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SILICON VALLEY NORTH: THE DEVELOPMENT OF A HIGH-TECHNOLOGY INDUSTRIAL BASE IN THE REGIONAL MUNICIPALITY OF OTTAWA-CARLETON

by

Don DeGenova

Thesis presented to the School of Graduate Studies in partial fullfillment of the requirements for the degree of Master of Arts in Geography

University of Ottawa
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UNIVERSITÉ D'OTTAWA
UNIVERSITY OF OTTAWA

ABSTRACT

The Regional Municipality of Ottawa-Carleton has long, perhaps too long, relied on the federal government as its major employer. As a result of this dependence, the growth and stability of the local economy would have been far more threatened by recent federal employee cut backs and decentralization programs, were it not for the fact that a viable, associated development has occurred in the form of the Region's fast-growing high-technology industry.

This study identifies the age, employment and ownership pattern of the Region's high-technology industry. The influence of these three factors on managers' perceptions of the area and the development of selected input and output linkages is described.

At least 45 high-technology firms have established manufacturing operations within the RMOC, 27 of these since 1970. These firms in 1981 employed 6,099 workers. They projected that by 1985 they will have a local employment base of 13,500. They are predominantly Canadian-owned. The majority of founders indicated that they had a strong local association with the area prior to the opening of their firm.

The presence of the federal government and the advantages derived from the clustering of high-technology firms were identified as the Region's

major drawing cards while a lack of direct flights to particular destinations in the U.S. and Europe, as well as an inadequate supply of high-skilled labour topped the Region's list of disadvantages.

Input and output linkages varied considerably according to firm age, size and ownership status. The discussion reveals that over one third of the high-technology industry's sales were made within the RMOC whereas only one quarter of their purchases originated from within the Region. More than half the high-technology firms surveyed considered their links with the federal government to be important, if not crucial. Their key links were with the departments of National Defence, Supply and Services and Industry, Trade and Commerce.

ACKNOWLEDGEMENT

I would like to thank all those persons responsible for seeing me through a most challenging period in preparing this thesis.

I am greatly indebted to Professor G. Steed for his patience, criticisms, and guidance throughout the duration of this research project. Also, Shaun Markey from the Commercial and Industrial Development Corporation was instrumental in offering encouragement, praise and further insight into sources of information and data collection. I would be remiss if I did not thank Professor P. Harrison for being an understanding friend. Furthermore, I thank the firms responding to my questionnaire, for without their co-operation, this analysis would not have been possible.

I would also like to thank my parents, Don and Leona, my sister Debby and brother John for supporting me throughout my seven years at University. Janet, another sister, was indispensable as she helped me code and interpret the questionnaires. I dedicate this thesis to the five most deserving people I know, my family.

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Two other people have been very important to me in recent years. Laurette Beauchamp has been a sister indeed and I thank her sincerely for her kindness, understanding and support and specifically, for a friendship which I will always cherish. Also, a special thank you to my cousin Freddie Brennan for giving me that final push necessary to finish this thesis.

To have been able to come this far has been quite an achievement. But to have done this with the help of such people has made it an achievement of the highest degree. I salute you all!

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CHAPTER I

INTRODUCTION

1. Introduction

Ottawa has long relied on the federal government as its major employer and hence as the "life support system" of its economic environment. The Region's industrial labour force has been minimal. In 1958 only 58 industrial firms employed 25 or more people (Scott's Directory, 1958). By 1969 the number of such firms had increased to 104; and by 1979 there were 130 firms with an employment base of 25 or more (Scott's Directories, 1969 and 1979).

The previous paucity of industry has probably been related not only to the dominance of the federal government as a regional employer but also to the proximity of two dominant centres, Toronto and Montreal. Michael Ray, for instance, has attributed eastern Ontario's relative industrial "backwardness" to the "economic shadow" cast by southwestern Ontario's industrialized areas, as well as Montreal. Ray associates this economic shadow with the preference of American parent firms to establish subsidiaries nearest to home operations or at the centre of Canadian economic potential (Ray, 1966). Large markets, a highly-skilled

and abundant labour force, a developed transportation network and facilities, and geographic concentration preferences also help to account for south-western Ontario's upper hand over its eastern counterpart in attracting manufacturers.

The presence of most manufacturers in the RMOC has been based primarily on satisfying local market demand for products, as emphasized in a survey conducted by the Mayo Commission. The survey found that 70% of RMOC firms manufactured over two thirds of their goods for sale in the Ottawa area (Mayo, 1976, p. 23). Although these firms primarily supply the local market, and only constitute a small portion of Ottawa's employment, they provide some needed diversity to this Region's economic base.

In 1977 the federal government announced its decentralization program, raising fears that this might jeopardize jobs in the local economy. Since the 1950's however, the first signs of a high-technology base have been evident, and this base has recently blossomed, giving rise to Ottawa being considered the "computer (manufacturing) capital of Canada" (Enterprise, January 1979, p. 1).

It is the intent of this thesis to compile and organize a data base which is suitable for describing and discussing the evolution of Ottawa's high-tech industrial base.

The geographic focus of this thesis is the Regional Munucipality of Ottawa-Carleton (RMOC). This includes Ottawa, Kanata, Nepean and Gloucester (Figure 1). However, for the purpose of this study, Gloucester is not differentiated from Ottawa, because there has been very little development of high-tech industry in Gloucester. Seven districts with significant firm clustering are identified in Figures 1.1 - 1.7.

The following questions provide an indication of the descriptive and analytical focus of this thesis:

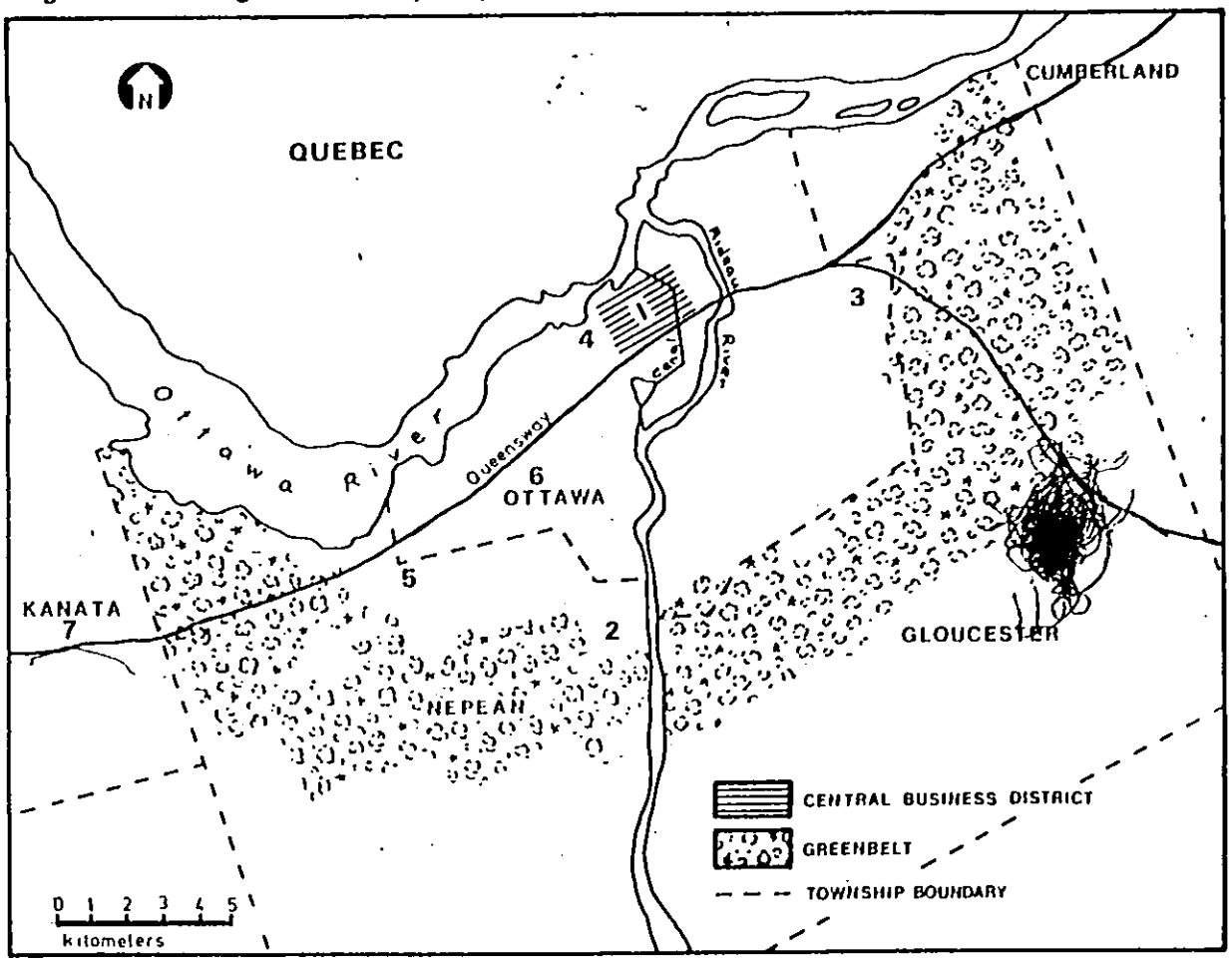
1. What is the age and size structure and ownership pattern of the Region's high-technology firms?

2. Where have these high-technology firms been locating within the RMOC?

3. What are the perceptions of high-technology industrial managers about the RMOC's environment, its strengths and weaknesses?

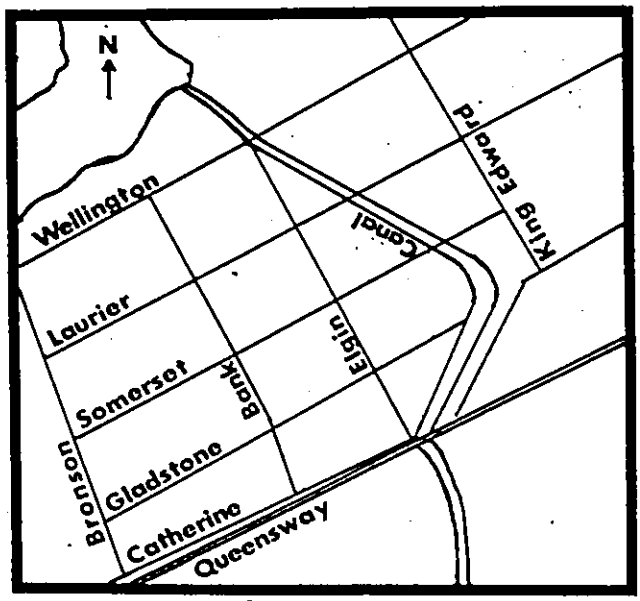
4. Do these perceptions vary according to firm age, size and ownership status (foreign and domestic firms)?

