THE LOCATIONAL CRITERIA

OF

HIGH TECHNOLOGY COMPANIES

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THE LOCATIONAL CRITERIA

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HIGH TECHNOLOGY COMPANIES

by

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ABSTRACT

The paper outlines the various criteria that companies might use in the process of searching for a site. Criteria are examined in terms of how they relate to the varied characteristics of a company. No single criteria was found to be universal to all companies in terms of the emphasis placed on them. Communities, when attracting a company, should match up the positive aspects of the community with companies that have characteristics matching these points. From findings made in this paper, recommendations concerning some of the policies or programs that a community might develop is put forward.

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1 INTRODUCTION

The term 'high technology' has been used a great deal in recent years and has many times been used in terms of it possessing almost mystical properties. High-tech is not in any way an economic saviour; it is, however, an important factor in the economy of most any nation. If Canada is to be able to compete on the international market, it requires a high technology industry (Dhawan, 1976, p. 39). This is because hightech can lead to several types of economic change. The first change is upon the production process by making it more efficient, or by increasing either the quality or quantity of the outputs. Examples of such changes include robots painting cars and computers or word processors in offices. A second change is in its effect upon other goods for which high technology products are inputs, such as guartz watches or electronic cameras. A third type of change $i \not r$ through creating new components of final demand such as with the case of video cassette recorders (Hamilton-Wentworth, 1984, p.3).

If it does not develop a high-tech industry, then Canada will have to import its technology. Its effect upon the economy is substantial and, therefore, it is understandable that everybody want a piece of the action. The acquisition of high technology firms in most any community is considered a high priority goal.

These factors indicate that it would be important to find out the locational criteria of high technology firms. To understand what type of criteria is used would allow communities to have the opportunity to find out if they would be a likely location. It would also allow communities to be able to promote their positive qualities and also allow for the opportunity to change or acquire what they do not possess.

High-tech industries possess a variety of beneficial characteristics that would make it an excellent industry to attract into an area. One of the qualities they have is that it is seen as an attractive corporate citizen providing economic development with minimal adverse This is because they "tend to locate on high environmental impacts. level prestige land, construct aesthetically pleasing buildings, and further the cultural development of the community through their professional and scientific employees (Association, 1981, p. 8). Another aspect of high technology is its ability to diversify the regional economic The industry is seen to be less vulnerable to both cyclical and base. structural changes in the economy (Pearson, 1983, p. 86). As well, "high technology firms can balance a local economy by expanding or diversifying the industrial base, and cushion a community against economic downturns in the local basic industry (Association, 1981, p.10). Finally, high technology firms can increase the rate of growth of regional economies This is because high technology industries are better and employment. job generators then other industries. This is shown in a 1983 study done by Anne Markusean in which it was found that high-tech firms had an an annual employment growth rate of 8 percent between 1972 and 1977 compared to a growth rate of 3 percent for manufacturing industries (Wiewal, 1984, p. 292). Examining high technology companies and their locational patterns would seem to be of some significance as its effect is so widespread. Such an examination was done through the use of a questionnaire.

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This questionnaire asked questions on the responding companies criteria for location and on other relevant information.

2 REVIEW OF THE LITERATURE

The purpose of this section is to outline some of the sources from which this paper received both ideas and direction. The literature was looked at both for general information and also for more specific reference to high technology. The general information was used to understand industrial location theory. Finally, many of the questions used in the survey come from ideas derived from the literature.

i) Alfred Weber (Weber, 1929)

Weber dealt with least cost theory in his analysis of industrial location. Weber defined locational factors as those "forces which operate as economic causes of locations" (Weber, 1929). These forces would make it more profitable to locate in one area over another through savings in such things as labour and transportation. The major focus for Weber is on transportation costs. This was the first step, for him, in the entire process of analyzing industrial location. This factor is not quite as prominant now with the advances that have been made in regards to transportation systems. Weber observed the fact that labour costs vary spatially which reflected differences not only in wage rates but also in worker efficiency. Weber also noted that labour costs are not equally important to all industries. The two locational factors of transport costs and labour costs locate industries into regions but factors related to agglomeration will locate industries within a region. Weber defined two types of agglomeration. The first type referred to economies of scale derived from expanding or enlarging an existing production site. The second is related to those benefits derived from locating close to other related plants. This type of agglomeration would yield economies from sharing specialized equipment and services, greater division of labour and large-scale purchasing and marketing, among other benefits. Weber's theory is frequently mentioned, but it is not however, a complete theory, and only really talks about the basic factors of transport costs, labour and agglomeration.

ii) Collins and Walker (Collins and Walker, 1975)

In their book, Locational Dynamics of Manufacturing Activity, Collins and Walker make several observations pertinent to this paper. The first refers to wages. They believe that its importance as a locational determinant is declining. The reasons for this include the expansion of communication networks, of minimum wage legislation, of collective bargaining, increased mobility and government attempts to reduce regional income disparity. As high technology is an expanding industry, these factors may not be significant as yet. Another point raised is in terms of the risks that a company might take. With the economic environment changing at an accelerating rate, companies are increasingly concerned with risk minimization, rather than simply cost minimization. A firm cannot be certain that a plant will be a success as changes in market tastes, trading conditions and technology may lead to its premature closure. As a result, firms take account of the

