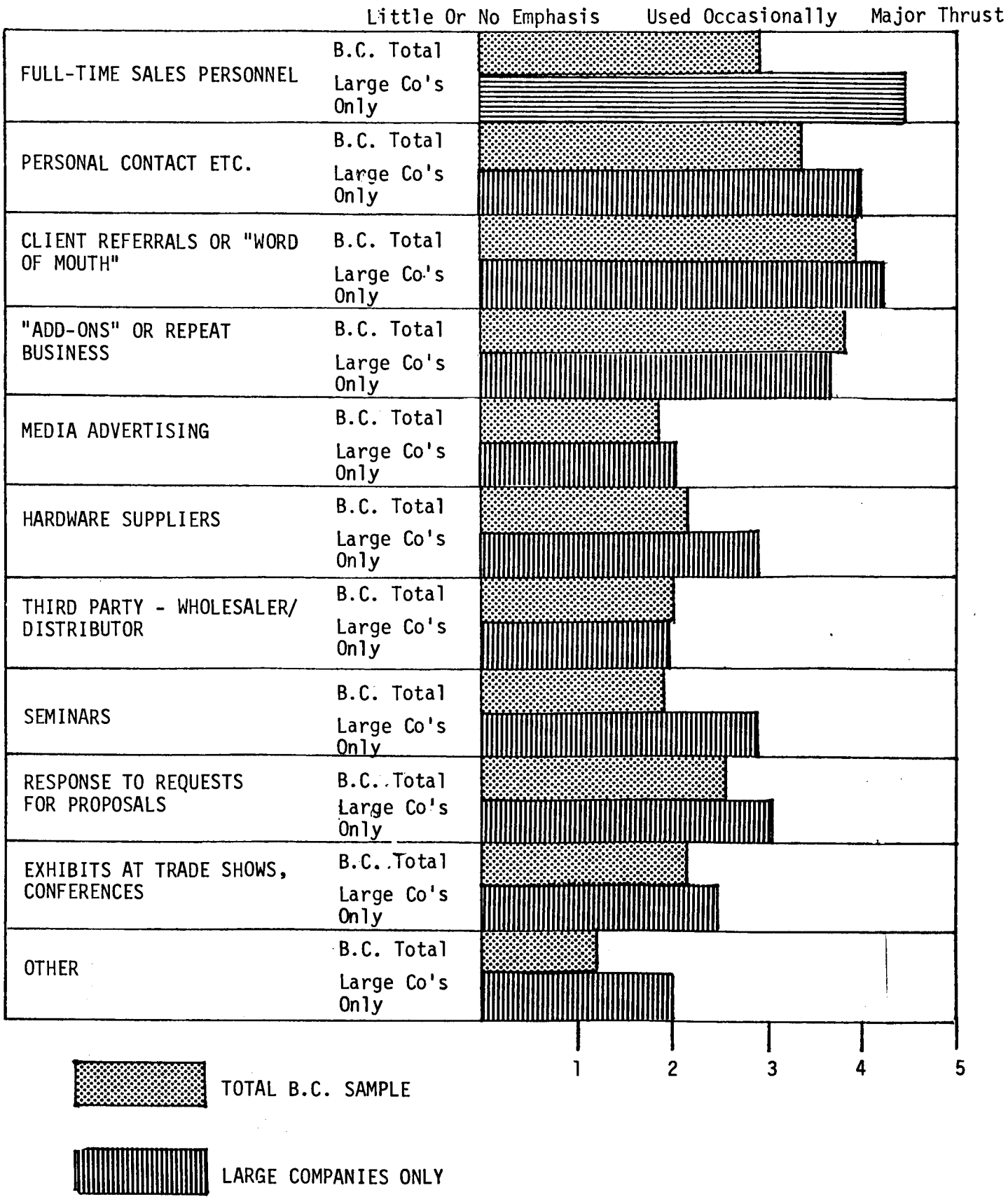
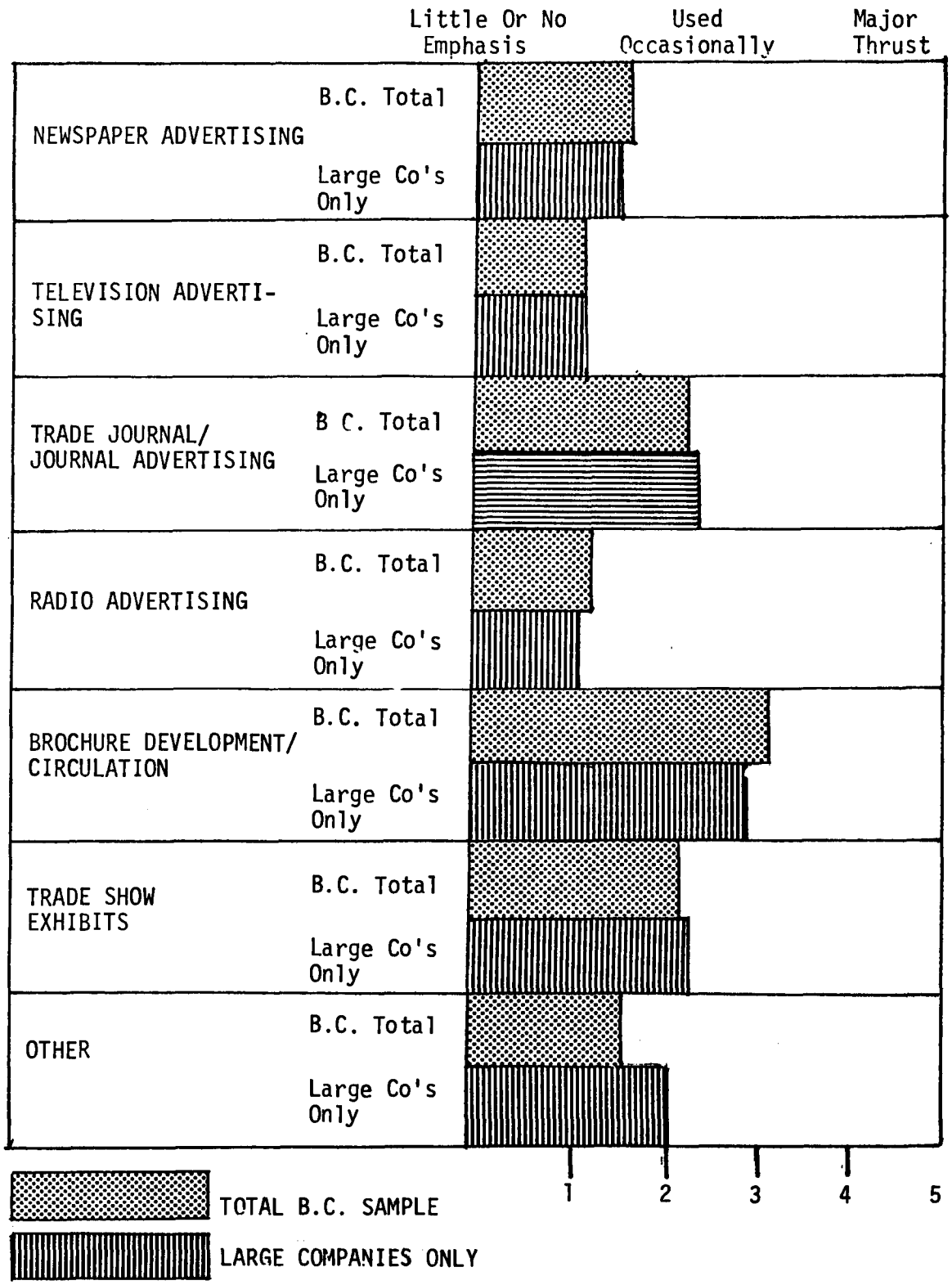


Figure 14

RELATIVE IMPORTANCE OF ADVERTISING MEDIA USED

TOTAL SAMPLE VS LARGE COMPANIES



## 4.6 ALLOCATION OF DEVELOPMENT EFFORTS

Amongst the larger companies in the sample, efforts spent on new packages were reported as approximately equal to efforts spent in modification to existing packages. The smaller firms tend to spend much less time proportionately on modifications to existing packages. This is to be expected since the larger companies have a larger inventory of already developed products with which to work.

A review of the listing of packages which have been developed by responding firms indicates that B.C. suppliers, whether for strategic reasons or otherwise, are tending to concentrate on packages for vertical markets and on some of the more common horizontal markets such as accounting, inventory management, payroll, etc. This allocation of emphasis appears to be consistent with the opportunities available in the market place.