Figure 1: The Regional Municipality of Ottawa-Carleton

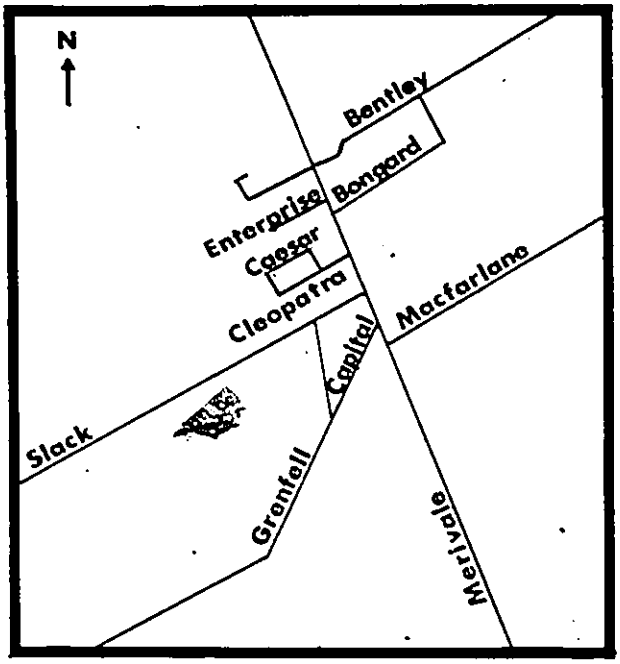


* The numbered districts are represented on a larger scale in Figures 1.1 - 1.7

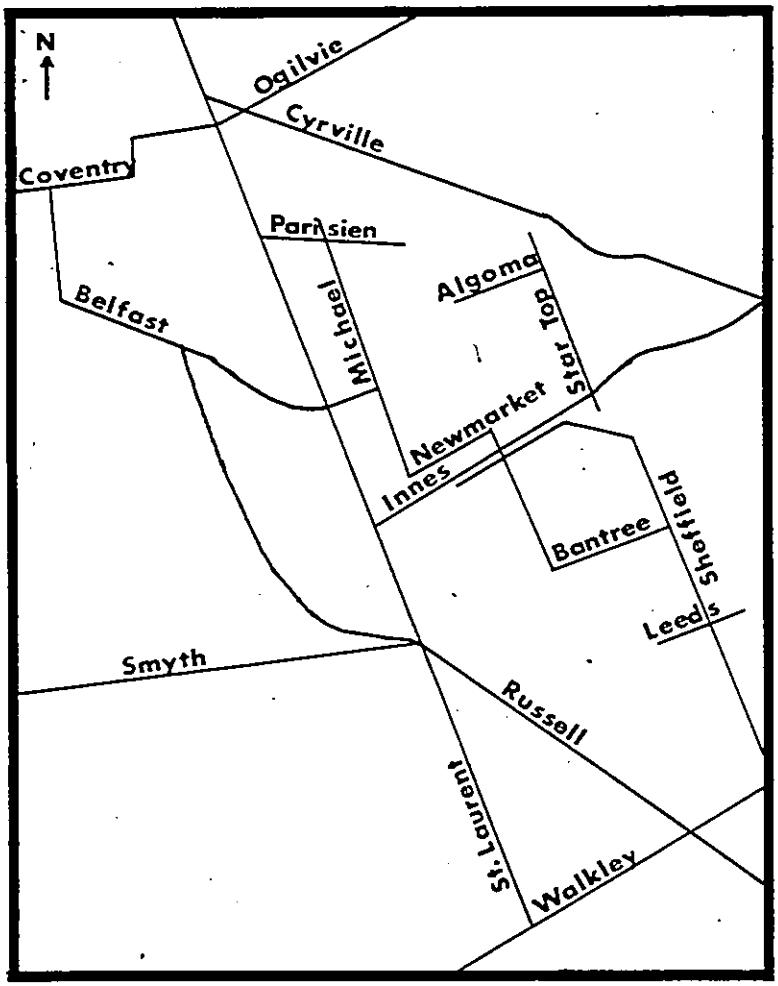
1.1 Central Business District



1.2 Nepean South

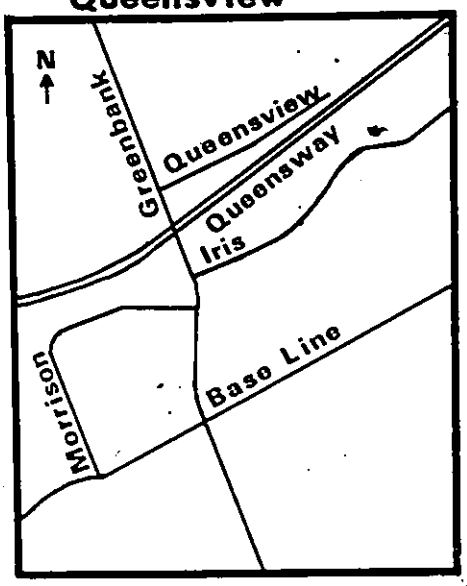


1.3 Ottawa East

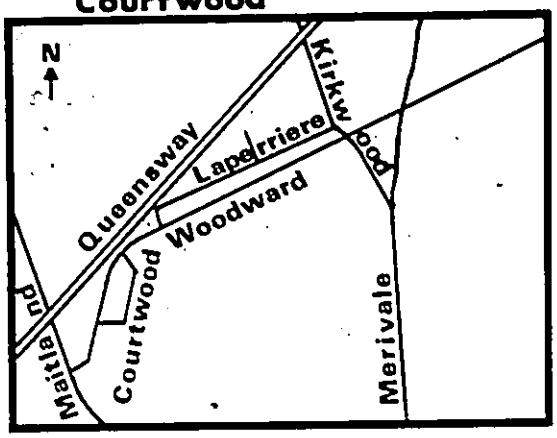


1.4 Ottawa North

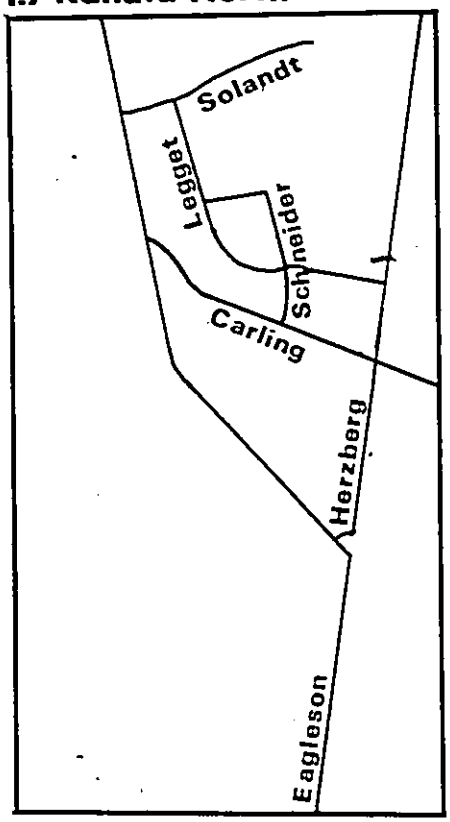
1.5 Morrison-Queensview



1.6 Woodward-Courtwood



1.7 Kanata North



5. How is the high-technology industry linked via input (materials) and output patterns to the RMOC and how export oriented are the various firms?

6. How do high-technology industrial linkages differ as a function of ownership, size and age?

7. With which federal institutions do these firms maintain linkages perceived to be important by senior management of the firms?

8. Why are high-technology firms attracted to the RMOC?

9. Are the major factors influencing high-tech industrial concentration common to the RMOC?

The structure of this thesis is as follows:

1.0.1 Chapter II: Technology and Regional Development: Factors Encouraging the Location of High-Technology Industries

This chapter is presented in two sections. Section one provides a general definition of the high-technology industrial sector. Section two is a literature review of the major factors contributing to the development of a high-tech industrial base. Factors as cited in various

studies include: agglomeration, high-skilled labour, tax structure, community aesthetic qualities, universities, community support, national governments and research facilities.

1.0.2 Chapter III: Development and Structure of the RMOC High-Technology Industry.

Some characteristics of the high-technology industry are documented in this chapter. Features covered include: firm age; growth in employees; and number of domestic and foreign firms. The location patterns of these firms are also noted.

1.0.3 Chapter IV: The RMOC Environment: Advantages and Disadvantages

This chapter identifies management's perception of the RMOC environment and provides a general review of some issues affecting the Region's high-technology industry. Advantages and disadvantages of locating in the area are contrasted according to firm ownership, age and size. Eleven major Canadian cities are also noted as to their ability to satisfy the overall current locational requirements of the firm.

1.0.4 Chapter V: Linkages of the RMOC High-Technology Industry

This chapter concentrates on revealing the input and output linkages of the firms as a function of ownership, age and size. Also considered is the extent to which firms differ in the degree of their dependence upon local linkages. The chapter identifies some linkages with federal government institutions.

1.0.5 Chapter VI: Summary and Conclusions

The final chapter summarizes several main points from earlier chapters and draws some conclusions.

Appendices include a list of RMOC high-technology firms and the sample questionnaire used in this study.

CHAPTER II

TECHNOLOGY AND REGIONAL DEVELOPMENT: FACTORS ENCOURAGING THE LOCATION OF HIGH-TECHNOLOGY INDUSTRIES

2. Introduction

Primarily since World War II, a technological revolution has spawned the growth of a new breed of manufacturers which specialize in the development of products classified as high-technology goods. Within the last decade, the growth rate of these high-technology manufacturers has exceeded those of all other manufacturing industries. In 1979, they had a world-wide market estimated at $100 billion (Chand 1978; Financial Post, 1979, p.F1). Governments at all levels have sought ways to secure a piece of this "high-tech economic pie" and to lay claim to superiority in some high-technology field.

Surprisingly perhaps, with such interest in high-technology industries there is little information available as to the locational preferences of these firms. This was the finding of the Joint Economic Commission (JEC) in their 1982 locational study of U.S. high-technology manufacturers:

> "... very little systematically organized data is (sic) available on high-technology companies. A review of the literature revealed that none of the numerous business location and expansion studies make high-technology companies their major focus." (U.S., 1982, p. 16).

The majority of studies available are directed at an analysis of national high-tech industrialization policies; corporate Research and Development (R & D) investments; relationships between the location of corporate head offices and laboratories; regional shifts in high-tech industrial concentration; and ratios of R & D expenditures to corporate sales. Literature of this type is beyond the scope of this thesis which focusses on the development of high-technology industry at a regional level. The major studies relevant to this thesis are reviewed in the following two sections. Section one presents a definition of the high-technology sector, and section two reviews various factors identified by other studies as influencing the locational preferences of high-tech manufacturers.

2.1 High-Technology Industries: A Definition

High-tech manufacturers are noted to have a strong commitment to R & D. Such firms are found in various sectors which differ somewhat between countries (Chand 1978). However, most common are the following

Standard Industrial Classification (SIC) groups: Machinery (SIC-14); Transportation Equipment (SIC-15); Electrical Products (SIC-16); and Chemical and Chemical Products (SIC-19). A frequent addition is Miscellaneous Manufacturers (SIC-20) where producers of scientific and medical instruments are classified. The emphasis of the supporting literature review is on those manufacturers which specialize in the production of telecommunications, aviation, scientific and medical equipment; and, computers, semi-conductors, micro-chips and other electronic equipment.

Regarded as high-risk investments, these high-technology manufacturers operate in a very competitive and rapidly changing market (Malecki 1980; McDermott and Taylor 1982). It is estimated that 20 - 25% of their products are outdated within three years (Financial Post, 1979, p. F1). Hence, the key to future growth is innovation, the result of large capital infusions into the area of R & D. Associated with this R & D is the firm's dependence on a high-skilled labour force. Furthermore, their products, although designed to reduce the labour inputs of other industries are, in themselves, very labour intensive, making them especially attractive to economically depressed areas (McDermott and Taylor 1982, p. 10), including those of third world countries.

In product development, the majority of high-tech manufacturers emphasize either the initial or middle stages of the product life

cycle[1]. It is the initial stage which is probably the most important to all these manufacturers since it marks the innovation phase. During this phase products are developed or improved as the result of large R & D capital outlays. Once the innovation becomes marketable, the firm then enters the second stage where sales and profits show rapid growth. Eventually the firm considers product standardization and mass production which are processes characteristic of the mature phase. However, it is often economically infeasible for many high-tech manufacturers to enter the latter stage. Their products are subject to numerous change-overs in design and, in some cases, total replacement by more efficient models. Nevertheless, often there are certain component parts such as computer casings which can be standardized and mass-produced. (Malecki 1979, p. 309; 1983, pp. 98-101; Heckman 1980a, pp. 5, 16).

2.2 Factors Encouraging High-Technology Industrial Development

High-technology manufacturers are often considered to be "foot loose" because their location decisions are not influenced by the traditional location restraints common to so many other manufacturers (Steed and DeGenova 1983, p. 261). Their products have a high value-to-

[1] The product life cycle traces the development of a product through three growth stages. The initial stage focuses on innovation, the middle stage concentrates on marketing with rapid growth in both sales and profits, and the mature stage represents the standardization and mass production of the product. (Heckman, 1980a, pp. 5-6).

weight ratio and, therefore, are not bound by transportation costs and the necessity to locate near large markets (Heckman 1980a, p. 5; U.S. 1982, p. 22). The proximity of natural resources and energy supplies are also usually not significant location requirements (VanderMuelen 1980, p. 1; U.S. 1982, p. 22).

There are, however, various factors which encourage the localization of high-tech manufacturers. These factors are identified in the following literature review and further contribute to understanding policies and strategies oriented to high-tech regional development.

Malecki (1983) associates regional development with technological change or innovation. In his literature review on the processes affecting regional development he identifies technology as a principal component in strengthening a region's economic environment. However, he does note that technology-based development may not necessarily represent the needs of society and hence, the negative effects might possibly outweigh any associated benefits. Nonetheless, regions have a tendency to adopt technology-based development approaches in anticipation of the perceived benefits they will accrue.