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opportunity costs of a closure. Generally, it is easier to dispose of a plant and equipment in major urban centres. This could, therefore, affect the spatial distribution of firms, especially those that are involved in high risk projects like many high-tech firms. A third observation made by Collins and Walker is the importance of personal contact. This is deemed to be a factor of increasing importance because of increased complexities found within the business environment. As well, it could cut down on industrial espionage and speed up the decision making process. All these points are relevant to high technology and would indicate that proximity to other related companies and a good transportation networks for people would be relevant locational factors.

iii) P.M. Townroe (Townroe, 1971)

In Townroe's paper, the perspective taken is of the specific things that a particular company would go through in deciding upon a location. It also deals with how the characteristics of a company would affect its locational decision. The amount of information available or sought is seen to be an important factor. Particular regions will provide more information than others and with knowledge of an area, a company is less uncertain about a particular choice. Another factor affecting site location, according to Townroe, is time. Fast growing firms such as those involved in high technology might be limited in the amount of information that they can collect and thus increase uncertainty about site selection. Secrecy in making a decision is also an important element when a plant is thinking of moving. A move is often kept secret so as to keep employees from worrying. The effect this has, however, is in

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terms of the amount of information that could be collected. Receiving data from such sources as the government would largely not occur and the lack of information would result in increased uncertainty. A very important element in the decision process that cannot be controlled for is the particular characteristics of an individual. In most cases, only one person or a small number of people make a decision. Each person has different wants, aspirations, different capacities for problem solving, and grew up with different backgrounds. These factors all affect high technology firms in different ways.

iv) K.C. Dhawan and L. Kryzanowski (Dhawan and Kryzanowski, 1983)

In their study of high technology, Dhawan and Lawrance dealt with a wide range of possible locator factors. One important thing that was examined is the type of R&D that is carried out at a location. For many companies locating, in Canada from the United States, the R&D that is done is of an applied kind rather than pure. This has important effects upon any location decision as some companies will require different types of labour in terms of skills. Materials required would be of a different nature and the importance placed upon such things as universities and markets may not be the same for companies doing pure R&D. A second aspect associated with location that is important to many high technology companies is a connection with a university. [With such an association, a company would be able to cut down on the amount of investment in plant and equipment, bring in fresh ideas and approaches, keeps a company up to date on the latest advances and is a source of experienced labour in the company's field.

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v)

P.F. Steed and Don DeGenova (Steed and DeGenova, 1983)

The study by Steed and DeGenova expressed several interesting points about the locational factors for firms in the area in and around Ottawa. Some of the characteristics included their age; which was usually young, the founder frequently came from the area and most are not foreign owned. One very important factor listed in this study was the presence of the federal government. No other city would likely indicate the strength of association between a government office and a locational decision. The importance placed upon the potential of the local market was very small. This could be attributed to a wider national or international view of the market. As well, many companies may be the only producer of a particular product and, thus, concern for a particular market may not be great as they would be the only supplier of that product.

vi) Planning and Development Department (1984)

The report by this department examines the possibilities for Hamilton in acquiring a high-tech industry. It examines the various factors that a company would look for in a site. Some of the conclusions that it draws includes the need for a community to give a positive image to decision makers for the site to be considered. An adequate labour force is also deemed essential for a location to possess. The presence of a high technology agglomeration is viewed as important so that a related labour pool and service facilities would be available. An adequate amount of area for expansion is generally required as this type of industry is characterized by a high growth rate and needs room to expand into. The report also concludes that, in many cases, a new high technology company will start up in the community in which the founders work and live.

3 RESEARCH DESIGN

i) Definition of High Technology

Defining high technology for research purposes is a surprisingly difficult task. The problem lies not so much with what high-tech is as it can be described as "Innovation and nonroutine production activities such as research and development, experimental and prototype manufacturing, and small volume production of new and changing products" (Malacki, 1974, p. 262). The problem is transferring this description into practical terms for purposes of research. There exists no listing of Canadian firms under anything resembling the above description. As a result, one has to use listings of a more general nature. The only type of listing available, for the purposes of this paper, is one based on the standard industrial classification code (SIC). The SCOTT's Directories (Throop, 1984) uses this code and has the most extensive listings of firms to be found in this form. The classification lists firms based upon the specific type of product made. The problem that remains is that "to define high technology in terms of SIC almost inevitably results in an industrial grouping so wide as to include a substantial number of activities which could not be reasonably considered as high technology" (Langridge, 1984, p. 4). In order to be able to specify high technology firms according to the SIC code system, this paper will use the criterion of R&D intensity as put forward by Malecki. This is a listing based upon the ratio of R&D expenditures to net sales (Malecki, 1974, p. 263). This method did include a number of non-high technology firms. In going over the list of SIC codes that made this criterion, those that were not considered high-tech were deleted leaving the following list (Throop, 1984).