There are, however, relatively few examples of B.C. commercial successes. Our interviews suggest that in most cases, this is more a marketing problem than one of technical inferiority or inappropriate product development strategy. While no evaluation of software firms was carried out, we were most impressed with the apparent quality of the people in the industry and the attitudes and concerns shown for technical excellence and customer service. As with so many other issues discussed in this report, the key problems seem to be primarily in the areas of financial resources, marketing orientation, marketing know-how, and marketing channels.

## 4.7 GROWTH AND FINANCING OF GROWTH

Responding B.C. software suppliers expect growth in the next five years to be considerably greater than that experienced in the recent past. Almost 60 percent expect a growth rate in excess of 35 percent per year. (See Figure 15.) Since this is approximately equal to projections of software markets generally, it means that B.C. companies are expecting a larger share of the market. In light of the constraints which exist and the weak competitive position of B.C. suppliers in the prime software markets, these expectations appear unrealistic. Our impression is that many of the B.C. firms, particularly the smaller ones which form the large majority, have not analyzed the realities of their situation thoroughly and have not developed specific strategies and plans for achieving this growth. We see a need for much more strategic thinking, and even for management training to develop strategic management competency.

Figure 15

COMPANIES' AMBITIOUSNESS FOR GROWTH

IN SOFTWARE REVENUES IN NEXT 5 YEARS

| | PERCENTAGE OF TOTAL B.C. RESPONSES | PERCENTAGE OF LARGE COMPANY RESPONSES ONLY |
|---|---|---|
| Very Rapid Growth Anticipated (over 60%/yr) | 27 | 17 |
| Rapid Growth Anticipated (35-59%/year) | 32 | 17 |
| Moderate Growth Anticipated (14-34%/year) | 26 | 33 |
| Slow Growth Anticipated (1-14%/year) | 11 | 33 |
| No Growth Anticipated | 3 | - |
| Decrease in Size Anticipated | 1 | - |

With respect to financial constraints being a limiting factor with regard to future growth, over 80 percent of respondents felt severely or moderately constrained by lack of financial resources. (See Figure 16.) Of these, 23 percent felt severely constrained. None of the large companies saw availability of financial resources as a severe constraint.

Our impression is that, notwithstanding the large percentage of respondents feeling financially constrained, many companies are underestimating the financial aspects of forward planning. The market place is moving rapidly in the direction of powerful packages requiring large financial investment in both product development and marketing. Estimates of marketing investment required to launch a new software product successfully for North America-wide distribution are in the range of $500,000 to $2,000,000. The survey responses respecting future financing do not appear to anticipate this magnitude of investment.

Figure 17 illustrates the sources of funding now being utilized by survey respondents. Most are relying on bank borrowing or on financing by proprietors and partners. In line with the above comments regarding the magnitude of future investment requirements, there will be a need for expanded efforts to obtain funding from other sources.

Considering all of the information related to B.C. software companies, in combination with the trends towards powerful software packages, it seems logical to suggest that the B.C. software industry may be overpopulated. While this conclusion is exactly opposite to the current prevailing attitudes in the industry, it is one which we see as deserving serious attention from government officials responsible for influencing policies or programs relative to this industry. If, in fact, the technological trends will result in software buying decisions becoming less dependent on proximity to the software developer, the B.C. market will become more vulnerable to external competition. In order to survive, let alone prosper under these circumstances, B.C. software suppliers will not only have to be competitive technically, but will need to address other markets more aggressively and will need to find solutions on how to penetrate them. The data obtained in this survey suggest that not much real progress has yet been made in this regard.

Many of the opinions gleaned in our interviews and literature search during the study suggest that for many small young companies with limited financial and marketing resources, it could be too late already.

## PERCEIVED FINANCIAL CONSTRAINTS ON FUTURE GROWTH

| | TOTAL SAMPLE | | B.C. BASED COMPANIES | | LARGE COMPANIES ONLY | |
|---|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | Number | Percent |
| Financing perceived as a severe constraint on future growth | 17 | 23 | 16 | 34 | 0 | 0 |
| Financing perceived as a moderate constraint on future growth | 42 | 58 | 24 | 51 | 2 | 40 |
| Financing not perceived as a significant constraint on future growth | 14 | 19 | 7 | 15 | 3 | 60 |
| TOTAL | 73 | 100 | 47 | 100 | 5 | 100 |

Figure 16

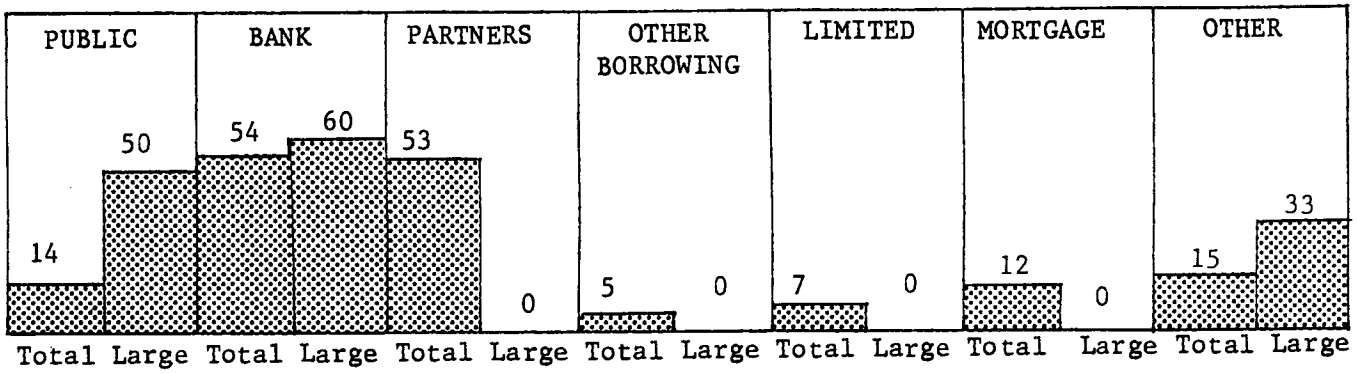
## CURRENT SOURCES OF FUNDING USED BY SURVEY RESPONDENTS

Number of Respondents

| | TOTAL | | LARGE CO'S ONLY | |
|---|---|---|---|---|
| | Number | Percentage | Number | Percentage |
| Public Stock | 10 | 14% | 3 | 50% |
| Bank Borrowing | 40 | 54% | 4 | 60% |
| Borrowing from Proprietor or Partners | 39 | 53% | 0 | 0 |
| Other Borrowing | 4 | 5% | 0 | 0 |
| Limited Partnership | 5 | 7% | 0 | 0 |
| Chattel or other mortgaging | 9 | 12% | 0 | 0 |
| Other | 11 | 15% | 2 | 33% |

Figure 17

EXPRESSED IN PERCENTAGE



# V. B.C. SOFTWARE SUPPLIER ADVANTAGES, DISADVANTAGES, FUTURE POTENTIAL

## 5.1 INTRODUCTION

Our analysis of data collected during the study indicates that, in spite of the spectacular opportunities available, conditions will need to change considerably if the average B.C. software company is to enjoy any significant share of them. The industry in this province does not appear to be ready to compete in the software markets as they are now taking shape. In fact, many B.C. suppliers may well find themselves in the category of:

- "Companies which thought they could make a living that way, (but) find they have to look for something else." (Canadian Data Systems Magazine, May, 1983).

This section will address, in general, the advantages and disadvantages of B.C. suppliers which will impact on their ability to compete in this rapidly expanding but difficult and intensively competitive business.

The development of a listing of advantages and disadvantages which is equally applicable to many different sizes and types of software companies, is impossible. Thus, in order to make this section of the report as useful and meaningful as possible, we have chosen to develop the listings primarily within the context of the median-range of suppliers responding to our survey. However, some of the factors are also quite applicable to the 6 large companies in the sample and to many of the 1 or 2 person cottage industry type companies. The listings below are not intended to be presented in order of importance.

## 5.2 PERCEIVED ADVANTAGES OF B.C. COMPANIES OVER COMPETITORS IN OTHER AREAS

- Attractiveness of Living Environment

  The attractive living environment and climate of B.C. provide an edge over many areas of Canada in terms of ability to attract talented personnel. It could be argued, however, that in light of B.C. companies' small size and weak competitive position, this advantage may well be offset by better career opportunities for talented professionals offered by other areas with greater dominance in the software business.