According to Malecki (1983), technology-based regional growth is stimulated by the presence of manufacturers in the initial stage of the product cycle. Firms in this innovation phase require a high-skilled

labour force to conduct their R & D activities. These workers prefer locations which offer a wide range of employment opportunities and a well-developed cultural and recreational environment. Linked to employment opportunities is the existence of agglomeration economies[2] which are dependent on local conditions that support innovative activity with both venture capital and compatible university resources. These basic criteria for technology-induced regional development are noted in the following studies on factors encouraging the location of high-technology manufacturers.

In 1980, the U.S. Joint Economic Commission (JEC) released a study based on a survey of the factors which influenced the location decisions of 691 high-technology manufacturers. The most important factors identified by these manufacturers were: accessibility to high-skilled labour; state and local tax structure; and the presence of academic institutions.

As noted in that study, high-tech manufacturers were dependent upon an accessible pool of skilled workers since their R & D activities

[2] There are basically three types of agglomeration economies: large scale economies, localization economies and urbanization economies. Large scale economies are within a firm and result from that firm's expansion (i.e. Steel Industry). Localization economies result from the growth of all firms in the same industry within a single location (i.e. Clothing Industry). Urbanization economies result from the growth of all firms in all industries concentrated in a single area. (Isard 1956, p. 172).

were very labour intensive. Their demand for high-skilled labour, which includes systems engineers, computer specialists and scientists, was supplemented by an equally important need for semi-skilled workers, namely technologists and computer programmers.

It is common for high-skilled workers to shift from employer to employer and, therefore, they prefer locations with ample employment opportunities.[3] Their desire to keep abreast of the latest technological advancements requires the presence of a university, preferably science-based, which offers a continuing-education program. However, the role of a university is multi-faceted in that high-tech manufacturers regard such institutions as a source of new innovations, technical advice, research assistants and graduating students.[4]

The JEC, in reference to state and local tax structure, emphasized that regions' with lower taxation rates are more attractive to high-tech manufacturers. These manufacturers are more concerned with state income tax rates and municipal property tax assessments than with corporate tax levels. When translated into corporate dollars,

[3] Often high-tech manufacturers entice key personnel from rival firms by promoting higher salaries and better benefits. This sustains and results in technological cross-fertilization (Hanson, 1980).

[4] According to Hanson (1980), high-tech agglomeration in the Silicon Valley was stimulated by Stanford and the University of California-Berkely, and in Boston's Route 128, by MIT.

high employee tax levels represent "tax-compensated wage increases" resulting in an overpaid labour force and increased operating costs.

Other minor location factors noted by firms in the JEC study were ranked in the following order:

1. cost of living;
2. ample room for expansion;
3. reduced commuter travel times;
4. cultural and recreational activities; and
5. favorable business climate.

The U.S. Office of Technology Assessment (OTA)[5] approaches the issue of high-technology development from a regional perspective. They note that all regions interested in developing a high-tech industrial base share three common goals: to create more employment; to enhance business development; and, to diversify their economic base. These principal objectives require the implementation of programs designed to alleviate the perceived barriers which might deter high-tech firms from locating in an area. Such programs, they argue, should attempt:

[5] The OTA conducts an ongoing analysis of technology and regional development from information provided to them by federal, state and local governments on the policies and programs which they have designed to encourage high-technology development (OTA 1984).

1. to improve the channels of university research and innovation information flows;
2. to increase the skilled labour supply;
3. to locate sources of investment capital;
4. to nurture the growth of spinoff firms;
5. to provide the necessary infrastructure for sustaining high-tech growth; and
6. to gather and disseminate information.

The OTA recognizes that the success of any high-tech industrial development program is dependent upon commitment and co-operation from all government levels, primarily state and local governments, and the private sector.

The OTA, although supporting the findings of the JEC, also identifies additional factors which they believe increase a region's odds in developing and maintaining a high-tech industrial base. The two major factors cited include community commitment and positive industrial experience. Community commitment pertains to the local support of high-technology industries by establishing venture capital funds, zoning industrial research parks, providing cultural and recreational facilities, designating incubator facilities for start-up firms, developing linkages between universities and industry, and implementing "high-tech development units" as an interface between

the private and public sectors. Associated with community commitment is a positive industrial experience which denotes collaboration between industry and the community in establishing trust and understanding.

Malecki (1984) has also identified a series of factors which encourage the development of a high-tech industrial base. He argues that these factors, in order of importance are:

1. an available pool of high-skilled labour;
2. high-tech agglomeration;
3. presence of academic institutions;
4. a well-developed infrastructure; and
5. community support and involvement.

It is interesting to note that Malecki's second most important factor is high-tech agglomeration, a factor not mentioned in the JEC and OTA studies. Perhaps the JEC and OTA associate high-tech agglomeration with the presence of academic institutions and an available high-skilled labour force, factors which are often considered to be prerequisites to the geographic concentration of high-tech firms.

Malecki also suggests that a well-developed infrastructure is an important factor. This infrastructure should include the following: a local airline service; cultural and social activities; good schools; and well-maintained public facilities.

Five basic locational criteria can be identified from this literature review on the factors contributing to the development of a high-tech industrial base. These are: an available high-skilled labour force; the presence of academic institutions; the existence of high-tech agglomeration; a well-developed infrastructure; and a favorable business climate, including the design of state and local tax structure. Infrastructure and business climate are general headings used to classify a set of related factors. Infrastructure incorporates cultural and recreational facilities, local airline service, reduced commuter travel times, and ample room for expansion. A favorable business climate is associated with available venture capital, community committment and positive industrial experience.

It is the purpose of the next chapters to focus specifically on several features of the high-technology industries located in the Regional Municipality of Ottawa-Carleton.

CHAPTER III

DEVELOPMENT AND STRUCTURE OF THE RMOC HIGH-TECHNOLOGY INDUSTRY

3. Introduction

During World War II the Government of Canada expanded existing Ottawa research institutions to satisfy war-time demands for highly scientific and electronic equipment. In the forefront of such expansion was the National Research Council which had attracted to the National Capital Region a wide variety of scientific and technical expertise. Following the war these research facilities continued to grow, thereby designating Ottawa as a center for research and development. (Mittelstaedt, 1980, p. 43).

The first high-tech firm to establish manufacturing operations within the RMOC was Computing Devices Co. in 1948. The next most significant high-tech development was not until 1958 when the Bell Northern Research Labs were established. High-tech growth continued to be minimal throughout the 1950's and early 1960's with Leigh Instruments and Digital Equipment of Canada Ltd regarded as the period's most notable entries. The Region's unprecedented high-tech

growth started in the late 1960's and continued into the 1970's. Major additions to the Region's high-tech environment include Epitek Electronics, Lumonics Research, Gandalf Data Communications and Mitel (Ontario Government, 1980, pp. 1-2). Today, Ottawa can boast having five of the country's ten largest revenue producers in the computer industry (Globe and Mail, July 6, 1981).

By June 1980, 85 high-technology firms, employing 15,000 people, with a collective payroll of $200 million, were reportedly operating in the RMOC (Steklasa, January 26, 1980, p. 5). Dramatic projections have been made for their future prospects. Michael Cowpland, President of Mitel, and a group of his associates have projected a high-technology employment base of 100,000 for Ottawa by 1990 (Steklasa, November 29, 1980). The Ottawa Citizen referred to this area as the:

> "Silicon Valley North ... where North America's fastest growing industries - microelectronics, telecommunications, computers - will cluster and grow, just as they did in the original Silicon Valley near San Francisco." (November 21, 1980).

It may be argued that Ottawa's success as a high-technology center can be attributed to the presence of several locational advantages: accessibility to those responsible for R and D investment programs and the massive buying power of the federal government; a well-developed

science and technology community, including the National Research Council, the Departments of Energy, Mines and Resources, Communications, National Defence; the labs of Bell-Northern Research; three institutions of higher learning - Ottawa and Carleton Universities and Algonquin College; a reasonable supply of highly-, semi- and non-skilled labour; and a life style based on an attractive socio-cultural and recreational environment (Steklasa, 1980; Enterprise, #'s 50, 83, 91 and 108).

The major types of high-technology products manufactured within the RMOC, as identified by the Commercial and Industrial Development Corporation (1979), are as follows: computer (mainframe and mini), printed circuits, computer peripherals, telecommunications equipment, aviation equipment, scientific equipment and medical instruments.

Through the use of a questionnaire, information has been obtained which reveals several features of the RMOC's high-technology industry including firm ownership, age, size and number of regional firm employees.

3.1 Survey Background

A questionnaire was circulated to the 64 high-technology firms identified by various means as being manufacturers within the RMOC. A list of these high-tech firms can be found in Appendix I.

Accompanying the questionnaire was a covering letter from Professor Steed. The questionnaire was circulated at the beginning of February 1981. It was expected that all responses would be returned by the end of the month. All firms that had not responded by then were contacted by phone and sent another questionnaire if they indicated the intent to respond.

At the end of February a total of 31 questionnaires had been returned representing a 48% response rate. The follow-up questionnaire resulted in another fourteen returns and hence an overall response rate of 70%. Non-respondents are generally thought to be very small firms, as confirmed through telephone calls and reference to Scott's Directory.

Two thirds of the questions were answered by all 45 high-technology firms (Table 1). The five questions lacking full response were those directed at managers' perceptions of the RMOC environment.

The questionnaire consisted of four basic types of questions: open-ended, numerical estimates, dichotomous (Yes/No), and interval. A copy of the questionnaire and covering letter are in Appendix II.

Table 1: Response Rate to Questions

QUESTION NO.	NUMBER	PERCENT OF TOTAL
1	45	100.0
2	45	100.0
3	44	97.8
4	42	93.3
5	45	100.0
6	45	100.0
7	41	91.1
8	44	97.8
9	44	97.8
10	45	100.0
11	45	100.0
12	45	100.0
13	45	100.0
14	45	100.0
15	45	100.0

Thirty-four (75.6%) of the respondents were either presidents, vice-presidents or general managers. The remaining eleven respondents held positions such as marketing manager or sales manager (Table 2).

Table 2: Employment Position of Respondents

POSITION	NUMBER	PERCENT OF TOTAL
President	19	42.2
Vice-President	9	20.0
General Manager	6	13.3
Other	11	24.5
TOTAL	45	100.0

Eighty-seven percent of the replies were from domestically-owned firms and 13% were from foreign subsidiaries. All data provided in Chapters 3, 4 and 5 were derived from the questionnaire and relate to the year 1981 unless otherwise specified.