SIC	Product Description
3662	Radio and television transmitting, signal- ing and detection equipment and apparatus
3673	Transmitting, industrial and special purp- ose electron tubes
3721	Aircraft
3724	Aircraft engines and engine parts
3709	Guided missiles and space vehicle parts and auxiliary equipment
3811	Engineering, laboratory, scientific and research instruments and associated equip-ment
3823	Industrial instruments for measurement, display and control of process variables and related products
3824	Totalizing fluid meters and counting devices
3825	Instruments for measuring and testing of electricity and electrical signals
3829	Measuring and controlling devices

These are the classifications of companies used for research purposes in this paper and represent the closest approximation to a

grouping of high-tech firms based on some pre-determined descriptions of what high-tech is.

ii) Procedure for the Selection of Companies

In sending out the questionnaire, two things were considered. First, how many to send out and to which companies. The number of questionnaires sent out was 150. This number was arbitrarily chosen as the most that could be sent out due to financial restrictions. The second thing that had to be considered was deciding upon the companies the questionnaire was to be sent to. Within the ten codes that have been listed, there are 477 companies. A random sample of these were chosen, but before this was done, the companies were divided into two groups based on their employment size. This was done so that large or small sized companies would not dominate in the selection procedure. The first grouping had one to 39 employees and the second contained companies having forty or more. Proportional distributions for each was found so that 59 percent or 88 companies would be chosen from the first group and 41 percent or 62 companies from the second. One problem that developed was that some firms were listed in more than one SIC code. Companies were, therefore, cross-checked to prevent a double selection. In the end, 150 companies were chosen and questionnaires sent to each.

iii) Research area

The research area chosen was Ontario. There were a number of reasons for this decision. The first was the desire to find a relatively homogenous population to work with. To do otherwise would require an even larger sample to take account of regional differences. As well, the largest proportion of companies of the type being looked at are found in Ontario. This would mean that to find the type of information that this paper requires, the area of study need not go outside the boundary of Ontario.

iv) Creation of the Questionnaire (Appendix A)

The creation of the questionnaire to be sent to the companies was based upon two sources. The first was basic location theory as described by Weber and others who placed much emphasis upon such general factors as labour, land, capital, agglomeration and transportation costs (Weber, These factors permiate, essentially, all writing based upon the 1929). topic of industrial location. From the sources, basic locational criteria for companies was selected. The second source of questions came from literature more specific to the research topic. Specific reports (Hamilton-Wentworth, 1984), a previous questionnaire (Steed and DeGenova, 1983) and other books that refer to high technology were used. From these sources, criteria found to be important to high-tech firms was collected. This information allowed for more specific types of questions to be asked. It also placed importance upon some factors that may otherwise have been neglected. These two sources were amalgamated so that questions could be asked and information collected, specific to the topic of this paper.

v) Source of Error

There are several aspects of this questionnaire which lead to some possible sources of error. The first thing has to do with a lack of response for those questions requiring a written answer. This did not present a problem, for the most part, except for one question. The question referred to the company's satisfaction with its present site. It was on a scale of one to seven and was answered consistently as satisfied. For follow up questions, respondents were asked to write out an answer indicating why they were unsatisfied with their location. To avoid the written part of this section, respondents may have indicated that they were satisfied with their location when, in fact, they were not.

Problems that exist for this type of data acquisition, in general, consist of several types. One problem is that respondents may give the answer that they felt was wanted. Also, the individual who eventually receives the questionnaire may not have had anything to do with locating the firm (questionnaires were addressed to the top ranked individual at the location). As well, the people answering the questions are recalling things that happened in the past and may do so inaccurately (Steed and DeGenova, 1983, p. 267). Finally, it may be the case that some of these companies returned questionnaires for good public relations, without really considering what was asked.

4 ANALYSIS OF THE DATA

i) How the Various Locational Factors are Expected to Affect High Technology Firms

In the questionnaire that was provided to high technology firms (see Appendix A), a section of it dealt with possible criteria for the location of a company at a specific site. The criteria were ranked on a with scale from one to seven indicating the level of importance for each. Some criteria are more specific to high-tech firms while others are more general in nature and are applicable to most any industry. The purpose of this section is to examine each of the criteria listed and outline their relative importance to companies when searching for a site.

The first criteria considered deals with the potential of the local market. Due to the nature of high technology; most firms make or develop new products; this criteria would not be considered important. The type of products that this industry produces would normally have a much wider application than just for the local market (Steed and DeGenova, 1983, p. 273).

Access to the national market should be a more significant criterion. Most companies will likely have their product marketed at the national level and having access to all significant market areas would likely be an important factor. This particular criterion may not be one that is directly important for locating a plant. Rather, access to a mode of getting a product to specific markets may be more relevant.

A highly skilled workforce should be a requirement for a location to possess. The industry requires skilled labour but it varies from place to place in it quality and quantity. People are not perfectly mobile and, therefore, cannot always seek out a location that would evenly distribute the workforce (Conkling and Yeates, 1976, p. 83). This has the most significant effect upon depressed areas (Townroe, 1971, p. 56), places with universities and areas with a significant number of similar companies.