- Promixity to Some Potential Sources of Product Testing and Product Development Opportunities

  B.C.'s large forest products base and world class engineering companies could represent opportunities which are not readily available in many other areas for development and testing of new products.

- High Quality Technical College Training

  The British Columbia Institute of Technology was mentioned by a number of industry representatives as an excellent source of quality specialized personnel.

This is a startlingly short and rather low-potency listing of competitive advantages, and will undoubtedly be challenged by some readers of this report. It should be kept in mind however, that the list has been restricted to tangible factors which might represent a competitive edge for B.C. companies in general over a majority of areas producing software. There have been and will be in future, B.C. companies who succeed because of unique individual strengths.

## 5.3 PERCEIVED DISADVANTAGES B.C. COMPANIES COMPARED TO COMPANIES IN OTHER AREAS

In many respects, the list of disadvantages is more important than the list of advantages. It is this listing that identifies areas which need to be addressed by private and public sector organizations and individuals in a position to have an impact on B.C.'s future in this industry. The items which we considered to be of significant importance on the basis of our analysis of data and personal opinion are as follows:

- Weak Current Competitive Position and Resources Base

  The B.C. industry profile, as defined by our survey responses, appears weak when considered in light of market trends and the nature of competition. Very few B.C. companies are in a position to make the size of investment required to ensure the success of their products in the market place. Examples can be cited of individuals or small groups starting with very limited resources and achieving spectacular success on the basis of creative, innovative products. This will continue to happen in the future but, as in the past, will represent only one out of every several hundred products developed by such hopeful innovators. Consequently, such possibilities cannot represent a significant strategic factor unless a mechanism can be developed for early accurate identification of prospective market successes for encouragement and assistance.

British Columbia's paucity of firms with resources to compete powerfully in the markets of the eighties and beyond is a fairly urgent issue. If catch-up is to be even partially achieved, time will be a crucial factor. Some would argue it may already be too late for many.

- Distance from Major Markets

It is often argued that software development firms can be based anywhere and still succeed. This is more valid for large established firms with strong marketing resources than it is for the typical B.C. software supplier. For small firms with inadequate funds to obtain effective distribution of their product, distance from major markets is a significant disadvantage.

- Distance from Resources for Development of Products for Major Vertical Market Opportunities

Other areas of North America have the advantage of proximity to a variety of major industries with whom software firms can conveniently work to develop and test new products. B.C. suppliers have access to only a few, such as forestry, engineering, education and service industries. This limits the range of probable successes, particularly in vertical markets, until such time as other key new industries locate in the province or more B.C. based software companies are large enough to establish branch operations in major centres.

- Relatively Low Concern for Expansion

Desire for bigness appears to have a relatively lower value for many B.C. software suppliers than for many American and Eastern Canadian counterparts. Many of the people in the industry in B.C. place a high value on the quality of life they enjoy and the opportunity for hands-on involvement in their chosen profession. These individuals see bigness and geographic expansion as at variance with their personal goals and values. This need not be a serious problem for those able to prosper on local markets which require high levels of service and proximity to the customer such as custom software development. For B.C. suppliers endeavouring to compete, however, against large powerful competitors, this is likely to range from difficult to impossible under current conditions.

- Low Marketing Orientation, Inadequate Marketing Expertise

As is the case with small software companies everywhere, the primary orientation of many B.C. software suppliers is technical, rather than marketing. Almost all of the managers of these companies are technical specialists. Many are also heavily involved in administrative aspects of the business. Thus, it is not surprising that little time is left for development of marketing skills or for adequate attention to marketing activities. This is, of course, not true for the large companies which can afford senior level marketing talent and who employ full time sales and marketing staffs.

- Low Access to Government Business

The British Columbia Systems Corporation (BCSC) has been the primary supplier of software to the provincial government departments. Thus, B.C. software developers have had little access to the provincial government as a major potential source of product development and product testing opportunities. In addition, few B.C. suppliers have obtained significant revenues from federal government departments.

The perception of the majority of suppliers interviewed during the study was that the policies and practices of BCSC have been a major constraint to the development of the industry. Very likely if the industry in B.C. had substantial other competitive advantages, this lack of opportunity for government business would not be considered nearly as important by industry members.

- Distance from Major Centres of Hardware and Technical Development

The remoteness from hardware manufacturers has meant that B.C. software suppliers have obtained a very meager share of the systems software market. They are in a weaker position than some other geographic areas with respect to software revenues which depend directly or indirectly on proximity to hardware suppliers and large centres of technological development activity.

. Financing Difficulties

Financial resource limitations are a major constraint on the ability of B.C. suppliers to compete in the larger markets against ever increasingly sophisticated and powerful competition. Many suppliers appear to see this as a matter of lack of risk-taking orientation and lack of appreciation of the software industry's potential on the part of possible investors and lenders. Even if this is the case, it seems unrealistic to view it as the total financial problem. Software has some unique disadvantages and risks compared to other investment options, such as the possibility of rapid obsolescence, uncertainty about product development, lack of tangible assets, etc. Thus, it is reasonable to expect that the software supplier, with either highly marketable products or the capacity to develop them, has a responsibility to demonstrate clearly to the investor or lender that the risk to his money is not excessive.

## 5.4 THE B.C. INDUSTRY'S CURRENT POSITION SUMMARIZED

The salient elements of the current situation in which the software industry in British Columbia finds itself, as revealed by our analysis, are as follows:

. Markets

Local markets are likely to be increasingly vulnerable to penetration by external suppliers. Geographic boundaries will become increasingly less significant with respect to software buying practices. Overall markets are expanding rapidly and prospects are excellent for strong competitors. The nature of these markets is changing in directions which are likely to favour large powerful companies. Some experts forecast domination by a few "world-class companies, with only crumbs left for the rest".

. Competitive Potency

B.C. appears to have very few firms with the resources required to develop into "world-class" companies in the near future. Most are too small to mount strong marketing efforts and are constrained by limited financial resources. So far, B.C. suppliers have obtained most of their revenues from local clients and have had very little success outside the province. Most are short of the kind of marketing expertise and resources required to change this situation dramatically. Awareness of the possibility of slow growth or possible business failure appears to be low. Growth expectations of companies responding to the survey are much higher than market forecasts.

- Investor Confidence

  Examples of investor confidence and willingness to invest substantial sums in B.C. software companies are few. Technical and financial resources are not yet combining in a manner which will facilitate the growth and development of the software industry in B.C.

In summary, B.C. software suppliers in general, are not in a good position to take advantage of the spectacular growth of markets expected in the 1980's. This conclusion is exactly opposite to the prevailing attitudes in the industry, in spite of the fact that most of those interviewed during the study acknowledge that the specific problems and constraints do exist.

## VI. FUTURE DIRECTION, REQUIREMENTS FOR CHANGE

The foregoing sections of the report have postulated a somewhat pessimistic outlook for B.C. software suppliers under present circumstances. While changing some of these circumstances may be difficult, it should not be considered impossible. There are a number of ways of making changes to improve the chances for future success of companies in the industry in B.C. Before addressing these changes, it may be useful to start with a summarization of the situation facing the typical software company as represented by the survey sample.

The typical B.C. software supplier:

- is managed by a proprietor or small group of partners whose backgrounds and interests are primarily technical;
- lacks the marketing knowledge and expertise required to compete strongly in the package-oriented markets of the 80's;
- lacks the manpower resources required to carry out effective marketing programs;
- at least until recently, has not perceived marketing as a particularly important issue;
- does not have sufficient finances or borrowing power to invest heavily either in extensive product development or in marketing;
- has inadequate understanding of how to prepare and present a business plan which will influence prospective sources of funds for product and marketing development;
- often invests time in developing products which are similar to others already developed which have competitive advantages;
- emphasizes <u>doing</u> functions, often to the exclusion of <u>managing</u> functions.

Thus, for B.C. suppliers to participate successfully in the dramatic expansion of the software industry, the major directions of change required are as follows:

- increased marketing orientation and marketing competencies;
- larger investments in development and marketing of products which will have unique appeals to potential customers;
- increased investor confidence, and software suppliers' ability to influence this confidence;

- higher concern for, and emphasis on, forward planning and on management of the business.

Effective changes in these directions are unlikely to result simply from increased efforts by each individual software company. There is a need for a more powerful, broader scale program which involves co-operative efforts of both industry and government bodies. While it is not within the scope of this project to suggest who should take responsibility for doing what, the following list of possible actions is offered as a basis for further discussion and planning.