3.2 Location of High-Technology Manufacturing Firms

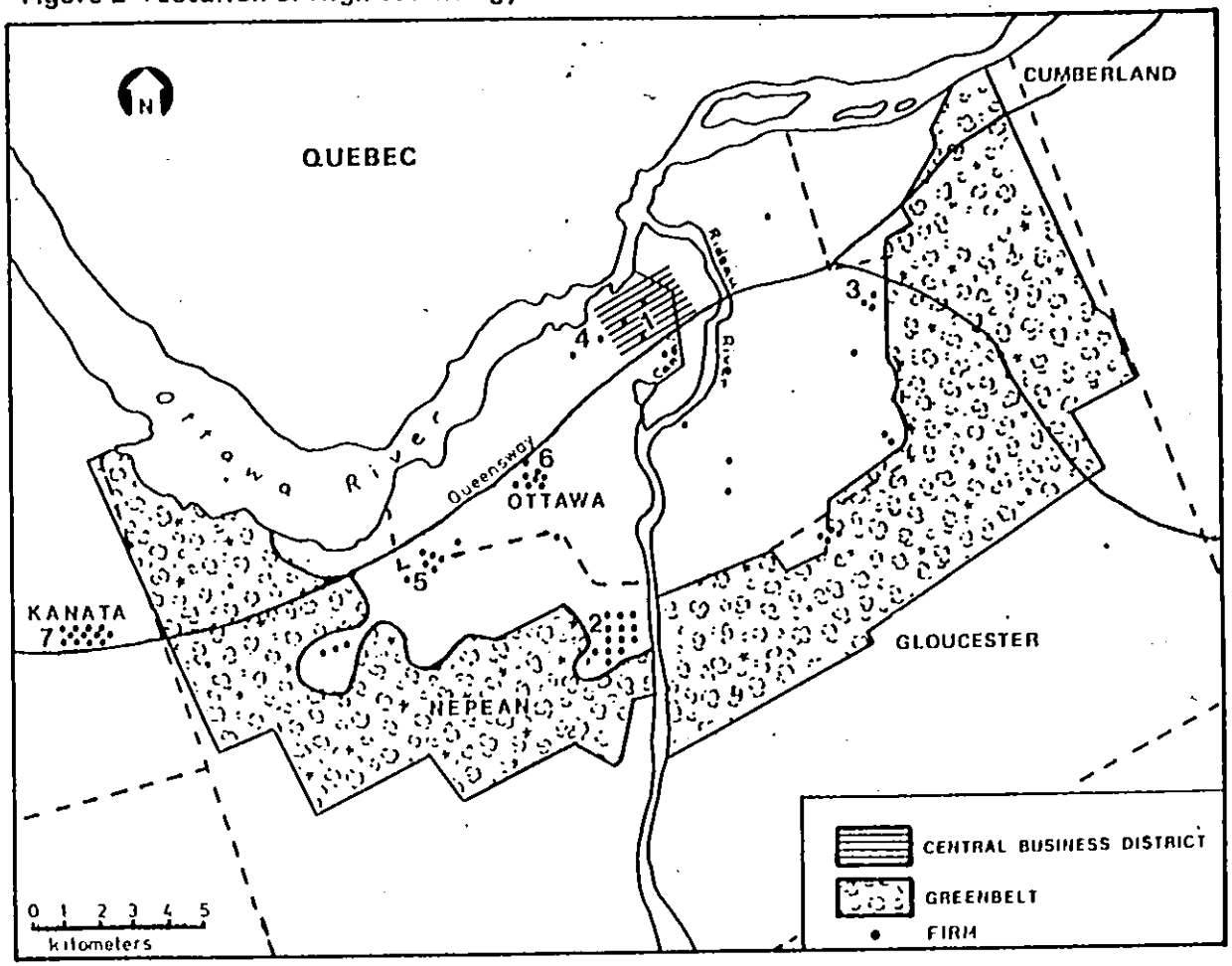
In 1981 there were 64 high-technology manufacturing firms operating in the RMOC. Thirty-four firms were located in Ottawa while Kanata and Nepean contained 12 and 18 firms, respectively.

Figure 2 shows a high concentration of firms around the Herzberg-Schneider-Leggett Road district in Kanata. Nepean's high-technology cluster was apparent in the Grenfell-Bongard-Slack Road district. Two areas in Ottawa displayed similar high-tech localization. One area was in the Morrison-Queensview district and the other in the Woodward-Courtwood district. Only three firms were located within the CBD. In eastern Ottawa there were weak signs of clustering around Algoma Road and Fenton Road.

3.3 High-Technology Employment

Table 3 shows that during 1976 Ottawa's high-technology manufacturers employed 1,406 or 44.7% of the Region's high-tech employment base. Nepean was second with 1,109 (35.2%) workers. Kanata accounted

Figure 2 : Location of High-Technology Manufacturers, 1981



* See Figures 1.1 - 1.7 for further detail on numbered areas.

Table 3: Number of Employees, 1976 to 1985

REGION	1976		1981		1985*	
	N	%	N	%	N	%
Ottawa	1,406	44.7	2,025	33.2	4,297	31.6
Kanata	634	20.1	2,595	42.6	6,685	49.1
Nepean	1,109	35.2	1,479	24.2	2,630	19.3
RMOC	3,149	100.0	6,099	100.0	13,612	100.0

N = Number of employees
% = Percent of column
* = Projected

for 634 (20.1%) high-tech employees. By 1981 Kanata had forged ahead to become the Region's number one high-technology employer with 2,595 (42.6%) workers. However, approximately three quarters of Kanata's employment was accounted for by Mitel and Digital Equipment. Ottawa dropped to second place with 2,025 employees (33.2%), whereas 1,479 (24.2%) high-tech employees were working in Nepean. Employment projections for 1985 reveal the considerable optimism of this sector and the expectation that Kanata-based firms will employ approximately 6,685 (49.1%) of the RMOC's high-tech workers. Firms in Ottawa and Nepean expect to account for 4,297 (31.6%) and 2,630 (19.3%) of the Region's employees, respectively. However, several respondents expect problems in obtaining suitable employees. And one claimed: "You can't hold down good workers. The federal presence generates many bad habits in workers and artificially raises salaries making us less competitive."

In 1976, there were 3,149 high-tech employees working within the RMOC. By 1981 there were 6,099 workers and 1985 projections by the responding firms indicate a high-tech employment base of at least 13,612 people.

3.4 Firm Size

Seventy-one percent of those firms operating in 1976 had less than 50 employees, whereas by 1981 only a little over one half the firms were that small, and by 1985 about one fifth expect to be in that employment size category. The larger RMOC high-tech firms on the other hand have experienced a rapid growth rate with over 26% of the 1981 firms employing 100 or more persons, an increase of 5.6% from 1976.

Table 4: RMOC High-Technology Firm Sizes

SIZE (Employees)	1976		1981		1985*	
	N	%	N	%	N	%
1 - 24	23	60.5	15	33.3	5	11.1
25 - 49	4	10.5	9	20.0	5	11.1
50 - 99	3	7.9	9	20.0	10	22.2
100 - 450	6	15.7	8	17.7	17	37.8
451 & over	2	5.3	4	8.9	8	17.8
TOTAL	38	100.0	45	100.0	45	100.0

N = Number of firms
% = Percent of column
* = Projected

Table 5 shows the distribution of the various firm sizes for Ottawa, Kanata and Nepean. The predominance of very small firms was evident for all three centres during 1976. A strong representation of small firms still existed in Ottawa and Nepean in 1981, but a trend towards larger establishments was evident across the Region.

Table 5: High-Technology Firm Size by Region: 1976, 1981 and 1985*

	SIZE (Employees)										TOTAL	
	1 - 24		25 - 49		50 - 99		100 - 450		451 & over			
	N	%	N	%	N	%	N	%	N	%	N	%
1976												
Ottawa	13	65.0	2	10.0	2	10.0	2	10.0	1	5.0	20	100
Kanata	6	66.7	-	-	1	11.1	2	22.2	-	-	9	100
Nepean	4	44.4	2	22.2	-	-	2	22.2	1	11.1	9	100
1981												
Ottawa	10	40.0	5	20.0	7	28.0	2	8.0	1	4.0	25	100
Kanata	2	18.2	2	18.2	1	9.1	4	36.4	2	18.2	11	100
Nepean	3	33.3	2	22.2	1	11.1	2	22.2	1	11.1	9	100
1985*												
Ottawa	5	20.0	2	8.0	5	20.0	11	44.0	2	8.0	25	100
Kanata	-	-	2	18.2	1	9.1	4	36.4	4	36.4	11	100
Nepean	-	-	1	11.1	4	44.4	2	22.2	2	22.2	9	100

N = Number of firms
% = Percent of row
* = Projected

Also, in 1981, each city had at least one firm employing over 500 people and Kanata had six with 100 or more workers. Employment forecasts for 1985 indicate that only five firms with 1 - 24 workers will be operating in Ottawa, with 52% of the firms employing no fewer than 100 persons. Furthermore, 72.8% of Kanata's firms expect to employ 100 or more people.

3.5 Firm Age

The RMOC's high-technology base consisted mainly of very young firms. In 1981 there were 27 (60%) firms that were no more than 10 years old. Eighteen (40%) firms were in existence prior to 1971. Suprisingly, perhaps, five (11.1%) firms were more than 26 years old.

Table 6: RMOC High-Technology Firm Ages as of 1981

FIRM AGE (Years)	N	%
1 - 5	14	31.1
6 - 10	13	28.9
11 - 15	9	20.0
16 - 25	4	8.9
26 or more	5	11.1
TOTAL	45	100.0

N = Number of firms
% = Percent of column

Early signs of high-technology manufacturing were evident in Ottawa (four firms) and Nepean (one firm) before 1956. Since 1976 there has been an apparent concentration of high-technology manufacturers within Ottawa.

Table 7: High-Technology Firm Ages as of 1981 by Region

REGION	FIRM AGE (Years)										TOTAL	
	1 - 5		6 - 10		11 - 15		16 - 25		26 or more			
	N	%	N	%	N	%	N	%	N	%	N	%
Ottawa	10	40.0	5	20.0	3	12.0	3	12.0	4	16.0	25	100
Kanata	3	27.3	5	45.4	2	18.2	1	9.1	-	-	11	100
Nepean	1	11.1	3	33.3	4	44.4	-	-	1	11.1	9	100

N = Number of firms
% = Percent of column

Table 8 indicates the weak tendency for the older firms to have larger plants.

Table 8: Comparison Between Firm Age and Size

FIRM SIZE (Employees)	FIRM AGE (years)										TOTAL	
	1 - 5		6 - 10		11 - 15		16 - 25		26 or more			
	N	%	N	%	N	%	N	%	N	%	N	%
1 - 24	7	46.7	5	33.3	2	13.3	1	6.7	-	-	15	100
25 - 49	4	44.4	3	33.3	1	11.1	1	11.1	-	-	9	100
50 - 99	1	11.1	3	33.3	3	33.3	-	-	2	22.2	9	100
100 - 450	2	25.0	1	12.5	3	37.5	1	12.5	1	12.5	8	100
451 & over	-	-	1	25.0	-	-	1	25.0	2	50.0	4	100

N = Number of firms
% = Percent of row

3.6 Firm Ownership

There were 33 (87%) domestic and five (13%) foreign high-technology firms manufacturing within the RMOC in 1976. This pattern of ownership status exhibited no change between 1976 and 1981. Three of the domestic firms were Canadian-controlled subsidiaries. Of the six foreign-owned subsidiaries, four were controlled from the United States and two from Britain.

Table 9: Firm Ownership: 1976 and 1981

REGION	1976				1981			
	DOMESTIC		FOREIGN		DOMESTIC		FOREIGN	
	N	%	N	%	N	%	N	%
Ottawa	16	48.5	4	80.0	20	51.3	5	83.3
Kanata	8	24.2	1	20.0	10	25.7	1	16.7
Nepean	9	27.3	-	-	9	23.0	-	-
RMOC	33	100	5	100	39	100	6	100

N = Number of firms
% = Percent of column

Domestic firms accounted for the greater portion of this Region's high-technology employment base (Table 10). Domestic firms employed 1,885 (60%) workers in 1976 and five years later employed 4,306 (71%) persons. Projections indicate domestic firms will continue this upward trend and employ 10,687 (79%) people in the RMOC by 1985.

Table 10: RMOC High-Technology Employment: Domestic and Foreign

OWNERSHIP	1976		1981		1985*	
	N	%	N	%	N	%
Domestic	1,885	60.0	4,306	71.0	10,687	79.0
Foreign	1,264	40.0	1,793	29.0	2,925	21.0
TOTAL	3,149	100	6,099	100	13,612	100

N = Number of employees
% = Percent of column
* = Projected

Nepean led in domestic high-technology employment in 1976, to be surpassed by Kanata in 1981. Kanata firms employed a mere 234 (12.4%) workers in 1976, but by 1981 1,795 (41.7%) people were working there. Ottawa-based domestic employment almost doubled between 1976 and 1981. Projections for 1985 confirm Kanata's position as the number one locality for high-tech employment, followed by Ottawa and then Nepean.

Table 11: Domestic High-Technology Employment

REGION	1976		1981		1985*	
	N	%	N	%	N	%
Ottawa	542	28.8	1,032	24.0	2,772	26.0
Kanata	234	12.4	1,795	41.7	5,285	49.4
Nepean	1,109	58.8	1,479	34.3	2,630	24.6
RMOC	1,885	100	4,306	100	10,687	100

N = Number of employees
% = Percent of column
* = Projected

Ottawa maintained its strong position in foreign-based employment from 1976 and into 1981. However, foreign firms in Kanata strengthened their standing with 800 (44.6%) employees in 1981 from 400 (31.6%) workers in 1976. Employment projections for 1985 suggest Ottawa's continuing lead with 1,525 (52.1%) workers.