A location near a university should be considered by companies in this industry as an important locational criterion. Such a location provides a company with a potential source of new employees, allows professionals to improve their skills, and have academic experts whose work might complement or assist the work that is being carried out by the company (Malecki, 1974, p. 267). Another benefit universities can provide is as a source of research facilities. This cuts down on investments in plant or equipment which would help greatly those new and small firms with limited resources (Dhawan and Kryzanowski, 1983, p. 100). It would not be an important factor if the research being done at the university is unrelated to that which the company is doing.

Research indicates that government incentives is not very important for companies in considering a location (Collins and Walker, 1975, p. 116). Reasons for this include the reluctance of firms to share findings with the government. As well, incentives for a location means the government has some say in the location of the site. High technology firms are more dependent on areas with skilled employees than many other industries are. Such factors as labour may be too important to sacrifice to receive a government incentive to locate in a depressed area or in an area lacking in needed factors.

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Another consideration to take into account is the presence of independent research facility. Such a facility would not likely be frequently required and may only be considered as a bonus if one is in a selected location.

Land prices have generally been a basic consideration when looking for a site. Such is the case for high-tech firms (Hamilton-Wentworth, 1984, p. 8). These firms, in many instances, seek out the more prestigious and, therefore, more expensive locations. The cost of the land and building would be important to companies but its relative importance would depend upon what the company is looking for in a site and its available resources.

The criteria of capital availability at a location may depend upon the company being looked at. Large companies may be able to finance an operation from its internal resources or be able to borrow money from areas that do not receive any investment. Small companies, on the other hand, might find this an important consideration. Such companies may find access to capital outside of the influence of his own bank limited (Association, 1981, p. 15). Finally, capital availability in one area may differ from another on the basis of an area's willingness to take chances on a fairly risky type of investment (Collins and Walker, 1975, p. 24).

Location near other similar firms is another criteria of likely importance. An existing industrial concentration may contain a pool of labour with particular skills, or special educational institutions geared to the needs of the industry. "Firms may also join together to develop a research institute, a marketing organization ... a city or region specializing in one industry often have machine makers and repairers, suppliers of components, containers and so on, and other industries ancillary to the main one and providing goods and services for it" (Association, 1981, p. 12). Such a location will also give a firm the opportunity to observe changes and trends in the industry.

Proximity to available services is conceivably a factor in a location decision. This is because the high-tech industry requires advanced equipment and constantly develops new products. As a result, such services catering to the repair of equipment or specialized legal advice might be required at a location (Zelinsky, 1962, p. 257). This type of industry may, therefore, require this particular criteria^w to be included in a location decision.

Having major suppliers nearby is something companies would look for in a location. Companies doing R&D may require large amounts of varied inputs and, therefore, would want to be located in an area with a wide range of supplies. The opportunity cost of not having supplies available for many high-tech companies is high. Companies, therefore, might want to be close to supplies in the event of any interruptions in the supply flow for such reasons as changes in weather or transport conditions.

An area may have an advantage over other possible locations if the founder is from the vicinity. Companies just starting out are generally very small, have limited resources and little knowledge about areas outside of their experience. The most logical choice for many of these companies would be in the founder's home area.

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Labour is an element in the location process that recurs in many forms. A major one is the attractiveness of an area in terms of its school system, recreational and cultural opportunities. This is an important factor in the attracting and in the retention of desired employees (Hamilton-Wentworth, 1984, p. 8). This type of factor is very difficult to determine because of the number of things that make it up and by its qualitative nature.

Transportation costs have traditionally been considered important in making a location decision. For high technology firms, the significance of this criterion may be reduced. "For the majority of lighter industries, transportation costs do not vary greatly from location to location." (Collins and Walker, 1975, p. 23). Transportation costs of high-tech companies normally form only a small fraction of overall costs so that other factors become relatively more important for locational decisions (Z@linsky, 1962, p. 259).

The existence of a good transportation system for people is a very pertinent criterion when considering a location. Despite the amazing array of methods and means of moving words, data and images rapidly over space, personal contact still remins as the most preferred way of communicating. As people, ideas and concepts are such important elements to high technology, the ease and efficiency of their movement will be of prime importance. High technology firms are very sensitive to the security of their developments. Personal contact greatly reduces the chances of conversations and written material being spied upon. It also reduces the number of people required to be involved in the transfer of any information.

Most companies would consider the quality of the transportation system for materials and products when examining a possible location. This is because it is usually the most fragile and high-value commodities that are most liable to be lost or damaged in transit (Toyne, 1974, p. 171). Many of the products sold by high-tech companies go as inputs for products in other companies and industries. Goods not delivered on schedule may mean stoppages in the production process for those companies. The safe and reliable movement of products and materials for the high-tech industry is an important factor and would be considered when looking for a site.

Having a location at which expansion can occur as the need arises is a consideration for many companies (Townroe, 1974, p. 88). For hightech companies, it is an even greater concern. This is because this industry is growing faster than other manufacturing industries. As a result, the need for more space will likely occur and costs would rise dramatically if a company had to move because of a lack of space at its present location.