- Development of an Industry Marketing Association

  To alleviate the problem of scarce marketing resources and expertise, consideration might be given to the formation of a marketing organization jointly owned by members of the industry. Such an agency could employ marketing resources not affordable by individual companies. There are examples of this approach being used in other industries, and there are no obvious reasons why it could not be applied here. The details of how such an organization would work, however, are fairly complex and would require considerable attention. Since addressing these details will take time, and since the situation is urgent, we suggest that it is important to reach a decision on the desirability of such an option as soon as possible.

- Rationalization of the Industry Through Mergers

  This option is not so readily amenable to deliberate planning on an industry basis. Rather, it could be something which happens as small companies with strong technical talents run into financial difficulties and are acquired by larger companies with strong marketing and financial capabilities. This is not an option which appeals to many B.C. suppliers at present. Most of them prefer the opportunity for creativity, flexibility, and high levels of motivation, more characteristic of small entrepreneurial organizations than of large companies.

  This is the direction in which the industry is likely to move naturally if deliberate efforts are not initiated to make other options viable.

- Networking

  One method of small companies solving the problem of scarce resources and access to markets is to work through loosely affiliated networks. This is happening informally now in a fairly small way. Some software developers have made fairly informal agreements to help promote each other's products. This could be carried further to include co-operation with product development and provision of support services in distant locations.

While the networking option has possibilities, it is likely to represent only a partial solution. It is difficult to maintain over time and will not provide the strong marketing expertise and concentrated thrust that is possible through more formally structured options.

- Organization of Industry-Wide Training Activities

The Software Industry Development Association (SIDA) has initiated some activity in this direction. This needs to be further encouraged and/or expanded. The primary areas suggested by the results of this study are: marketing in general, marketing channels, business planning, and management of developmental-type organizations.

- Increased Trade Show and Trade Mission Activity

The senior levels of government currently undertake considerable activity in this regard. This could be expanded by government, or by co-operative efforts of industry members.

- Collection and Dissemination of Information on Products and Market Developments

The main purpose of this service would be to help industry members make better informed decisions on how much to risk investing in specific product areas, thus minimizing wasted effort and unnecessarily early product obsolescence.

- Provision of a Software Library of Canadian Software Products for Potential Users

This service would make it easy for software buyers to obtain useful information on Canadian products, resulting in more frequent selection of these than at present.

- Financial Assistance to Software Users for Product Development

This would apply primarily to software applications for vertical markets. There will be many software applications that organizations would like to have but for which they cannot afford the development cost. Possibly, government could take responsibility for facilitating the development of specific products which could be subsequently marketed to other users in the same industry.

- Increased Purchase of B.C. Software by the Provincial Government

This could be a way for the provincial government to assist B.C. suppliers to develop packages marketable elsewhere while meeting legitimate government needs for systems development.

- Grants or Loans for Product Developers

  It is our understanding that financial assistance for software development is available under certain conditions under current federal and provincial assistance programs. Further expansion of grants programs could pose considerable difficulty in terms of deciding on which products are eligible.

- Special Encouragement of Computer Manufacturing or Research Facilities Location in B.C.

  As indicated in an earlier section of the report, B.C. suppliers have very little access to software business which is dependent on proximity to computer manufacturers or other companies involved in related high technology development.

This study has shown an urgent need for actions to be taken if B.C. software suppliers are to share in the growth of this industry. What is required now is the establishment of an organizational mechanism to address the issues raised and to initiate appropriate action. To be maximally effective, this will need to be a joint public/private sector effort.

# APPENDIX A

# INDUSTRY SURVEY QUESTIONNAIRE

# B.C. SOFTWARE INDUSTRY SURVEY

Company _____ Telephone _____

Please place a check (✓) in the box that best describes the primary business of your company

- Software development ☐
- Turnkey systems ☐
- Computer hardware ☐
- Service bureau ☐
- Other _____ (Please Specify)

Reference date (month and year of most recent fiscal year for which figures are available for questionnaire completion).

_____

Name and position of person completing this questionnaire. _____

1. Please place a check (✓) in the box that best describes your firm.

   ☐ The company's Head Office is in B.C. and all branch offices, if any, are located in B.C.

   ☐ The company's Head Office is in B.C. and it has at least one branch office located outside of B.C.

   ☐ The company's Head Office is located outside of B.C. but the firm has one or more branch offices in B.C.

2. In the space provided, please indicate how many people you employ in B.C. in occupations related to software development, maintenance, marketing or administrative support. In the case of individuals whose time may be divided between software and other activities, include only those who spend 50% or more of their time on software related activities.

| | Present | Estimated 1986 |
|---|---|---|
| a) Total software-related employees | _____ | _____ |
| b) Software technical staff | _____ | _____ |
| c) Marketing and sales | _____ | _____ |
| d) Management/administration | _____ | _____ |
| e) Other _____ (Please Specify) | _____ | _____ |

3. Please place a check (✓) in the box which best describes how your current employment level compares with your 1980 level.

| ☐ | ☐ | ☐ | ☐ | ☐ |
|---|---|---|---|---|
| Substantially increased since 1980 (Over 50%) | Somewhat increased since 1980 (10% to 50%) | About the same (± 10%) | Somewhat decreased since 1980 (10 - 50%) | Substantially decreased since 1980 (More than 50%) |

4. Please indicate the number of years your company has been involved in software by placing a check (✓) in the appropriate box.

| Less Than 2 Yrs. | 2 - 5 Yrs. | 5 - 10 Yrs. | Over 10 Yrs. |
|---|---|---|---|
| ☐ | ☐ | ☐ | ☐ |

5a. What software revenues were obtained by your B.C. based software operations in your most recent fiscal year? Include all software revenue obtained by B.C. operations regardless of client location. (Reminder - this information will be used only in groupings which will maintain anonymity of individual company data.)

Revenue in thousands of dollars: $ _____ Thousands

5b. Does the above revenue figure include either income from sale of packages developed outside of B.C. or fees for time involvement of non-B.C. personnel? Please check (✓) the appropriate box.

☐ Yes ☐ No

6a. Please indicate where the approximate percentage of your B.C. software revenues in the most recent fiscal year were derived from the following service categories.

. Systems software _____ %
  eg. Operating systems, Language processors, DBMS, Report generators, etc.

. Application software packages _____ %
  eg. Accounting, payroll, sales, etc.

. Custom software development _____ %

. Other _____ _____ %
  Please Specify

TOTAL 100%

6b. If any of the above revenues were related only to provision of software personnel for client-managed projects, what percentages do you estimate this represented?

_____ %

6c. What changes, if any, do you anticipate in the relative importance of the service categories listed in 6a. above in the next five years?

_____

_____

7a. Please indicate the approximate percentage of your B.C. Software Revenues for the most recent fiscal year derived from services related to the following classifications of hardware:

. Mainframe _____ %

. Minicomputer (Including 32 Bit Superminis) _____ %

. Microcomputer _____ %

TOTAL 100%

_____

_____

8. Please indicate which of the following market sectors have represented your most important sources of revenue in the last two years by checking (✓) up to three boxes.

| | | | |
|---|---|---|---|
| . Agriculture | ☐ | . Wholesale, Trade | ☐ |
| . Forestry | ☐ | . Retail, Trade | ☐ |
| . Health Care | ☐ | . Finance, Insurance & Real Estate | ☐ |
| . Mining | ☐ | . Education - Teaching Purposes | ☐ |
| . Manufacturing | ☐ | . Education - Other Purposes | ☐ |
| . Construction | ☐ | . Community & Personal Services | ☐ |
| | | . Government | ☐ |
| . Transportation, Communication & Other Utilities | ☐ | . Home Computer Market | ☐ |

. Other _____
  Please Specify

8b. What changes, if any, do you expect to see in the relative importance to you of these various industry sectors over the next five years?

_____

_____

9a. Please indicate, in the space provided, the approximate percentage of your B.C. Software Revenues derived from each of the following geographical areas.

| | | |
|---|---|---|
| B.C. | _____ | % |
| Prairies, N.W.T., Yukon | _____ | % |
| Eastern Canada | _____ | % |
| Washington, Oregon, California, Alaska | _____ | % |
| Rest of U.S.A. | _____ | % |
| Outside North America | _____ | % |
| TOTAL | 100% | |

9b. Which, if any, of the above non-B.C. markets do you consider will be most important to your company in the next five years?