Table 12: Foreign High-Technology Employment

REGION	1976		1981		1985*	
	N	%	N	%	N	%
Ottawa	864	68.4	993	55.4	1,525	52.1
Kanata	400	31.6	800	44.6	1,400	47.9
Nepean	-	-	-	-	-	-
RMOC	1,264	100	1,793	100	2,925	100

N = Number of employees
% = Percent of column
* = Projected

It would appear from Table 13 that in 1976 domestic firms were predominantely small. Approximately 75.8% of the 33 domestically-owned firms employed less than 50 people. However, by 1981 there had been a gradual shift to larger-sized firms with 17 (43.6%) firms employing 50 or more persons. Twenty-two (56.4%) domestic firms still employed less than 50 workers in the RMOC. Employment projections for 1985 indicate a growth in the number of medium- and large-sized firms and a relative decline in smaller ones. Furthermore, Table 13 reveals that only two foreign-owned firms employed less than 50 people.

By 1981, foreign firms were evenly distributed between small-, medium-, and large-sized. Their projections for 1985 indicate that four firms expect to employ 100 or more people in the RMOC.

Table 13: Size of Domestic and Foreign High-Technology Firms

SIZE (Employees)	DOMESTIC						FOREIGN					
	1976		1981		1985*		1976		1981		1985*	
	N	%	N	%	N	%	N	%	N	%	N	%
1 - 24	21	63.7	13	33.3	3	7.7	2	40.0	2	33.3	2	33.3
25 - 49	4	12.1	9	23.1	5	12.8	-	-	-	-	-	-
50 - 99	3	9.1	8	20.5	10	25.6	-	-	1	16.7	-	-
100 - 450	4	12.1	7	17.9	15	38.5	2	40.0	1	16.7	2	33.3
451 & over	1	3.0	2	5.1	6	15.4	1	20.0	2	33.3	2	33.3
TOTAL	33	100	39	100	39	100	5	100	6	100	6	100

N = Number of firms
% = Percent of column
* = Projected

Most of the new firms are domestic, although there are two foreign entrants which have been in the RMOC for under six years.

Table 14: Age of Domestic and Foreign High-Technology Firms

AGE (Years)	DOMESTIC		FOREIGN	
	N	%	N	%
1 - 5	12	30.8	2	33.3
6 - 10	13	33.3	-	-
11 - 15	9	23.1	-	-
16 - 25	2	5.1	2	33.3
26 or more	3	7.7	2	33.3
TOTAL	39	100	6	100

N = Number of firms
% = Percent of column

3.7 Local Association

Approximately 41 (91.1%) respondents indicated as founders had a strong association with the area. Only four firms noted their founders had no strong local association. According to Table 15, those lacking strong local associations were in firms employing less than 100 people.

Table 15: Firm Founder's Association with RMOC by Firm Size

LOCAL ASSOCIATION	SIZE (Employees)									
	1 - 24		25 - 49		50 - 99		100 - 450		451 & over	
	N	%	N	%	N	%	N	%	N	%
Yes	13	86.7	8	88.9	8	88.9	8	100	4	100
No	2	13.3	1	11.1	1	11.1	-	-	-	-
TOTAL	15	100	9	100	9	100	8	100	4	100

N = Number of Firms
% = Percent of Column

Three of the four firms whose founders lacked local association were firms formed within the previous decade.

Table 16: Firm Founder's Association with RMOC by Firm Age

LOCAL ASSOCIATION	AGE (Years)									
	1 - 5		6 - 10		11 - 15		16 - 25		26 or more	
	N	%	N	%	N	%	N	%	N	%
Yes	12	85.7	12	92.3	9	100	3	75.0	5	100
No	2	14.3	1	7.7	-	-	1	25.0	-	-
TOTAL	14	100	13	100	9	100	4	100	5	100

N = Number of firms
% = Percent of column

Thirty-seven (94.9%) of the domestically-owned firms acknowledged the importance of their founder's association with the RMOC in establishing firm operations here (Table 17). Among the foreign-owned subsidiaries, four (66.6%) firms indicated their founders had a strong association with the Region, a reflection perhaps of some foreign investment occurring through take-over of previously domestic firms.

Table 17: Firm Founder's Association with RMOC by Domestic and Foreign Ownership

LOCAL ASSOCIATION	DOMESTIC		FOREIGN	
	N	%	N	%
Yes	37	94.9	4	66.6
No	2	5.1	2	33.3
TOTAL	39	100	6	100

N = Number of firms
% = Percent of column

3.8 Firm Births

The beginnings of a high-technology manufacturing base can be traced back to 1948 when two firms were established (Figure 3). From 1948 to 1966 there was an apparent lull in high-tech firm creation. Only seven (15.6%) of those born during this period still remained in 1981. A small surge in firm births was evident in the Region between 1967 to 1971 and 10 (22.2%) of these firms still operated in 1981. However, the major growth of high-technology firms occurred between 1973 and 1978. Twenty-three (51.1%) new firms that emerged in this span of six years still operated in 1981.

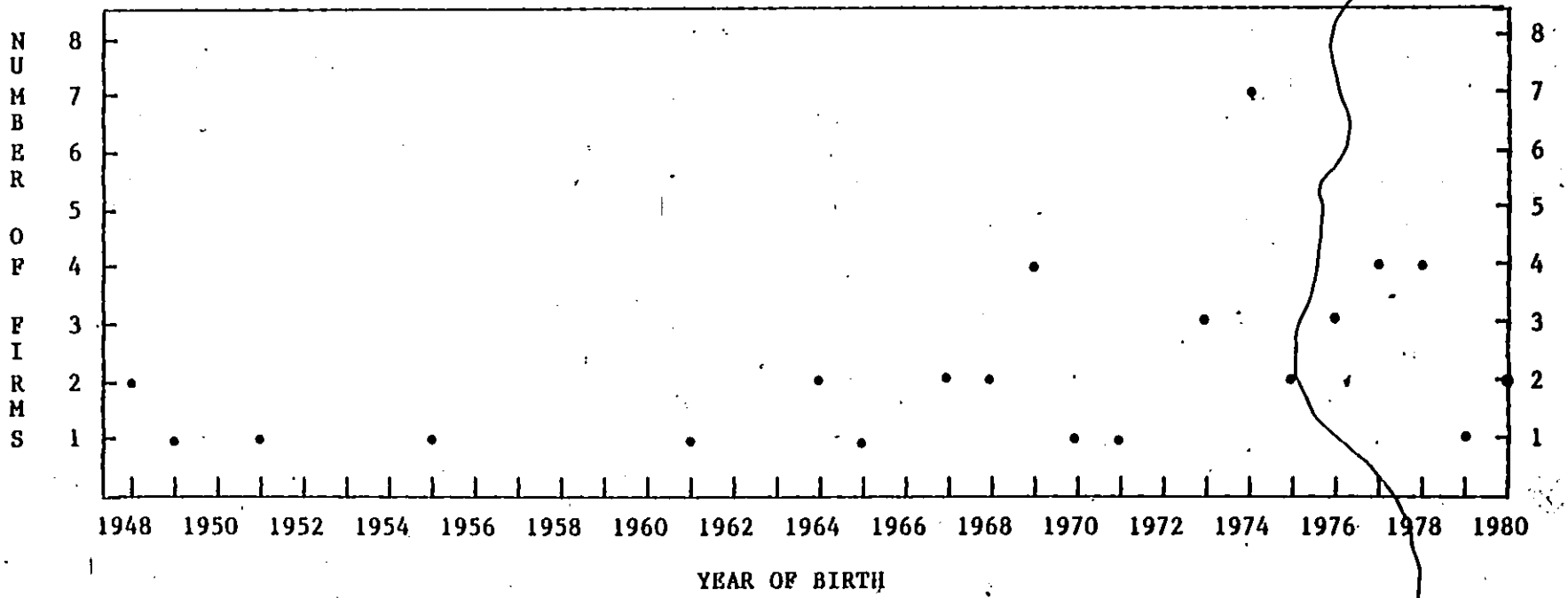


Figure 3: High-Technology Firm Births by Year

CHAPTER IV

THE RMOC ENVIRONMENT: ADVANTAGES AND DISADVANTAGES

4. Introduction

What factors have been perceived by the senior executives of these high-tech firms as being positive or negative in their regional environment? For instance, is proximity to the federal government viewed to be an advantage? And does management's perception of the local environment vary according to characteristics such as ownership, age, size, product type or firm structure? Perhaps what one firm perceives as a serious disadvantage may be less serious or even an advantage to another firm.

It is the purpose of this chapter to identify the advantages and disadvantages of Ottawa's economic environment as perceived by the Region's high-tech managers.

4.1 Proximity to the Federal Government

In the questionnaire, respondents were asked to evaluate the importance of their proximity to the federal government on a scale of one, very significant, to five, very insignificant. Contrasts in the responses to this question are rated according to ownership, size and age characteristics in Table 18.

Table 18: Firm's Proximity to the Federal Government by Ownership Size and Age of Firm, 1981.

	Very Significant 1		2		3		4		Very Insignificant 5		TOTAL	
	N	%	N	%	N	%	N	%	N	%	N	%
OWNERSHIP												
Domestic	9	23.1	13	33.3	5	12.8	5	12.8	7	18.0	39	100
Foreign	2	33.3	2	33.3	1	16.6	-	-	1	16.6	6	100
SIZE (EMPLOYEES)												
1 - 24	3	20.0	4	26.4	2	13.3	3	20.0	3	20.0	15	100
25 - 49	3	33.3	2	22.2	2	22.2	1	11.1	1	11.1	9	100
50 - 99	1	11.1	5	55.6	-	-	1	11.1	2	22.2	9	100
100 - 450	3	37.5	2	25.0	1	12.5	-	-	2	25.0	8	100
451 & over	1	25.0	2	50.0	1	25.0	-	-	-	-	4	100
AGE (YEARS)												
1 - 5	3	21.4	4	28.6	3	21.4	1	7.1	3	21.4	14	100
6 - 10	3	23.1	3	23.1	1	7.4	4	30.8	2	15.4	13	100
11 - 15	2	22.2	3	33.3	1	11.1	-	-	3	33.3	9	100
16 - 25	1	25.0	2	50.0	1	25.0	-	-	-	-	4	100
26 or more	2	40.0	3	60.0	-	-	-	-	-	-	5	100

N = Number of firms
% = Percent of row

Most (83.4%) foreign-owned firms acknowledged the importance of their proximity to the federal government as three or higher. However, domestic firms placed relatively less emphasis on such proximity with only 27 firms (69.2%) rating this question as three or higher. Furthermore, only one foreign firm indicated its proximity to the federal government as very insignificant whereas twelve domestic firms rated this factor as four or lower.

All four firms employing 451 or more people rated the significance of their proximity to the federal government as three or higher. Firms employing less than 451 people appeared to be relatively divided on this question. Twenty-eight (68.3%) of these firms regarded such proximity as three or higher while the remaining 13 (31.7%) considered it to be four or lower.

Another contrast is revealed by the firm age factor. All nine firms that were sixteen or more years old agreed that federal government proximity was three or higher. There was a greater propensity for young high-tech firms not to view proximity as significant. A total of 23 firms regarded close proximity to the federal government as three or higher and 13 as four or lower.

4.2 The Federal Government as an Economic Shadow

The immediate presence of the federal government may also have its detrimental elements. To what extent does it "overshadow" the Region's high-technology industry as some have claimed? The CIDC indicated some concern about this point. In the context of this thesis, the term "overshadow" was used to indicate whether or not the Region's high-tech managers considered that the presence of the federal government was an actual impediment to their future growth. Were there firms worried about federal government favoritism for particular manufacturers when awarding contracts, or which believed the government was a trend setter with respect to salaries and benefits, which might be detrimental to the firms' performance?

Twenty (44.4%) respondents believed the federal government did in some sense overshadow the industry, whereas 25 (55.6%) did not believe it overshadowed them. The basis for these replies arise from a variety of factors. For instance, a major complaint of the high-technology industry is the federal government's role as a "trend setter" with respect to salaries and benefits. Whether it is such a trend setter is less important than the perception that it is. Furthermore, one medium-sized firm ventured that the federal government was "attempting to directly interfere with the natural market forces affecting growth patterns by favouring some companies over others, deliberately and openly, and without apology". Among the positive reactions were claims

that government financial and technical assistance has enhanced high-technology industrial expansion within the area. A number of firms also cited the federal government as a primary factor in building up their export base. Finally, one respondent regarded the federal government and the high-technology industry as being complementary to each other. He stated that "the government has a major economic interest in encouraging high-tech in Canada and the high-tech industry wishes to sell to government departments".