A very subjective criteria that will often be used by companies in considering a location is the image of the community. If an area has a large amount of heavy industry found within it, that area will likely be considered unsuitable for a high-tech firm. Conveying a positive image of a community is important as the selection process is largely based upon the personal judgements of top executives (Hamilton-Wentworth, 1984, p. 8). By and large, the greatest percentage of R&D carried out in Canada is done by the federal government. A criterion that many companies will likely consider would then be access to the headquarters of government offices. Such a location would allow for personal contact with those responsible for handing out R&D contracts.

ii) General Observations

From the survey that was sent out, a number of general trends and characteristics can be observed as taken from the means of the responses received (see Appendix B). The value (4), as taken from the scale incorporated in the section of the questionnaire dealing with the criteria for location and the scaling of the cities, is used to represent neither a positive or a negative position.

In examining the characteristics of the industry itself, a number of observations can be made. Most of the goods that are sold are sent to industrial clients with only a very small proportion of sales going to the public. This would indicate that the high-tech industry, as found in this study, is primarily a producer of intermediate products. Another very strong characteristic that was uncovered was that a very large number of firms do R&D. An even larger proportion of firms indicated that they produce a newly developed product. These two attributes of the companies in this industry indicates its dynamic nature and its potential for growth. Many companies are the only producers of a particular product which would likely give it a very wide market orientation. This would only hold if the product the company produces is not easily substituted for by other, related products. The majority of companies are not

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presently at the location where they were founded. This finding may have some implications for government incentives. It seems to indicate that to attract a company to a particular location with an incentive, does not mean that the company will necessarily remain at that particular site. For the most part the companies responding to the questionnaire are Canadian owned. Companies have generally been at this present location for approximately 11-15 years. The average size of these companies in terms of employment is in the range of 51-100. The overall picture that is taken from these observations is that the high technology industry is dynamic and will likely play a larger role in Ontario's economy.

The section of the questionnaire dealing with the criteria for a site selection (Appendix B) was interesting in the sense that relatively few of the criteria were important as measured at an aggregate level. Land prices and rents are a criterion that is found to be important as a This criteria is expected to do well as this is a locational factor. basic factor in the choice of a site for any type of industry. Labour was another factor that showed up as being a factor, however, it was a relatively weak indicator. This development was a surprise considering the type of industry involved and the labour requirments one would expect this industry to need. The criterion of an area having a good transportation system for people was indicated as being a factor in deciding upon This was expected as the industry is characterized as one a location. placing an emphasis on people and therefore the ease of movement for people would be considered in looking at a site. A site that is close to available services/supplies is considered to be a criterion in locating according to a majority of the firms. The founder, if he was a resident

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of the area, is a factor that showed up relatively strongly. This is a criterion that only affects Canadian companies. Gubmy ahead of your self

The second strongest criterion mentioned was good transportation for materials and products. That this is a relevant criterion is not surprising, rather it is surprising that it is more important than criteria such as the availability of labour or the presence of a university. The criterion that is the most persuasive in deciding upon a location is availability of land for expansion. This is understandable as these companies have such high growth rates.

Of the criteria that were not listed as being important, some, it would have been thought, should have been factors of significance to high technology companies. These criteria included locating near other similar firms, presence of a university and access to government offices. The government is a primary source of R&D contacts and a location near a related government body one would think, should be a major locational factor. As the criterion of locating near skilled labour was considered important, the fact that two possible sources of labour, universities and locating near similar companies, are not important is curious.

An analysis of means was done to test to see if the means for the criteria of locating near similar companies or a university is significantly different from that of the availability of skilled labour (see Appendix B):

	University	Similar Companies	Skilled Labour
Mean	5.442	4.909	3.494
Variance	6.077	4.715	3.516
Ν	77	77	77

1) The first analysis was on location near a university versus availability of skilled labour. The assumption was that the means should

be the same if the university criterion is considered as a source of skilled labour.

$$S^{2} = \frac{S_{1}^{2} (N_{1} - 1) + S_{2}^{2} (N_{2} - 1)}{N_{1} + N_{2} - 2} = \frac{461,852 + 267.216}{152}$$
$$= \underline{4,7965}$$

$$S \overline{x}_1 - \overline{x}_2 = \sqrt{S^2 (N_1 + N_2)} = \sqrt{738.661} = \sqrt{.124584}$$

= .3529652

t =
$$\overline{x_1} - \overline{x_2}$$
 = $5.442 - 3.494 = 1.948$
 $\overline{x_1} \overline{x_2}$.3529652 .3529652

$$=$$
 5.51896577 \approx 5.519

 $t_{\alpha} = 2.326$ with 152 degrees of freedom and $\alpha = .01$

 $5.519 > 2.326 . t > t_{a}$

This indicates that the two means are not the same and therefore companies believe that the two criteria are separate.