_____

_____

10a. Please indicate by circling the appropriate number on the continuum below, your opinion of the relative importance of the various marketing methods and channels used by your company in generating your B.C. software revenues.

| Marketing Method Or Channel | Little Or No Importance | | | | Major Importance |
|---|---|---|---|---|---|
| . Full-time sales personnel | 1 | 2 | 3 | 4 | 5 |
| . Personal contact/sales calls by management/technical personnel | 1 | 2 | 3 | 4 | 5 |
| . Client referrals or "word of mouth" | 1 | 2 | 3 | 4 | 5 |
| . "Add-on" or repeat business with present or previous clients | 1 | 2 | 3 | 4 | 5 |
| . Media advertising | 1 | 2 | 3 | 4 | 5 |
| . Hardware suppliers | 1 | 2 | 3 | 4 | 5 |
| . Third party - wholesaler, distributor | 1 | 2 | 3 | 4 | 5 |
| . Seminars | 1 | 2 | 3 | 4 | 5 |
| . Response to requests for proposals | 1 | 2 | 3 | 4 | 5 |
| . Exhibits at trade shows, conferences | 1 | 2 | 3 | 4 | 5 |
| . Other (Specify) _____ | 1 | 2 | 3 | 4 | 5 |

10b. If you advertise software services, what percentage of revenue in your most recent fiscal year was expended on advertising? Include product related advertising, general media advertising and trade show exhibits.

_____ %

10c. If you advertise your services, please indicate the relative emphasis on the various media listed below by circling the appropriate number on the continuum below.

| Medium | Little Or No Emphasis | | Used Occasionally | | Major Advertising Thrust |
|---|---|---|---|---|---|
| . Newspaper advertising | 1 | 2 | 3 | 4 | 5 |
| . Television advertising | 1 | 2 | 3 | 4 | 5 |
| . Trade journal or other journal advertising | 1 | 2 | 3 | 4 | 5 |
| . Radio advertising | 1 | 2 | 3 | 4 | 5 |
| . Brochure development/circulation | 1 | 2 | 3 | 4 | 5 |
| . Trade show exhibits | 1 | 2 | 3 | 4 | 5 |
| . Other (Please Specify) _____ | 1 | 2 | 3 | 4 | 5 |

10d. What changes, if any, do you anticipate that your company will be making in your approaches marketing your software services in the next three years? Consider all items listed in question 10 a, b and c, above.

_____

_____

_____

_____

11a. If your company is engaged in new software product development (excluding custom software), please indicate in the spaces provided, the approximate portion of your efforts/expenditures allocated to:

(i) Development of new software packages _____ %

(ii) Modification of packages _____ %

(iii) Enhancing previously released products (for re-release) _____ %

11b. What changes, if any, do you foresee in these percentages over the next five years?

_____

_____

12a. Please indicate by circling the appropriate number on the continuum below, your current balance of emphasis between custom software development and development of new software packages.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Exclusive focus custom software development | Custom software the major thrust; some package development | 50 - 50 balance of emphasis | Packages the major thrust; some custom software development | Exclusive focus on software packages |

12b. Please indicate by circling the appropriate number on the continuum below the balance of custom/package emphasis you expect in your company by 1986?

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Exclusive focus custom software development | Custom software the major thrust; some package development | 50 - 50 balance of emphasis | Packages the major thrust; some custom software development | Exclusive focus on software packages |

13a. Please indicate by placing a check (✓) in the appropriate box your estimate of your company's ambitiousness for growth in software revenues in the next five years (real growth in constant dollars).

| | | |
|---|---|---|
| Very Rapid Growth Anticipated | (Over 60%/year) | ☐ |
| Rapid Growth Anticipated | (35 - 60%/year) | ☐ |
| Moderate Growth Anticipated | (14 - 34%/year) | ☐ |
| Slow Growth Anticipated | ( 1 - 14%/year) | ☐ |
| No Growth Anticipated | | ☐ |
| Decrease In Size Anticipated | | ☐ |

13b. What source or sources of financing does your company currently utilize?

- Public stock ☐
- Bank borrowing ☐
- Borrowing from proprietor or partners ☐
- Other borrowing ☐
- Limited partnership ☐
- Chattel or other mortgaging ☐
- Other ☐

13c. To what extent do you believe your company's growth ambitiousness or capability for expansion in the next five years is likely to be constrained by financial resources?

1. Severe Constraint - Financing required for maximum desired growth unlikely to be available. ☐
2. Moderate Constraint - Financing required for maximum desired growth likely to be available but with some difficulty or financial strain. ☐
3. No Significant Constraint - Maximum desired expansion likely to be possible with no significant difficulty or taxing of financial resources. ☐

14a. What do you see to be the major growth opportunities for companies such as yours over the next three to five years?

14b. What do you see to be the most important factors which may limit your company's ability to take maximum advantage of future growth opportunities?

15. Do you have any other comments relative to any aspect of the software incustry which you would like to make?

16. Please list and describe any software packages your firm has developed which have been sold to more than one client.

| Package | Purpose/Description |
| --- | --- |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

# APPENDIX B

## NON-QUANTITATIVE SURVEY RESPONSES

B.C. SOFTWARE INDUSTRY STUDY

ANALYSIS OF SURVEY QUESTIONNAIRES - NON-QUANTITATIVE RESPONSES

## Major Growth Opportunities Question 14a

What do you see to be the major growth opportunities for companies such as yours over the next three to five years?

| | # of Responses |
|---|---|
| Vertical markets | 22 |
| Microcomputer application packages | 15 |
| Quality packaged software | 11 |
| Turnkey systems | 7 |
| Home market | 5 |
| Linking micros to mainframes (LAN) | 5 |
| Dealer networks | 5 |
| Program generators | 4 |
| Process control/robotics | 4 |
| Software packages for small business | 4 |
| Minicomputer packages | 4 |
| EDP related training | 4 |
| Computer assisted learning | 3 |
| Education | 3 |
| Increased government use of outside contractors | 3 |
| Office automation | 3 |
| Decreased hardware costs increasing demand | 3 |
| Custom development | 3 |
| Consulting | 2 |
| Hardware-independent software | 2 |
| Joint ventures with hardware manufacturers and users | 2 |
| Third party distributors | 2 |
| Turnaround in forestry and mining industry | 2 |
| "Limitless" | 2 |
| Retail sales | 1 |

B.C. SOFTWARE INDUSTRY STUDY

ANALYSIS OF SURVEY QUESTIONNAIRES - NON-QUANTITATIVE RESPONSES

Major Growth Opportunities Question 14a (Cont'd)

| | # of Responses |
|---|---|
| Business graphics | 1 |
| IBM compatible systems software | 1 |
| Industry software improvement consulting | 1 |
| Manufacturing | 1 |
| The service sector | 1 |
| Canadian wholesale software distribution network | 1 |
| Expanding industry acceptance of computers | 1 |
| Hardware-specific expertise and packages | 1 |
| Sale of packaged software under licence | 1 |

B.C. SOFTWARE INDUSTRY STUDY

ANALYSIS OF SURVEY QUESTIONNAIRES - NON-QUANTITATIVE RESPONSES

## Limiting Factors Question 14b

What do you see to be the most important factors which may limit your company's ability to take maximum advantage of future growth opportunities?

| | # of Responses |
|---|---|
| Inadequate funding | 42 |
| BCSC, Lack of support from B.C. Government | 18 |
| Shortage of qualified personnel | 16 |
| Lack of management expertise | 8 |
| Marketing/distribution channels | 8 |
| Taxation policies (eg: incentives for R&D required) | 8 |
| Technological uncertainty, unpredictability | 7 |
| Economic downturn | 7 |
| Inadequate marketing expertise | 6 |
| Competition | 5 |
| Exclusion of software from R&D government grants | 4 |
| Over-restrictive import/export legislation | 3 |
| Lack of understanding of industry in the public sector | 2 |
| Tax incentives too difficult to apply for (eg: R&D) | 2 |
| Distance from major markets & high tech development centres | 2 |
| Time delays in bringing software to market | 2 |
| Software piracy | 1 |
| Users' unrealistic expectations of micros | 1 |
| Unreliability/maintenance costs of hardware | 1 |
| Need to develop a customer base | 1 |
| Conservative ownership | 1 |
| Internal consultants being used instead of outside firms | 1 |

B.C. SOFTWARE INDUSTRY STUDY

ANALYSIS OF SURVEY QUESTIONNAIRES - NON-QUANTITATIVE RESPONSES

Limiting Factors Question 14b (Cont'd)

| | # of Responses |
|---|---|
| Cost of educating client | 1 |
| Non-availability/cost of computer time | 1 |
| Low revenues mean underpaid proprietor | 1 |
| Lack of industrial strategy at provincial or federal government levels | 1 |
| High shipping and brokerage costs to the U.S. | 1 |
| WATTS line too expensive | 1 |
| Size of vertical market | 1 |
| Small, fragmented B.C. market | 1 |
| Protectionism curbing ability to do business in international markets | 1 |

B.C. SOFTWARE INDUSTRY STUDY

ANALYSIS OF SURVEY QUESTIONNAIRES - NON-QUANTITATIVE RESPONSES

## Other Comments Question 15

Do you have any other comments relative to any aspect of the software industry which you would like to make.