Table 19 contrasts ownership, size and age with this issue of the federal government overshadowing the development of the Region's high-technology industry. Four (66.7%) foreign-owned firms replied 'yes' to this question whereas only 16 (41%) domestically-owned firms agreed. There is a certain air of ambivalence regarding the impact of the federal government, particularly when comparing foreign subsidiary responses to the questions on proximity and government 'overshadowing'. Three of the firms stressing the significance of their proximity to the federal government claimed that the federal government also overshadowed the Region's high-tech industry. As one of these respondents replied: "There is little contact or understanding on either side. Another example of two cultures."

There is little apparent role of age or size in influencing perceptions on whether or not the federal government's presence overshadows the high-tech industries.

Table 19: Does the Federal Government Overshadow the Region's High-Tech Industry, by Ownership, Size and Age of Firm , 1981.

	Yes		No		TOTAL	
	N	%	N	%	N	%
OWNERSHIP						
Domestic	16	41.0	23	59.0	39	100
Foreign	4	66.7	2	33.3	6	100
SIZE (EMPLOYEES)						
1 - 24	6	40.0	9	60.0	15	100
25 - 49	5	55.5	4	44.5	9	100
50 - 99	5	55.5	4	44.5	9	100
100 - 450	2	25.0	6	75.0	8	100
451 & over	2	50.0	2	50.0	4	100
AGE (YEARS)						
1 - 5	5	35.7	9	64.3	14	100
6 - 10	7	53.8	6	46.2	13	100
11 - 15	3	33.3	6	66.7	9	100
16 - 25	2	50.0	2	50.0	4	100
26 or more	3	60.0	2	40.0	5	100

N = Number of firms
% = Percent of row

4.3 Ability of Major Canadian Cities to Satisfy Firm Operations

Does Ottawa offer something uniquely attractive to high-tech firms? Respondents were invited to rate eleven major Canadian cities as to the ability of those cities to satisfy the overall current locational requirements of the firm. It was indicated that this question was not to be interpreted in terms of the ability of a city to satisfy the requirements of a branch expansion. A list of these cities and the scale on which they were rated can be found in Table 20. This question was not fully answered by all respondents which accounts for the numerical differences in the 'total' column.

As might be expected, Ottawa was rated as number one (very satisfactory), 28 times and 12 times as number two. Three firms classified Ottawa as only acceptable and one firm as less than acceptable. Other reasonably highly-rated cities, in order of importance, were, Toronto, Calgary, Montreal, Kitchener-Waterloo and Vancouver. The most unsatisfactory city, from the viewpoint of these firms was Halifax, followed by Winnipeg, Edmonton, London and Hamilton. Although Calgary, Montreal, Kitchener-Waterloo and Vancouver were reasonably highly-rated, they were also considered to be less than acceptable and unsatisfactory (columns 4 and 5) by a number of firms, including at least 14 firms for Vancouver, and as many as 19 firms for Montreal.

Table 20: Firm's Rating of Major Canadian Cities

CITY	Very Satisfactory				Acceptable				Unsatisfactory				Less than Acceptable: (Columns 4 & 5)
	1		2		3		4		5		Total		
	N	%	N	%	N	%	N	%	N	%	N	%	%
Halifax			3	7.9	5	13.2	8	21.1	22	57.9	38	100	79
Montreal	5	12.8	7	17.9	8	20.5	11	28.2	8	20.5	39	100	49
Ottawa	28	63.6	12	27.3	3	6.8	1	2.3			44	100	2
Toronto	15	37.5	16	40.0	6	15.0	2	5.0	1	2.5	40	100	7
Hamilton	3	8.1	5	13.5	10	27.0	11	29.7	8	21.6	37	100	51
Kitchener / Waterloo	4	10.8	7	18.9	11	29.7	9	24.3	6	16.2	37	100	30
London	1	2.6	7	18.4	10	26.3	10	26.3	10	26.3	38	100	52
Winnipeg	1	2.6	5	13.2	7	18.4	13	34.2	12	31.6	38	100	65
Edmonton	2	5.3	6	15.8	7	18.4	12	31.6	11	28.9	38	100	61
Calgary	3	7.9	11	28.9	8	21.1	6	15.8	10	26.3	38	100	42
Vancouver	4	11.1	7	19.4	11	30.6	8	22.2	6	16.7	36	100	39

N = Number of firms
% = Percent of row
1 = Very Satisfactory
3 = Acceptable
5 = Unsatisfactory

4.4 Factors Encouraging Initial Development

Respondents were asked to list up to three factors which stimulated the firm's initial development within the area. These responses are indicated in Table 21.

Table 21: Factors Stimulating Firm's Initial Development

Factors	Location of Firm				Firm Ownership		Firm Size					Firm Age				
	Ottawa	Kanata	Nepean	RHOC	Domestic	Foreign	1-24	25-49	50-99	100-450	451 & over	1-5	6-10	11-15	16-25	26 or more
1. Potential of the Local Market	4	2	2	8	7	1	3	1	2	1	1	3		3	2	
2. Access to the National Market	5			5	4	1	2	1	2			2	2			1
3. Availability of Highly Skilled Labour	4	3	2	9	7	2	2	1	3	1	2	4	3			2
4. Universities	1	1		2	2		1	1				2				
5. Research Facilities	1	2	2	5	5		1		1	2	1	1	1	2		1
6. Land Prices and Rents	4	1		5	4	1	1	1	1	2		3			1	1
7. Availability of Capital	5			5	4	1	2	1		1	1	2	1		1	1
8. High-Tech Agglomeration	3	6	3	12	12		3	4	3	1	1	4	6	2		
9. Presence of Federal Government	12	5	4	21	17	4	7	3	5	3	3	5	4	5	3	4
10. Technical Services		1		1	1					1				1		
11. Professional Services		1		1	1					1				1		
12. Supplies from Local Manufacturers	1	1	1	3	3		1	1		1			2	1		
13. Resident of Area	9	3	3	15	14	1	10	1	2	2		6	6	3		
14. Residential Attraction	4		1	5	5		3	1	1		1	3	2			

Nearly half the respondents cited the presence of the federal government[6] as the principal factor leading to the firm's initial development. A further 33.3% listed the importance of the firm's founders being resident in the Region while 26.7% referred to high-tech agglomeration as an initial stimulation. High-tech agglomeration was identified by Kanata firms as the number one stimulating factor.

Foreign subsidiaries had a tendency to attribute their initial development in the RMOC to the presence of the federal government followed by the availability of a highly-skilled labour force.

Small firms, one to 49 employees, acknowledged the importance of their founder being a resident of the area. They also listed the presence of the federal government and high-tech agglomeration as the next two most important factors. Both medium firms, 50 to 450 employees, and large firms, 451 or more workers, identified the presence of the federal government as the key initial stimulator. Medium-sized firms also mentioned both high-tech agglomeration and the availability of a highly-skilled labour force as factors influencing their initial development.

[6] The phrase "presence of the federal government" encompasses a variety of factors helpful to the development of high-technology firms. Such factors include: accessibility to those responsible for allocating R & D capital and making decisions on the use of the government's buying power; superior research facilities; and knowledge of technology within the local pool of skilled labour.

Firms that were less than eleven years old attributed their founder's residential affiliation with the area as the number one factor. Other initial stimulators cited, in order of importance, were high-tech agglomeration, the presence of the federal government, and an available high-skilled labour force. All firms eleven or more years old referred to the presence of the federal government as a significant location incentive.

4.5 Evaluation of Location: Advantages

Respondents were also requested to list the key factors responsible for the recent growth of their firm in the RMOC. A total of eight major factors were identified and these can be found on Table 22.

The Region's principal advantage for the recent growth of these firms was the presence of the federal government. The next most favourable factor was the availability of highly-skilled labour, followed by high-tech agglomeration, a clearly interrelated set of factors. Four firms remarked on Ottawa's image as the "high-tech capital".

It is apparent from Table 22 that foreign-owned firms noted very few factors in the RMOC as favourable.

Table 22: Factors Favourable to Recent Development or Growth of Firm

Factors	Location of Firm				Firm Ownership		Firm Size					Firm Age				
	Ottawa	Kanata	Nepean	RHOC	Domestic	Foreign	1-24	25-49	50-99	100-450	451 & over	1-5	6-10	11-15	16-25	26 or more
1. Availability of Highly Skilled Labour	6	2	1	9	8	1	1	2	2	4		5	1	1	1	1
2. Land Availability		1	1	2	1	1			1		1			1	1	
3. High-Tech Agglomeration	5	1	1	7	6	1	1	2	2	1	1	3	2			2
4. Presence of Federal Government	14	3	3	20	18	2	5	4	6	4	1	5	5	4	2	4
5. Technical Services		2		2	2		1			1		1	1			
6. Professional Services	1	1	1	3	3		3					1	1	1		
7. Availability of Suppliers	1			1	1		1						1			
8. "High-Tech Capital" Image	3		1	4	4		1	2	1			1	2			1

Both small- and medium-sized firms indicated the presence of the federal government as their most favourable factor. Small firms further identified professional services. Large firms did not emphasize any one particular factor.

The principal factor identified by all age groups was the presence of the federal government. Firms less than six years of age also identified the importance of the Region's abundant high-skilled labour force and high-tech agglomeration.

4.6 Evaluation of Location: Disadvantages

The last question was directed at identifying what factors the executives considered might reasonably be changed in order to improve the firm's operations in the RMOC (Table 23).

Approximately 69% of the respondents perceived the Region's principal disadvantage to be the lack of direct air flights to major U.S. and European cities. Another 22% were dissatisfied with the supply of high-skilled labour. Twenty percent disapproved of federal government interference and discrimination[7] among firms. However, it should be

[7] Less federal government interference and discrimination were terms used by some respondents to accentuate their concern over federal government involvement in the following areas: the lack of federal high-tech industrial development policies; a shortage of federal R & D capital; and federal preferential support of competitors when awarding contracts.

Table 23: Factors to be Changed in Order to Improve Firm's Operations

Factors	Location of Firm				Firm Ownership		Firm Size					Firm Age				
	Ottawa	Kanata	Nepean	RMOC	Domestic	Foreign	1-24	25-49	50-99	100-450	451 & over	1-5	6-10	11-15	16-25	26 or more
1. Lower Labour Costs			1	1	1			1						1		
2. Lower Cost of Living			1	1	1			1						1		
3. More R&D Capital	2	2	1	5	5			1	1	2	1	1	1		1	2
4. Reduction in Fed. & Prov. Corp. Taxes			1	1	1				1					1		
5. A More Skilled Labour Supply	3	3	4	10	10		4	1	2	2	1	1	4	2	2	1
6. A More Diversified High-Tech Base	3	1	2	6	5	1	3	1		2		2	2	1	1	
7. Less Federal Government Interference	4	1	1	6	5	1	2		1	3		1	1	2		2
8. Less Municipal Government Interference		1		1		1					1				1	
9. Less Federal Government Discrimination	2	1		3	3		2			1		1	1	1		
10. More Direct Air Flights	16	9	6	31	27	4	9	6	7	6	3	11	9	7	2	2
11. Cheaper Air Transport	1	1	1	3	2	1	1			2		1		1		1
12. More Suppliers	5			5	3	2	3		1	1		2	2			1
13. Direct Telephone Service to Europe	1			1	1		1						1			

noted that 21 of the respondents also identified the federal government as a principal factor leading to the firms' initial development (Table 21). Another two complaints were geared to the need for more local suppliers and R & D capital.

The major complaint of both domestic and foreign firms was the need for more direct air flights. Also high on the list of domestic firm responses was a need for: a more skilled labour force; more R & D capital; a more diversified high-tech base; and, less federal government interference and discrimination in high-tech firm operations.

Categorizing responses according to size of firm indicates that all sizes believed in the need for more direct air flights to the U.S. and Europe. A more skilled labour force and a more diversified high-tech base completed the list of major small firm complaints.

The major complaint concerning the need for more direct air flights was apparent among all age groups of firms. Firms less than eleven years old were also dissatisfied with a shortage of both suppliers and skilled labourers, as well as a lack of diversification within the high-technology industry. Firms over ten years old were more concerned with an increase in R & D spending, less federal government interference and more skilled labour.

This air transportation issue generates an array of comments such as: "customers usually arrive extremely tired and with a fresh crop of stories about travel frustrations", and, "I am embarrassed by the airline service between Mirabel and Ottawa for our European visitors".