2) The second analysis will involve the comparison of location near similar firms versus availability of skilled labour. The assumption here

is also that the means should be the same if location near similar firms is considered a source of skilled labour.

$$s^{2} = \frac{s_{1}^{2} (N_{1} - 1) + s_{2}^{2} (N_{2} - 1)}{N_{1} + N_{2} - 2} = \frac{358.34 + 267.216}{152}$$

= 4.1155

S
$$\overline{x}_1 - \overline{x}_2 = \sqrt{\frac{S^2 (N_1 + N_2)}{N_1 N_2}} = \sqrt{\frac{633.787}{5929}} = \sqrt{.1068961}$$

= .3269497

t =
$$\frac{\overline{x}_1 - \overline{x}_2}{s \ \overline{x}_1 - \overline{x}_2}$$
 = $\frac{4.715 - 3.516}{.3269497}$ = $\frac{1.205}{.3269497}$

$$= 3.6855822 = 3.686$$

 t_{α} = 2.326 with 152 degrees of freedom and α = .01 3.686 > 2.326 ... t > t_{α}

This indicates that the two means are not the same. Companies may have had other, more significant reasons for not using the criterion of locating near similar firms as a source of skilled labour.

In looking at the responses in regards to the questions about the criteria for the importance of a university location a slightly different pattern emerges. With 24 companies responding to the question of

whether they located close to a university for a source of new employees the answer was a very definite yes. In this more specific analysis of the university criterion, without any influence from companies not using it as a criterion, the presence of skilled employees is important. Besides labour, another reason why companies wish to locate near universities is that they have programs in the companies field.

In the question concerning the companies satisfaction or dissatisfaction with their present location, the responses were fairly uniform. Most companies indicated that they were satisfied with their present location.

Some of the most interesting responses came from the section of the questionnaire dealing with the companies feelings for various cities. They based their responses on the criteria used to analyse their own our block of the out that only two cities were considered a locational choice. It turned out that only two cities were considered a good place to be located in. The best place to be situated was Mississauga, with Toronto coming in second place. A few of the placings seems to be a little unusual. The most unusual is Hamilton being considered a better location than London, Kingston and St. Catherines. To see if this is a very significant ranking, the means of Hamilton and the city ranked below it, London, shall be compared.

$$\begin{array}{ccccc} & & & \frac{\text{Hamilton}}{5.984} & \frac{\text{London}}{5.219} \\ \text{Variance} & & 2.499 & 2.682 \\ \text{N} & & 64 & 64 \\ \text{S}^2 &= \frac{\text{S}_1^2 (\text{N}_1 - 1) + \text{S}_2^2 (\text{N}_2 - 1)}{\text{N}_1 + \text{N}_2 - 2} = \frac{157.437 + 168.966}{126} = \frac{326.403}{126} \\ &= 2.5905 \end{array}$$

$$S \overline{x}_1 - \overline{x}_2 = \sqrt{S^2 \frac{(N_1 + N_2)}{N_1 N_2}} = \sqrt{\frac{2.5905}{3969}(128)} = \sqrt{.0835435}$$

= $\frac{.2890389}{.2890389}$

$$t = \frac{x_1 - x_2}{x_1 - x_2} = \frac{5.094 - 5.219}{.2890389} = \frac{-.125}{2.890389}$$
$$= -.4324678 \approx |-.433| = .433$$

 $t_{\alpha} = 1.658$ with 126 degrees of freedom and $\alpha = 0.05$.433 > 1.658 ... $t > t_{\alpha}$

This would indicate there there is not a significant difference between the means of the two cities. It may not be the case that Hamilton is ranked higher than London. This also questions the legitimacy of any attempt to rank the cities.

iii) Examination of expected and unexpected responses:

In examining the responses of companies to the various locational criteria the general result was that few of the criteria showed up as being significant reasons for choosing a site. This section shall indicate that a particular criteria's strength or weakness depends upon the type of company under consideration. The relationships that are going to be discussed come from significant chi-square values. For this you use values that you expect to find in each cell, Eij, and compare them to observed values, Oij. Used in the following equation it gives you a chi-square value:

$$x^{2} = i \sum_{j=1}^{k} j \quad j \sum_{j=1}^{l} i \quad \frac{(0ij - Eij)^{2}}{Eij}$$

The larger the value is the more likely that the distributions of what is being measured will be different. If the distributions are statistically significant then it would be reliable to use the cross-tabulations as an indication of some pattern that the data forms. The significance level was taken as .1. All cross-tabulations used can be found in Appendix C. From an examination of the cross-tabulation data, confirmation of some of the expected patterns emerge as well as contradictions of what was anticipated.

a) Ownership of company

Companies that are foreign owned have been at their present site for a significantly longer time, proportionally, than their Canadian counterparts (Appendix C1). Foreign controlled companies have 44.5 percent of their number being located at their present location for twenty The Canadian companies on the other hand have only 6.5 years or more. percent of all companies being located at their present site for this length of time. At the other end of the spectrum, Canadian firms have 44.4 percent of them being founded within the last five years while foreign companies account for only 13.6 percent in this section. This distribution of companies may be accounted for by the relative stage of development for Canadian firms. Foreign, especially U.S. companies, have been long established in the high-tech field. Canada, as a result of its slower start, lacks the long established plants that the foreign controlled firms possess. A second explanation for the observed distribution is found in the relative strength of Canadian and foreign For a foreign plant to exist there has to be a parent company in firms. another country. Before a branch plant is established the parent company has to be successful. This means that the foreign owned company will have the backing of its parent and enters the scene with an already established technology, market, name and financial backing. Many Canadian companies on the other hand start from scratch and lack most of the advantages of a typical foreign owned company. This would result in a large number of Canadian companies entering the field but many would The foreign firms enter a smaller number of likely not make it. companies but these are more successful. A third possibility is that Canadian firms establish a technology, have it proven successful, and then allow it to be sold to foreign interests.