"Government grants are not a motivating factor."

"Keep government out of the private sector."

"The industry does not need government support to assist in marketing/development of software. The good products will succeed on their own."

"The government should keep out of the software industry except ... by allowing substantial write-offs and reducing red tape."

"If politicans were made aware of the potential revenues for this province which can be realized from a healthy software industry, major changes could be made in policies and procedures to permit the optimum growth of the industry."

"Unfortunately most of the 'good' people are not good businessmen and don't have a clue how to start a software development company or how to finance one. A course outlining this ... should be required of every computing graduate."

"An educational program is required for government and investors [to familiarize them with the industry]."

"B.C. Government agencies [should] promote software products developed in B.C."

Other Comments Question 15 (Cont'd)

"Some export assistance in making contact and even financial assistance to large buyers (as in other industries) is initially desirable."

"Canada lacks marketing expertise in international markets."

"Excellent existing and future capability in B.C. to satisfy B.C. needs and develop export markets."

"This is one industry where B.C. could really make a contribution ... the industry needs a nucleus to form around."

"The software industry in B.C. is small and fragmented."

"A hardware manufacturer is needed (in B.C.) to support the software industry."

"The proposed Dynatech organization would have made a tremendous difference ... because there would have been a continuous turnover in technical staffs as happened in Ottawa, Silicon Valley North. One large organization is needed as a critical mass."

"It is difficult for traditionally service firms to sell to mass markets."

"The industry needs to ... provide better methods for marketing and distribution for 'one man shows'."

"Extremely difficulty to find a distributor for Canadian software."

Other Comments Question 15 (Cont'd)

"The proposed changes of the April '83 Federal Budget relating to tax credits for R&D applying to high tech companies will have a significant beneficial affect on the Canadian computer software industry. Similar real incentives given by the Government of B.C. would be an additional help to the industry in B.C."

"Current B.C. Securities Act legislation is very restrictive."

"Current legislation provides inadequate incentives for software developers."

"It is difficult to obtain user confidence, many users feel that the company is too small and may disappear ... a 'software bank' [should be set up] where copies of source could be field on behalf of users, but kept unavailable while the company was still active, thus protecting both the user and the company."

"... would like to see recognition and support of the cottage industry aspect of software development, using a network of resource agencies and people."

"Public image is deteriorating as the personal market and those selling in that area take on 'used car salesman' attitudes."

"Small startup companies ... often employ no one for the first couple of years while principals earn salaries elsewhere and engage in unpaid 'midnight programming'."

"... the micro industry is such a fast paced new industry, three to five year estimates are not going to be realistic. The market is just now being established."

Other Comments Question 15 (Cont'd)

"... the [mini] software industry is very economy dependent."

Future Developments

"- increased emphasis on system 'friendliness' and self teach programs for new users;
- enhanced features such as touch screen, voice communication, presentation graphics;
- local area networking will create a boom for micros in the office environment at the expense of minis;
- interlinked LAN's over long distances;
- portables with plasma displays, micro disks, video disks."

"- making good use of technology for business, eg: a 158 [mainframe] chip in the telephone;
- robots with large information storage and increased capabilities;
- mini computers will disappear."

B.C. SOFTWARE INDUSTRY STUDY

ANALYSIS OF SURVEY QUESTIONNAIRES - NON-QUANTITATIVE RESPONSES

## Type of Software Packages Sold Question 16

Please list and describe any software packages your firm has developed which have been sold to more than one client.

| Vertical Markets | # of Responses |
|---|---|
| - professionals (doctors, lawyers, etc.) | 8 |
| - real estate, property management | 7 |
| - forest products | 5 |
| - wholesale distribution | 5 |
| - school district administration | 4 |
| - manufacturing | 4 |
| - municipal government | 3 |
| - banking, finance | 3 |
| - retail, point of sale | 3 |
| - transportation | 2 |
| - auto dealership | 2 |
| - hospital | 2 |
| - restaurant | 2 |
| - pharmacy | 2 |
| - hotel/resorts | 2 |
| - insurance agency | 2 |
| - club membership | 1 |
| - geology | 1 |
| - welding | 1 |
| - library | 1 |
| - mining | 1 |
| - petroleum | 1 |
| - hospital | 1 |

B.C. SOFTWARE INDUSTRY STUDY

ANALYSIS OF SURVEY QUESTIONNAIRES - NON-QUANTITATIVE RESPONSES

Type of Software Packages Sold Question 16 (Cont'd)

| | # of Responses |
|---|---|
| - social services | 1 |
| TOTAL | 64 |
| | |
| Accounting | 24 |
| Inventory Management | 10 |
| Payroll | 8 |
| Data base management | 6 |
| Word processing | 6 |
| Financial analysis, planning and modelling | 6 |
| Job costing | 5 |
| Graphics | 4 |
| Mailing list management | 4 |
| Project management, critical path | 3 |
| Electronic spreadsheets | 3 |
| Telidon | 2 |
| Scientific, engineering | 2 |
| Systems software | 2 |
| Networking, communications | 2 |
| Personnel management | 2 |
| Program generators, "fourth level" | 2 |
| Statistical analysis | 1 |
| Computer assisted learning | 1 |
| Report generation | 1 |
| Security systems | 1 |

# APPENDIX C

## REFERENCE SOURCES USED

B.C. SOFTWARE INDUSTRY STUDY

References Sources (excepting magazine articles)


- Statistics Canada 63-222 computer service Industry 1981
- Association of Data Processing Service Organizations (ADAPSO) Computer Services Industry, 1982
- Future Computing Inc. Future Views and "Opportunities and Pitfalls" Seminar Notebook, 1983
- International Data Corp. Computer Industry Review and Forecast 1976-1986
- Dunn & Bradstreet, Software Industry Report, 1983
- Evans Research - various reports, 1982 - 1983
- U.S. Department of Commerce; NBS Special Publication 500-79; An Assessment and Forecast of ADP in the Federal Government; August, 1981
- W.L. Frank: (John Wiley & Sons Inc. 1983) Critical Issues in Software
- Interdepartmental Task Force on Transborder Data Flow Report on Software Related Issues; December, 1981
- D.D. Cowan & J.W. Graham; (University of Waterloo; June 1983.) A Study of the Packaged Software Industry in Canada
- B.C.S.C. Research Group: The Desktop Computer, April, 1982
- Culpepper & Associates Inc; Salt 'N' Pepper - A Newsletter for the Computer Software Executive
- University of Maryland; The Software Industry, A State of The Art Survey; May, 1983
- Rosen Research Inc.; The Rosen Electronics Letter
- Association of Computer Users Newsletter

# APPENDIX D

## SOFTWARE USERS' COMMENTS

## SOFTWARE USERS' COMMENTS

The comments of software users have not been included in the body of the report because they consiste more of data useful for individual company marketing than for analysing the total industry problem. They are shown under a number of headings with a ranking shown for each factor. These rankings reflect the number of mentions by software users providing inputs - the higher the number, the greater the importance to the majority of software users. The categories of information collected are as follows:

- Criteria for selecting software suppliers
  - Mainframe, custom
  - Mainframe, packages

- Problems/irritations in dealing with suppliers of mainframe custom software

- Problems/irritations in dealing with software suppliers Mainframe, package

- Future expectations/hopes re software suppliers

- Profile: Dollars spent on systems software

CRITERIA FOR SELECTING SOFTWARE SUPPLIER

MAINFRAME, CUSTOM SOFTWARE

| | RANKING |
|---|---|
| - Application expertise | 18 |
| - Technical capability of specific individual(s) | 16 |
| - Local presence | 15 |
| - Stability | 14 |
| - Project management capability | 13 |
| - Familiarity with in-house hardware and software | 12 |
| - Documentation approach and competency | 12 |
| - Reputation | 11 |
| - Industry experience | 10 |
| - Implementation support | 10 |
| - Price | 10 |
| - Technical expertise of firm | 9 |