Respondents, although noting Ottawa as a satisfactory location when compared with a number of other Canadian cities, have identified a series of disadvantages inherent to the Region which might possibly restrict the further development of a high-tech industrial base. These disadvantages must be resolved if the RMOC is determined to maintain its image as "Silicon Valley North". To date, high-tech managers have lobbied extensively, and with some success, for improved air services. Furthermore, the Region's educational institutions are evidently attempting to remove the skilled labour shortage problem. Algonquin College, for instance, has decided to offer more computer related courses and Carleton University has established a Department of Computer Science.

CHAPTER V

LINKAGES OF THE RMOC HIGH-TECHNOLOGY INDUSTRY

5. Introduction

The rapid growth of the Region's high-technology industry has exerted many new demands on the local economy or created a number of opportunities. To what extent are the high-tech firms tied to local supply sources or local demand? And with which government departments, institutions or Crown corporations do the high-tech firms maintain significant contact linkages?

This chapter identifies the backward and forward linkages of the Region's high-tech industry. Forward linkages denote a firm's connections with its customers (sales) and backward linkages mark a firm's ties with its suppliers (purchases). (Hoare, 1975). In this study these linkages are contrasted according to firm ownership, size and age. Also in the questionnaire, respondents, who indicated that their proximity to the federal government was very significant, were asked to identify those government departments or institutions whose proximity they found to be most useful. The responses to this question are revealed in Table 24.

Backward and forward linkages were also identified by way of the questionnaire and they are summarized in Table 25 and 26. The percentages on both tables represent a weighted average for purchases and sales.

5.1 High-Tech Linkages with the Federal Government

Forty-two percent of the high-technology firms rated their proximity to the federal government as either three of lower (Table 18). Furthermore, nine of these 19 firms claimed that the federal government did overshadow the Region's high-tech industry. Four of these nine firms only rated Ottawa as an acceptable or less than acceptable city for satisfying the firm's current locational requirements (Table 20).

Table 24 lists those government departments and federal institutions interacting with the high-tech manufacturers which considered such interaction to be very significant to their presence in Ottawa. A total of 26 firms identified some 69 federal government linkages. Contact with the Department of National Defence proved most important with 14 linkages (20.3%). The other main contacts were with the Department of Supply and Services and the National Research Council, each with 10 (14.5%) linkages. Other significant federal government linkages were with: Department of Industry, Trade and Commerce (13.0%); Transport Canada (11.6%); Department of Communications (11.6%); and the Department of Energy, Mines and Resources (7.2%).

The nature of the interactions involved with these agencies range widely, of course, incorporating the federal government's role as:

Table 24: Firm's Major Contact Linkages with Federal Government

FEDERAL GOVERNMENT	NUMBER OF FIRMS
1. Energy, Mines and Resources	5
2. National Defence	14
3. Transport Canada	8
4. Public Works	3
5. Industry, Trade and Commerce	9
6. Supply and Services	10
7. Communications	8
8. National Research Council	10
9. Federal Business Development Bank	2
TOTAL	69

a potential consumer for high-tech products; a supplier of technical expertise; and a source for R & D funding.

5.2 Backward Linkages

Table 25 indicates that 47% of the high-tech firms' total material, parts and component purchases were from abroad, 28.4% from the rest of Canada, and only 24.6% from Ottawa. The purchasing patterns varied slightly between firms in various parts of the RMOC. Nepean's firms purchased the most inputs from within Canada with only 33.9% of their purchases coming from foreign countries. Both Ottawa's and Kanata's firms purchased over 50% of their inputs from abroad.

Is there any difference between Canadian- and foreign-owned firms in the degree of their linkage to the local economy? McDermott (1979), in his study of the high-technology industry in Scotland, noted little interaction between the local economy and high-tech manufacturers, regardless of ownership status. For example, the majority of both foreign and domestic sales were destined for other markets in the host country. Their purchases, however, originated from different markets. Foreign subsidaries were dependent on their parent firms for the majority of their material inputs, where as indigenous firms relied on other domestic markets for their input requirements. In the RMOC there was a notable though small difference between the purchasing patterns of domestic and foreign firms. Foreign-owned firms purchased most from

Table 25: Origin of Purchases

CHARACTERISTICS	Number	Percent Total Purchases		
		Ottawa	Rest of Canada	Foreign
Location				
1. Ottawa	25	22.7	23.8	53.5
2. Kanata	11	22.3	24.2	53.6
3. Nepean	9	28.9	37.2	33.9
4. RMOC	45	24.6	28.4	47.0
Ownership				
1. Domestic	39	25.8	27.4	46.8
2. Foreign	6	11.2	22.5	66.3
Size (Employees)				
1 - 24	15	23.1	23.2	53.7
25 - 49	9	25.9	28.9	45.2
50 - 99	9	32.0	23.8	44.2
100 - 450	8	17.8	30.2	48.0
451 and over	4	23.5	31.7	44.8
Age (Years)				
1 - 5	14	16.8	15.9	67.3
6 - 10	13	28.5	27.7	43.8
11 - 15	9	27.8	32.3	39.9
16 - 25	4	12.5	33.8	53.8
26 or more	5	33.6	37.2	29.2

abroad (66.3%) while domestic companies depended to a greater extent on Canadian made inputs (53.2%). Only 11.2% of the foreign subsidiary purchases were from the Ottawa area as opposed to the 25.8% of such purchases made by domestic firms.

The spatial patterns of purchases were remarkably similar among the various categories of firm sizes. Each of the size groups purchased at least 40% of their inputs from abroad.

Firms between the ages of 1 to 5 and 16 to 25 years bought the least amount of inputs from RMOC suppliers with only 16.8% and 12.5% Ottawa-based purchases, respectively. Firms that were 26 or more years old purchased the most inputs (33.6%) from the Ottawa area. There was a general upward progression in the purchasing of inputs from the rest of Canada as the firms increased in age. Young firms, one to five years, tended to buy the most goods from foreign countries (67.3%). The least amount of foreign purchases (29.2%) was recorded by firms 26 or more years old.

5.3 Forward Linkages

Table 26 indicates that high-tech sales were relatively evenly distributed between Ottawa (30.6%), the rest of Canada (35.7%) and foreign countries (33.7%). The most sales to the RMOC originated from firms operating in Nepean (38.3%). Sales to foreign markets were

Table 26: Destination of Sales

CHARACTERISTICS	Number	Percent Total Sales		
		Ottawa	Rest of Canada	Foreign
Location				
1. Ottawa	25	32.5	37.2	30.3
2. Kanata	11	20.9	32.7	46.4
3. Nepean	9	38.3	37.2	24.4
4. RMOC	45	30.6	35.7	33.7
Ownership				
1. Domestic	39	32.4	35.6	32.0
2. Foreign	6	20.5	39.5	40.0
Size (Employees)				
1 - 24	15	26.2	47.5	26.3
25 - 49	9	53.6	34.2	12.2
50 - 99	9	29.7	31.8	38.6
100 - 450	8	31.3	28.0	40.7
451 and over	4	5.0	24.5	70.5
Age (Years)				
1 - 5	14	30.4	41.1	28.6
6 - 10	13	25.8	33.1	41.2
11 - 15	9	43.8	35.0	21.1
16 - 25	4	42.5	33.5	24.0
26 or more	5	12.4	34.2	53.4

highest among Kanata firms (46.4%) while sales to the rest of Canada were dominated equally by Ottawa (37.2%) and Nepean (37.2%).

Domestic firms demonstrated little market concentration geographically at least among the three categories identified, with sales to Ottawa (32.4%), rest of Canada (35.6%) and foreign countries (32.0%). Foreign subsidiaries were less oriented to the local market, with approximately 80% of their sales concentrated in other markets in Canada (39.5%) and abroad (40.0%).

Those employing between 25 to 49 people in the RMOC were the most oriented to the local market, with 53.6% of their sales made here. The largest producers sold only 5% of their finished products in the RMOC.

Firms that were more than 25 years old were least oriented to the local market with only 12.4% of their sales made here and over 50% of their sales made abroad. Young firms, one to five years, focussed to a greater extent on the rest of the Canadian market with sales reaching as high as 41% of their total output.

The complaint by several respondents that there is a definite need for more local suppliers of high-tech inputs is substantiated by the fact that three quarters of the Region's high-tech material, inputs are

purchased from markets outside the RMOC. The presence of these suppliers would further contribute to the local economy as well as to the RMOC's growing high-tech base.

CHAPTER VI

SUMMARY AND CONCLUSIONS

6.1 Summary

The aim of this thesis has been to provide answers to the nine questions posed in the introduction, as well as to determine if the factors encouraging RMOC high-tech industrialization are characteristic of those factors outlined in Chapter II. This was accomplished by compiling and organizing a data base suitable for describing and analyzing some features of the RMOC's high-tech industrial geography.

This investigation has noted that industrialization within the RMOC for a long time was small scale, with production in earlier years primarily of the type geared to servicing local market demands. In recent years, however, rapid industrial development has occurred, the growth coming primarily from the high-technology industry.

In 1976, 38 high-tech firms employed 3,149 people. By 1981, 45 firms employed 6,099 workers. Management of these high-tech firms projected in 1981 that by 1985 their 45 high-technology firms will have more than doubled their RMOC employment base to 13,612 people.

In 1976, high-tech employment was concentrated in Ottawa but by 1981, Kanata had taken the lead followed by Ottawa and then Nepean. There was an apparent concentration of high-tech firms in four main areas: the Herzberg-Schneider-Legget Road district in Kanata; the Grenfell-Bongard-Slack Road region in Nepean; and the Morrison-Queensview and Woodward-Courtwood areas in Ottawa.

This study also identified the following three features in the structure of RMOC high-technology firms. Firstly, 36 firms were locally-owned independent enterprises, three were domestic subsidiaries, and six were foreign subsidiaries. Secondly, these firms were basically small in Ottawa and Nepean, while medium and large firms were more characteristic of Kanata's high-technology industry. Thirdly, 27 of the Region's high-tech firms were established within the past ten years. However, nine firms were located in the RMOC before 1966.

After Ottawa, with which most firms were satisfied as a location, the firms considered Toronto and Calgary to be the cities next most able to satisfy their current locational requirements, among the eleven cities targeted. The least acceptable locations among the main cities identified were Halifax and Winnipeg, then Edmonton, London, Hamilton and Montreal.

The success of the RMOC's high-tech industry has been attributed to a number of advantages, even though a series of disadvantages have been perceived. However, prior to stating any general conclusions;

it should be noted that the factors considered in the high-tech location decision-making process vary according to firm size, age and ownership. At the regional level however, the following factors were identified.

The single most important contributing factor to the development and success of the RMOC's high-tech industrial base is the presence of the federal government. This factor alone is the most noteworthy advantage that this Region has. Such attraction to the federal government is largely attributed to its massive buying power, well-developed research facilities, and high-skilled labour. There exist, however, certain grievances within the high-tech community towards the federal government which include: a lack of R & D spending; discrimination in awarding contracts; and wage levels of public servants. Nonetheless, these complaints have not undermined the continued development of what appears to be Canada's largest concentration of high-tech manufacturers.

Such high-tech concentration has encouraged the development of agglomeration economies, another factor considered in the location selection process. Such high-tech clustering has fostered the development of spinoffs and strengthened technical and information flows via synergism and technological cross-fertilization. These latter attributes have not been explored in this thesis but that does not understate their importance in understanding the properties of an agglomeration economy. In fact, they are worthy of investigative studies of their own.

There is an apparent shortage in the RMOC of suppliers to the high-tech firms. This study, as well as others (Ontario Government, 1980; U.S., 1980), noted that areas characteristic of high-tech clustering often lack a suitable supply and support service, and this may jeopardize the continued success of the high-tech community. For example, 75% of the RMOC high-tech inputs are purchased from markets outside the local economy.

Yet another intrinsic location requirement as identified by high-tech managers is an available high-skilled labour force. Although the RMOC has been typified as a center of high-skilled labour, and boasts more university degrees per capita than any other city in Canada, firms identified a potentially alarming shortage of high-skilled workers.

High-tech manufacturers also note that their further development would be assisted by improved direct air connections to centers such as Boston and New York. RMOC high-tech manufacturers now share a growing concern over the lack of direct flights to major U.S. and European destinations since foreign markets now account for over 30% of their sales. The major problem with existing passenger flights is that they often result in tiresome delays through re-routing and stop-overs. Perhaps a study designed to identify the destination and frequency of visits made by high-tech manufacturers would result in the eventual introduction of more direct flights.