A second interesting development that occurs with ownership relates to whether the company has always been at its present location (Appendix C2). While with Canadian firms the distribution was almost even, such was not the case for foreign companies. With foreign companies, 82 percent have moved from their founding location. Depending upon the circumstances, this figure has some significance for the government when it gives incentives to locate at a specific location. Such a large figure would seem to indicate the possibility that if incentives are taken, the firm might leave that location after a sufficient period of time has elapsed.

One of the few points on which both Canadian and foreign companies agree deals with the potential of the local market (Appendix C3). Fifty-seven percent of the foreign companies and eighty percent of Canadian companies felt that this was not a factor when considering a location. This result is consistent with what was expected to occur. The lower proportion for the foreign companies might have something to do with them being larger in size, (Appendix C4), and thus will more likely be able to afford looking for its "best" location and might then consider the potential of the local market to some extent.

A final difference that exists between the two forms of ownership concerns the importance each places on access to the national market (Appendix C5). Canadian firms for the most part, 53 percent, did not consider this as a factor in their location decision. Foreign firms on the other hand did take this criterion into consideration 60 percent of the time. Some of the factors as to why the Canadian firms do not usually consider this will be examined later and will include size of company, founder being a resident of the area, and availability of services. These factors give Canadians a much narrower perspective and this restricts their ability to search. Foreign companies, being generally larger, develop a wider view and will therefore look at a location in relationship to its access to the national market.

It can be generalized that foreign owned firms have a wider perspective that come from their larger size and greater resources than their Canadian counterparts. They are therefore more likely to consider a wider range of locational criteria when selecting a site.

b) Number of employees

The size of a company is a factor in deciding whether or not to consider proximity to similar companies. Respondents to the questionnaire gave a clear indication that it is the largest companies, (200+), that consider this an important criterion. The two hundred plus group indicated that this was a factor 56 percent of the time (Appendix C6). This is a surprising development as it would be expected that this would be a very important locational criteria. A similar survey of companies in the Ottawa area (Steed and De Genova, 1983, p.270) listed this criterion as

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being the third most important consideration for companies there. This could be accounted for by the fact that Ottawa has a large number of high-tech firms and this particular survey was sent all over Ontario. The results here show however that it is only large companies that consider this a factor. Large companies would find it difficult acquiring an adequate workforce in some areas. Therefore, they would want to locate near an area that would satisfy its labour requirements. As well, large firms are more sensitive to the developments and changes of related companies. They may wish to observe or even spy on competitors so as to gain every advantage possible.

The criterion of the founder being a resident of the area was, as expected, mostly relevant to the smaller companies. Those companies with up to 25 employees and from 26 to 50 employees felt that this criterion was important 76 percent and 60 percent of the time respectively (Appendix C7). The larger companies felt that this was less of a factor. The smaller the company the less resources available. The founder also has less exposure to the possibilities of other locations. The result is that the founders area receives preferential consideration when examining possible locations.

c) Research and Development

For those companies that indicated that they did R&D, one criterion that was considered important in deciding upon a location was access to services. This was considered important by 47 percent of those companies responding and as well 30 percent gave a neutral response (Appendix C8). This was in part expected, but as with many of the criteria the strength of this one was somewhat less than anticipated. If a company is doing R&D and is using special equipment or requires specialized work done by some outside group, it might be expected that the presence of

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services in the area would be a factor in making a locational decision. A possible reason why this might not be the case could be that the type of R&D carried out limits the need for outside contact. If it is applied in nature rather than pure then most of the services required by the company may be available in most any location.

Another expected result was the emphasis placed upon a good transportation system for people. With 53 percent of the companies indicating that this was important one might conclude that people are an important consideration in the decision process (Appendix C9). This response is only to be expected considering the nature of the industry. With so much tied up with people and the development of ideas and concepts, and the transfer of information between points, this criterion would naturally be considered important.

One surprising development that occured in analysing the data was the response to proximity to government offices. Companies doing R&D felt very strongly about this with 73 percent saying that this was not a factor in their decision (Appendix C10). This was surprising, as indicated earlier, the government does a large amount of R&D. It would seem that some office or facility that is related to work being done by a company would be a consideration when deciding upon a location. The explanation for this might be that private companies do not want their work to be shared, controlled, or regulated by the government if such a connection was formed.

d) Company being founded at its present location

In examining the response towards land prices, a traditionally important criterion, an interesting pattern developed. For those companies that moved from their original location, 70 percent felt that land prices was important when considering a site (Appendix C11). Those

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companies still at their original location did not indicate if it was important or not. Thus, for an initial site, land prices may not be important but with subsequent moves it becomes increasingly important. For an initial site decision other factors may be more important, such as labour considerations. Once a company is established then land prices can be considered for future moves.