## CRITERIA WHEN SELECTING A SOFTWARE SUPPLIER
## MAINFRAME, PACKAGES

| | |
|---|---|
| - Meets requirements | 21 |
| - Operates on specific hardware | 19 |
| - Overall vendor support | 17 |
| - State of the art (how well software has been engineered) | 17 |
| - Level and ease of modification | 16 |
| - References | 12 |
| - Vendor stability | 10 |
| - Ease of installation | 10 |
| - Local support | 10 |
| - Vendor experience | 9 |
| - Best price | 8 |
| - Local sales presence | 4 |
| - Compatability with existing software | Dependent upon application |

PROBLEMS/IRRITATIONS IN DEALING WITH SOFTWARE SUPPLIERS
MAINFRAME, CUSTOM SOFTWARE

| | RANKING |
|---|---|
| - Lack of technical competence | 16 |
| - Lack of integrity regarding promises and delivery of services | 14 |
| - Inability to understand and define user needs | 14 |
| - Overruns on time and budget | 13 |
| - Lack of problem-relevant knowledge | 12 |
| - Lack of stability | 11 |
| - Switch in people | 10 |
| - Software too general or too specific | 9 |
| - Lack of local support | 9 |
| - Inadequate maintenance | 9 |

PROBLEMS/IRRITATIONS, IN DEALING WITH SOFTWARE SUPPLIERS - MAINFRAME, SOFTWARE PACKAGES

| | RANKING |
|---|---|
| - Lack of integrity regarding promises and delivery of services | 18 |
| - Inability to understand and define user needs | 17 |
| - Lack of product knowledge on part of support staff | 16 |
| - Poor completeness and lack of clarity in information given | 15 |
| - Lack of support and follow-through regarding software updates | 14 |
| - Lack of local support | 13 |
| - User ignorance of package availability | 11 |
| - Lack of product knowledge on part of salesman | 11 |
| - Packages too general or too specific | 9 |

## FUTURE EXPECTATIONS/HOPES RE SOFTWARE SUPPLIERS

- 4th generation languages
  - faster development, greater flexibility
- More software productivity tools
- More micro-based software
- More packaged application software in mainframe area
- Greater business knowledge

PROFILE: DOLLARS SPENT ON SYSTEMS SOFTWARE

| Systems Software Expenditures ($000's) | As a % of Total Budget | Total DP Budget ($000's) | Hardware Budget ($000's) |
|---|---|---|---|
| 45 | 7.5 % | 600 | 250 |
| 78 | 7.1 % | 1,100 | 500 |
| 60 | 5.45% | 1,400 | 500 |
| 40 | .67% | 6,000 | 2,500 |
| 75 | 1.88% | 4,000 | 1,000 |
| 1,000 | 3.85% | 26,000 | 10,000 |
| 40 | 4.0 % | 1,000 | 350 |
| 1,335 | | 40,100 | 15,100 |

| Application Software Package Expenditures ($000's) | No. of DP People | Personnel Budget |
|---|---|---|
| - | 10 | |
| 150 | 10 | |
| 30 | 5 | |
| 40 | 60 | |
| 200 | 40 | |
| 1,000 | 170 | |
| 60 | 6 | |
| 1,480 | 301 | |

# APPENDIX E

## SUMMARY OF SOFTWARE PACKAGES ON THE MARKET AS OF MAY, 1983

EXISTING SOFTWARE PACKAGES ON THE MARKET - MAY, 1983

---

As indicated in our report it is extremely difficult for software suppliers to obtain up-to-date information on available software in order to make sound decisions on which products they should develop. The summary of number of computer packages on the market by type and by hardware brand may be useful in assessing the competitive situation as of May this year. There are a number of software lists and sources which can be used for more detailed current information. Most software suppliers are likely to be familiar with these.

# TYPE OF PACKAGED APPLICATION SOFTWARE
## BY HARDWARE BRAND*

| APPLICATION TYPE | APPLE | Burroughs | CDC | CP/M | DATAPOINT | DEC | GEAC | HEWLETT PACKARD | HONEYWELL | IBM | NCR | PRIME | RADIO SHACK | SPERRY UNIVAC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AGRICULTURE | 5 | | | | | | | | | | | | | | 5 |
| AUTOMOTIVE | - | | | | 2 | | | | | 1 | 3 | | | | 6 |
| BANKING | - | | | | 4 | 3 | | | | 14 | | 3 | | | 24 |
| COMMUNICATIONS | 2 | | | 2 | | 5 | | | | 3 | | | | | 12 |
| CONSTRUCTION | - | 44 | | | 17 | | 6 | 2 | 32 | | 11 | | 1 | | 113 |
| COURIER | - | | | 1 | | 2 | | | | | | | | | 3 |
| DISTRIBUTION/ SALES | - | 3 | | 8 | 1 | 49 | | 4 | 5 | 24 | 4 | 4 | | 1 | 103 |
| EDUCATIONAL | - | 1 | | 6 | | 3 | | 1 | 1 | 9 | | 3 | 5 | 3 | 32 |
| FINANCIAL MANAGEMENT | 6 | 9 | 12 | 37 | 16 | 123 | 5 | 18 | 21 | 155 | 28 | 10 | 3 | 11 | 454 |
| FOOD/BEVERAGE | - | | | 1 | | 3 | | | | | | | | | 4 |
| GOVERNMENT | - | | 1 | | | 1 | 3 | | | 1 | | 2 | | | 8 |
| HUMAN RESOURCES MANAGEMENT | 1 | 4 | 3 | 3 | 1 | 5 | | 2 | 3 | 48 | 4 | 1 | | 5 | 80 |
| INSURANCE/ INVESTMENT | 1 | 4 | | 3 | | 4 | 1 | 4 | 1 | 24 | | 6 | | 1 | 49 |
| LEGAL | - | | | 1 | | 6 | | | | 15 | | | | | 22 |
| LIBRARY | | | | | 5 | 1 | | | | | | | | | 6 |
| MAILING LIST | - | | | 3 | | 1 | | | | 3 | | 3 | | | 10 |
| MANUFACTURING | - | | | 2 | | 34 | | 3 | 7 | 26 | | | 1 | 2 | 75 |
| MEDICAL/HEALTH CARE | - | | 1 | | 1 | 9 | | | 13 | 4 | | | | | 28 |
| MEMBERSHIP MANAGEMENT | - | | | | | 1 | | | 1 | | | 1 | | | 3 |
| MISCELLANEOUS | - | | | | 1 | 2 | | | | 8 | | 1 | | | 12 |
| ORDER ENTRY | - | 3 | | 4 | 1 | 23 | | 2 | | 3 | 4 | | | | 40 |
| PROPERTY | 1 | | | | | 2 | | | | 2 | 4 | 1 | 1 | | 11 |
| PUBLISHING | 1 | | | | | 8 | | 1 | 6 | | | | | | 16 |
| REAL ESTATE | - | | | 1 | 1 | | | | | | | 1 | | | 3 |
| SCIENTIFIC | - | 53 | 154 | | 63 | | 4 | 53 | 8 | | 10 | | | | 345 |
| TRANSPORTATION | - | | | | | 1 | | | | | 1 | | | | 2 |
| TRAVEL | - | | 1 | | | 1 | | | 1 | | | | | | 3 |
| TOTAL | 17 | 77 | 216 | 72 | 33 | 367 | 9 | 44 | 109 | 386 | 47 | 58 | 10 | 24 | 1,469 |