Local high-tech manufacturers also identified their founders' local association and the community's aesthetic qualities as important factors influencing their location. They were not concerned with employee tax rates, which was, however, a major consideration in the location selection process of U.S. high-tech firms. Perhaps there are larger tax discrepancies between regions in the U.S. than is the case in Canada.

The responses provided by the region's high-tech manufacturers support three of the five principal findings identified in various studies discussed in Chapter II. These include: the presence of a high-skilled labour force, the existence of high-tech agglomeration, and the provision of a well-developed infrastructure, although there are clearly concerns about the adequacy of air passenger service. Other major factors noted in Chapter II, proved to be of a lesser importance in this study. They were the design of state and local tax structure, the presence of academic institutions and a favorable business climate. For high-tech manufacturers in the RMOC, much the most notable factor was the presence of the federal government, a factor not identified in studies of other high-tech concentrations.

This thesis represents the first major survey of the development of the RMOC's high-technology industry. It provides a base for comparative studies with other cities, and an indication of the role of particular factors in the development of a high-technology industrial complex.

6.2 Concluding Comments

The development of the Region's high-tech manufacturing base can be traced back at least to 1948, but the real surge in private sector investment did not occur until the late sixties. In a span of twelve years (1969-80) a total of 32 high-tech manufacturers set up operations in the RMOC. Indeed, there may have been many more as this analysis has ignored those which may have failed before 1981. On the basis of responses to this survey, it is clear that executives in the high-tech firms wish to expand their operations here. From a regional viewpoint, the following types of action might help support their endeavors:

1. Expand Ottawa's direct air connections to accommodate, where economically feasible, the passenger flight requirements of high-tech firms to major U.S. and European destinations. Existing air travel arrangements result in tiresome delays through re-routing and stop-overs.

2. Ease the high-tech industry's problems in acquiring a skilled labour force, by encouraging the area's educational institutions, mainly Ottawa and Carleton Universities and Algonquin College, to expand upon existing computer and related science and engineering programs.

3. Encourage new high-tech suppliers to move into the region. Some of the Region's high-tech manufacturers would benefit from a broader range of local suppliers. At the moment they rely on other Canadian and foreign sources. The RMOC might usefully encourage the development of ancillary industries, which, at the same time, would contribute to the diversification of the Region's high-tech base.

4. Strengthen the role of the Commercial and Industrial Development Corporation, CIDC, as a liaison between the Region and prospective high-tech manufacturers. To date, CIDC has been instrumental in attracting a number of high-technology industries to the RMOC. A major success has been their periodical publications, Enterprise and Interface Ottawa.

A number of communities, Canadian and otherwise, have looked with envy at Ottawa's high-tech growth. The Region has before it a "golden opportunity" to reduce its economic dependence on the federal government by stressing its advantages for science- and technology-based development, and nurturing the continued expansion of its high-tech industrial base. The Region must be alert to fully capitalize on its advantages when every community in North America seems to want to attract high-tech firms. It must also do its best to rectify its disadvantages, in order to maintain its newly-won image as "the high-tech capital of Canada".

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APPENDIX I

RMOC: 1981 Manufacturers of High-Technology Products

RMOC: 1981 MANUFACTURERS OF HIGH-TECH PRODUCTS

FIRM NAME	ADDRESS	REGION
AEA Electronic Ltd.	53 McBean	Ottawa
Louis Albert Associates Ltd.	2264 Stevenage Dr.	Ottawa
Allcom Data Ltd.	5 Caesar Ave.	Nepean
Alphatext Ltd.	240 Catherine St.	Ottawa
Avtech Electrosystems Ltd.	15 Grenville Cres.	Nepean
Richard Brancker Research Ltd.	27 Monk St.	Ottawa
Canadian Astronautics Ltd.	1024 Morrison Dr. - Floor 2	Ottawa
Canadian Marconi Ltd.	1150 Morrison Dr.	Ottawa
Cesco Electronics Ltd.	66 Colonnade Rd.	Nepean
Cirtronics Ltd.	89 Bentley Ave.	Nepean
Compucraft Systems Ltd.	701-2197 Riverside Dr.	Ottawa
Computing Devices of Canada	Bells Corners	Nepean
Computex Centres Ltd.	1795 Courtwood Cres.	Ottawa
Consolidated Computer Inc.	2421 Lancaster Rd.	Ottawa
Cybernex Ltd.	1257 Algoma Rd.	Ottawa
D.G. Instruments Ltd.	308 Leggett Dr.	Kanata
DM-4 Systems	1573 Laperrière St.	Ottawa
Data Images Inc.	1283 Algoma Rd.	Ottawa
Digital Electronics Laboratories	4 Foothills Dr.	Nepean
Digital Equipment of Canada	100 Herzberg Rd.	Kanata
Digital Methods Ltd.	1736 Courtwood Cres.	Ottawa
Dipix Systems Ltd.	1785 Woodward Dr.	Ottawa
Dynalogic Corporation Ltd.	141 Bentley Ave.	Nepean

FIRM NAME	ADDRESS	REGION
Epitek Electronics Ltd.	100 Schneider Rd.	Kanata
Filtran Ltd.	229 Colonnade Rd.	Nepean
Fisher Scientific Co. Ltd.	112 Colonnade Rd.	Nepean
Foundation Electronic Instruments Ltd.	1794 Courtwood Cres.	Ottawa
Gandalf Data Communications	9 Slack Road	Nepean
Harrison, Williams & Associates	1085 Cahill Dr. West	Ottawa
Harris N. Computer Corp.	1150 Morrison Dr.	Ottawa
Inax Instruments Ltd.	306 Moodie Dr.	Nepean
Interdaco	2373 Stevenage Dr.	Ottawa
Interoptics	17 Grenfell Cres.	Nepean
K.O. Mair Associates Ltd.	145 Spruce St.	Ottawa
Leak-X-Dectron Devices Ltd.	215 Colonnade Rd.	Nepean
Leigh Instruments Ltd.	2680 Queensview Dr.	Ottawa
Lumonics Research Ltd.	105 Schneider Rd.	Kanata
Marinav Corporation	1140 Morrison Dr.	Ottawa
Mechron Engineering Products	2437 Kaladar Ave.	Ottawa
Miller Communication Systems	300 Leggett	Kanata
Mini-Peripherals Inc.	2760 Fenton Rd.	Ottawa
Mitel Corporation	Highway 17	Kanata
Multilek Inc.	15 Grenfell Cres.	Nepean
Nican Electronics Corp.		Kanata
Nortec Solar Industries Inc.	1501 Sieveright Rd.	Ottawa
Northern Telecom Ltd.	Hwy. 17 at Eagleson Rd.	Kanata
Optotek Ltd.	1283 Algoma Rd.	Ottawa

FIRM NAME	ADDRESS	REGION
Ottawa Printed Circuits Ltd.	1120 Morrison Dr.	Ottawa
Presentey Engineering Products	2784 Fenton Rd.	Ottawa
Pylon Electronic Development	20-H Enterprise Ave.	Nepean
Quantetics Corporation	582 Somerset West	Ottawa
Racal Canada Ltd.	1806 Woodward Dr.	Ottawa
Sander Geophysics Ltd.	250 Herzberg Rd.	Kanata
Satel Consultants Ltd.	1013 Wiseman Cres.	Ottawa
Scott and Hart Associates	260 Deschamps	Ottawa
Semco Instruments Co. Ltd.	1339 Baseline Rd.	Nepean
Sharon Electronics, Ltd.	215 Cooper	Ottawa
Siltronics Ltd.	Highway 17	Kanata
Spar Aerospace Ltd.	Highway 17	Kanata
Sperry Gyroscope	3 Hamilton Ave. North	Ottawa
T&T Electronics & Communications	23 Firwood Cres.	Nepean
Tech 5 Engineering Services	106 Schneider Rd.	Kanata
Technetics Inc.	1573 Laperrière Ave.	Ottawa
Wilk K.W. & Associates Ltd.	34 Capital Dr.	Nepean

APPENDIX II

Covering Letter and Questionnaire

SURVEY OF HIGH TECHNOLOGY FIRMS IN THE OTTAWA AREA

The phenomenal growth of firms such as yours in the Ottawa area has attracted much attention. As part of a larger study on the development of manufacturing in this area, one of my graduate students, Mr. Don DeGenova, is undertaking a survey of certain important aspects of the high technology firms. The survey has the full support of the Commercial and Industrial Development Corporation (CIDC). The questionnaire is designed to be completed in less than 5 minutes. Also enclosed is a pre-paid envelope. The results of the survey will be aggregated in order not to reveal any information on individual firms, and you may rest assured your response will be treated with the utmost CONFIDENTIALITY.

Your participation in this survey will be most appreciated. Should you have any questions regarding the survey, please feel free to contact:

Mr. Shawn Markey (CIDC: 233-6254)
Dr. Guy P.F. Steed (University of Ottawa: 231-5451)
Mr. Don DeGenova (University of Ottawa: 231-2395)

Yours faithfully,

Dr. G.P.F. Steed

GPFS/lb

Enc.

CONFIDENTIAL

Q-1 When did this company start production in the Ottawa area? _____

Q-2 Did the person(s) who founded this firm have any strong association with this area which may have influenced the decision to start the firm in this area and not elsewhere? (Circle number)

1 YES 2 NO 3 DON'T KNOW

Q-3 Please list up to three key factors which stimulated the initial development of your company in the Ottawa area:

1.

2.

3.

Q-4 Please indicate from the viewpoint of your company which factors in the Ottawa environment have proved most favorable to the recent development or growth of your plant here: (please be as specific as possible)

Q-5 How significant do you consider your close proximity to the federal institutions, government and Crown corporations based in Ottawa to be: (Circle number)

VERY SIGNIFICANT				VERY INSIGNIFICANT
1	2	3	4	5

If you indicate 1 or 2 above, with which government institutions have you found such proximity to be most useful, and for what aspect of your operations:

Q-6 Do you believe that the presence of the federal government overshadows this region's high technology industry? (Circle number)

1 YES 2 NO

Please explain.

Q-7 Please indicate the three most significant factors within the Ottawa environment which might reasonably be changed to improve the operation of your company in this area:

1.

2.

3.

Q-8 Given the overall current locational requirements of your firm, how satisfactory would you expect a location for your company to be in the following major Canadian cities: (not to be interpreted as a branch expansion) (Circle number)

	VERY SATISFACTORY				UNSATISFACTORY
HALIFAX	1	2	3	4	5
MONTREAL	1	2	3	4	5
OTTAWA	1	2	3	4	5
TORONTO	1	2	3	4	5
HAMILTON	1	2	3	4	5
KITCHENER-WATERLOO	1	2	3	4	5
LONDON	1	2	3	4	5
WINNIPEG	1	2	3	4	5
EDMONTON	1	2	3	4	5
CALGARY	1	2	3	4	5
VANCOUVER	1	2	3	4	5

Q-9 What is the reaction of your out of town customers or business associates to your location in the Ottawa area? Please differentiate between types and locations of associates, i.e. suppliers, customers, Toronto, or foreign.

Q-10 How many persons did you employ (approximately) in 1976 in the Ottawa area?
_____

Q-11 What is your current employment in the Ottawa area? _____

Q-12 Looking to the future, how many people do you expect your company to employ by 1985? _____

Q-13 Is this company controlled by another firm? (Circle number)

1 YES 2 NO

If "YES", are you a wholly owned subsidiary? (Circle number)

1 YES 2 NO

Please indicate the name and the country of the controlling firm:

NAME: _____

COUNTRY: _____

Q-14 Please indicate the percentage of total parts and components (material inputs) in 1980 purchased from producers in:

_____% OTTAWA _____% REST OF CANADA _____% FOREIGN

Q-15 Please indicate the destination of your total sales for 1980:

_____% OTTAWA _____% REST OF CANADA _____% FOREIGN

NAME OF RESPONDENT: .....

POSITION: .....

COMPANY: ..... TELEPHONE NO: .....

Thank you for your co-operation.

Don DeGenova (232-2075)
Geography Department
Ottawa University
165 Waller St.
Ottawa, Ontario
K1N 6N5

Dr. Guy Steed (231-5451)

Mr. Shaun Markey (CIDC) (233-6254)