As Reported In Computer Data Magazine "Canadian Guide to Software" 1983

## TYPE OF SYSTEM SOFTWARE BY HARDWARE TYPE*

| SYSTEM SOFTWARE TYPE | APPLE | BURROUGHS | CDC | CP/M COMPATIBLE | DATAPOINT | DEC | GEAC | HEWLETT PACKARD | HONEYWELL | IBM | NCR | PRIME | RADIO SHACK | SPERRY UNIVAC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COMPUTER MANAGEMENT | - | 2 | | 4 | 1 | 9 | | 2 | 3 | 85 | | | | | 108 |
| CONVERSIONS | - | | | | | | | | | 31 | | | | 1 | 32 |
| DATA BASE ENHANCEMENTS | - | | | | | 1 | | | | 10 | | 1 | | 1 | 13 |
| DATA BASE MANAGEMENT | 1 | | 9 | 1 | | 13 | | | 1 | 26 | | 2 | | 2 | |
| DATA COMMUNICATIONS | - | | | 6 | 1 | 10 | | 2 | | 19 | | 5 | | | 43 |
| DATA ENTRY | - | | | 3 | | 4 | | 2 | 1 | 25 | | 1 | | 1 | 37 |
| FILE HANDLER | - | | 2 | 4 | 2 | 14 | | 2 | 6 | 13 | | 2 | 1 | 2 | 48 |
| GRAPHICS | 2 | | 16 | | 2 | 9 | | 1 | | 6 | | 3 | | | 39 |
| OPERATING SYSTEMS | - | | | 1 | | 2 | | | 1 | | | 1 | | 1 | 6 |
| OPERATING SYSTEMS ENHANCEMENTS | - | | | | | | | | | 9 | | | | | 9 |
| IBM COMPATIBLE | - | | | 1 | | 1 | | | | 6 | | | | | 8 |
| PRODUCTIVITY | - | 1 | 7 | 2 | | 22 | | 4 | 3 | 107 | | 6 | | 3 | 155 |
| PROGRAMMING LANGUAGES | - | | | 17 | | 21 | | | | | | 9 | | 1 | 48 |
| REPORT WRITERS | - | | 3 | 2 | | 3 | | 2 | 5 | 49 | 4 | 4 | | 1 | 73 |
| SECURITY | - | | | | | 1 | | | | 8 | 4 | 1 | | | 14 |
| WORD PROCESSING | 1 | | | 14 | | 12 | | 2 | | 4 | | 2 | | 3 | 38 |
| TOTAL | 4 | 3 | 37 | 55 | 6 | 122 | 0 | 18 | 20 | 398 | 8 | 37 | 1 | 18 | 727 |

As Reported In Computer Data Magazine "Canadian Guide to Software" 1983

# APPENDIX F

## LIST OF RESPONDING COMPANIES

Mr. Gordon Warrenchuk
Barry A. Taylor
Mr. Kevin Morrison
Mr. John Bourgeois
288113 B.C. Limited
Abacus Computing Ltd.
ACS Computer Services
Act-Com Consulting Inc.
Actif Software Design Ltd.
Acumen Software Services Ltd.
ADP Computer Services Ltd.
ADP Dealer Services Ltd.
ADS Accounting & Data Systems of B.C. Ltd.
AIS Advanced Information Systems Ltd.
Albricor Systems Inc.
Allegro Computer Systems Ltd.
Amcan Industrial Data Systems Ltd.
Amdahl Ltd.
Apocalypse Enterprises Inc.
Arrowsmith Computing Ltd.
Augur Data Planning Inc.
Axion Computer Software Ltd.
Bailey & Rose Ltd.
Barrodale Computing Services Ltd.
Basic Software Group
Blue Chip Software
Boeing Computer Services Canada Ltd.
Burnaby Computer Centre
Burroughs Inc.
Bynatech Systems Inc.
C.A. Business Computers Stores Ltd.
C.R. Toren Ltd.
C.A.D. Developments Inc.
C.M.I. Canada Microsystems Inc.
Canadian Automatic Data Processing Services Ltd.
Canadian European Systems Ltd.
Canadian General Electric Company Limited
Canada Microsystems Inc.
Canadian Systems Development Corp.
Canmax Software Development Corp.
Cantec Resources
Canysco Industries Ltd.
Ceska Geobotanical Research Co.
Charles Michael Development Corporation Ltd.
Churchill Research & Development Ltd.
Clyde Digital Systems (Canada) Ltd.
Cole & Company Ltd.
Columbia Computing Services Ltd.
Comdata Services Ltd.
Computech Consulting Canada
Computer Access Ltd.
Computer Dynamics Ltd.

Computer Sciences Canada Ltd.
Computer TACS Systems Ltd.
Computype Services Ltd.
Comshare Limited
Consolidated Computer Inc.
Control Data Canada Ltd.
CPS Computer Services Ltd.
Crawford E. Laing Company
Currie, Coopers & Lybrand
CTL Computeractive Time-Sharing Ltd.
Dale Wershler & Associates Ltd.
Danbie Management Ltd.
Data Crown Inc.
Data General (Canada) Ltd.
Data Key Ltd.
Data Terminal Mart
Dataline Systems Limited
Datap Systems
DataTech Systems Ltd.
Deloitte Haskins & Sells
Design 80 Consulting Ltd.
Dialog Business Computer Systems Ltd.
Digital Equipment of Canada Ltd.
DISC Designed Information Systems Corp.
DMR & Associates
Dodd & Walker Accounting
Dyadic Resources Ltd.
Dynamic Business Software Inc.
Dynamic Control Systems
E & N Jaeger Ltd.
Eastern Pacific Instruments
EDP Industries
Elements Four Management Services Ltd.
Entropy Systems Ltd.
Escom Systems Ltd.
Executive Micro Computers Inc.
Forest Planning Systems Ltd.
Four-Phase Systems Ltd.
Gatling Communications Inc.
GEAC Computer Corp. Canada Ltd.
Genesys Consulting and Design Inc.
Geomin Computer Services Corporation
Grandall Enterprises Ltd.
Gray Matter Group
Groberman Computer Engineering Ltd.
Group West
HLU Computer Products
Hewlett-Packard (Canada) Ltd.
Honeywell Information Systems
I P Sharp Associates Ltd.
IBI Group
IBX Datasystems Ltd.

ICS Computer Systems Ltd.
Imso/Information Management Solutions Ltd.
Infotechnica
Intadata Management Inc.
Interact Computing Services
ISP Information Systems Planning Corp.
ISS Information System Services Ltd.
J.C. Management Services
KEA Systems Ltd.
Kehler Computer Services Inc.
Keltan Management Ltd.
Ken Aplin Design Associates Ltd.
KG Consulting Ltd.
LM Microcontrols Ltd.
LW Smart & Associates Ltd.
Macrotech Computer Products Ltd.
Macura Engineering Ltd.
MAI Canada Ltd.
Management Control Systems (Canada) Ltd.
Management Horizons Data Systems
Management Science America (Canada) Ltd.
Maves Periana & Associates
Memspec Computer Systems Inc.
Meridian Computer Corp.
Micro Media West Ltd.
Microwest Distributing Ltd.
Miller Computing Services
Mitech Consulting Ltd.
MSA Business Services Ltd.
Multiple Access Computer Group
National Datacentre Corporation
NCR Canada Ltd.
Network A: Business Services
Network Consulting
Nissi Computer Systems Inc.
ODS Online Data Systems Ltd.
OMNI Systems Ltd.
Okanagan Business Data Services
Pace Computer Systems Ltd.
Pacific Coast Time Sharing
Pacific Learning Systems
Pal Computing
Peat Marwick & Partners
Pedacomp Ltd.
Performance Associates Ltd.
Peter Zandron & Associates Ltd.
Pharmacom Systems Ltd.
Platon Consulting Ltd.
PM Sulcs & Associates
PMS Profile Management Systems Ltd.
Price Computer Associates
Protean Services Inc.

Quasar Systems Ltd.
Quilchena Consulting Ltd.
R.J. Wordcraft Inc.
RAE Data Systems
Response Services Incorporated
Reynolds and Reynolds (Canada) Ltd.
Richmond Data Management Ltd.
RJK and Associates Ltd.
RMS Industrial Controls Inc.
Rogers & Associates Management Consultants
S. Lam and Associates Inc.
Scan Computer Projects Inc.
Schwartz Computer Consulting
SCI-COM Dial Services Ltd.
Seaboard Computing Services Inc.
SER Enterprises Ltd.
Shared Medical Systems Canada Inc.
Silicom Int. Software Services
Smith & Co.
Software International Corp.
Softwords/Press Porcepic Ltd.
Solution Software Ltd.
SPCL Software Products Co. Ltd.
Sperry Univac Computer Systems
Stewart & Co.
Sydney Development Corporation
Syscon Services Inc.
Systematics Consultants Ltd.
Systemhouse Ltd.
Systems West
Systron Projects Inc.
T.P. Systems Ltd.
Taylor Made Systems Ltd.
Tetrad Computer Applications
Texas Instruments Inc.
Trendata Canada Ltd.
TRW Data Systems Division of TRW Canada Ltd.
Ultra Marine Systems
Universal Library Systems Ltd.
Vancouver Systems Services Ltd.
Victoria Microsystems Ltd.
Victoria Personal Computer Company
Wang Canada Ltd.
Western Computing Vernon
Zentronics, A Div. of Westburne Industrial Enterprises