An expected trend that did develop was that when a site is being considered it would receive preferential consideration if the person making the decision was from the area. The companies still at their original location indicated that for 88 percent of them this was important (Appendix C12). For those companies that have moved this criterion was not included in the decision process. This would indicate that a company will consider the area from which the founder is from in the strongest light. Economic and information constraints may have made the founders area the only realistic option. Decisions after the establishment of the plant allows for a less prejudiced view of other possible locations. With success, a company is able to consider more dependable criteria that would enhance its economic position.

Companies using the criterion of proximity to other similar firms are those found at their original choice for a site (Appendix C13). Companies that move do not use this as a criterion. The cross-tabulation pattern establishes that this criterion is initially important and then, later, has its importance diminished. This might be from insecurity felt at the start of an operation so a company locates near similar firms to monitor trends and developments. Later, after the company is established or becomes a specialist in a field the need to locate near other similar companies lessens.

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e) Cities

awteward $\langle In examining the data related to the cities, few responses con$ cerning the companies feelings on how the listed cities would meet their criteria for a location was found to be importan \overline{t} .) Most respones were not significant and if they were significant did not indicate anything of The following are those few criteria that were important. note.

For the criterion concerning area for expansion, only one city was listed as a strong candidate for this factor. The city was Mississauga with 52.3 percent (Appendix C14) of the companies indicating that this city was the only one that satisfies their requirements in regards to this criterion. Mississauga is a young city, very large, has lots of available land and is close to Toronto. It is therefore a perfect place to plan for future expansion. Other cities in the questionnaire are much older and more established and this limits their potential for expansion.

The criterion of proximity to government offices was not considered important to companies when deciding upon their own location. When asked to examine other cities in regards to this criterion, Ottawa showed up as being the only city considered for this factor (Appendix C15). This is not a big surprise but it does indicate that a location could have characteristics unique unto itself. When placed in a survey, however, an important criterion for one area may show up as being unimportant when used in an aggregated measure.

Finally, the only unusual response to this section comes in regards to the importance placed on locating near a university. Kanata was the only place for which a city was statistically significant and had 100 percent of the companies saying that this was an important criterion (Appendix C16). Kanata does not have a university. The only explanation for this is that they are referring to the university in Ottawa and have located in Kanata for some other reason such as zoning restrictions in Ottawa.

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iv) Further examination of results:

The analysis used up to this point has been analysis of means and cross-tabulations. A final type used to examine the data in this paper will be multiple regression. The purpose of this is to confirm results already obtained and to uncover new relationships. Although regression analysis can be used in predicting values, this paper shall only make use of it for descriptive purposes. The regression equation provides a mathematical description of the relationship between variables (Babbie, 1983, p.430). A series of independent variables are seen to affect a dependent Each independent variable affects the dependent variable to a variable. different degree. Using the independent variables, the effect on the dependent variable can be measured. From examining the regression equation the company characteristics that affect the decision as to which criteria should be used will be found. Also the direction of the relationship will be used to explain how the criteria related to the characteristics of the company. The most enlightening cases are presented here.

In examining the criterion of locating near similar companies, two company characteristics were required for this factor to be important. The first is when the company makes a new product and the second is if the company was founded at its present location. The former gave a very interesting response (Appendix D1). It was indicated that companies making new products feel that this criterion is of less importance than for those not making new products. This result may be because those companies not making any new products might feel that they could observe other companies to get an idea on a new development. Those companies making a new product might be less inclined to locate near other similar companies for just the opposite reason: to protect their product from being copied by competitors or having announcements of new developments be superseded by competitors announcing their developments first. The other characteristic is if the company was founded at its present location. The response to this relationship corresponded to the crosstabulation results and indicated that this was an important criterion for those companies that are still in their original location. The importance of this criterion decreased when the company moved from its founding site.

There are three company characteristics that combine to make the criterion of government incentives a factor in the decision process. These are, if R&D is done by the company, who the company sells its products to, and whether or not the company is foreign owned (Appendix D2). Those companies that engage in R&D feel very strongly about this criterion not being important. This result was similarly observed in the cross-tabulation analysis which confirmed the position that companies doing R&D do not seek or even, it seems, desire government money to locate. Foreign owned companies. Both, however, view this as a very weak reason for locating as seen in the cross-tabulation analysis (Appendix C17). The regression equation indicates that the criterion of government incentives are, for the most part, discounted by companies of all types.

The criterion of having a good transportation for people has some interesting elements to its regression equation. The characteristics that are included are employment size, if the company engages in R&D, and ownership of the company (Appendix D3). The relationships between the criterion and employment size is a negative one. This means that the smaller the company, the more important it is to have a good transportation system for people. This is borne out by the cross-tabulation analysis which indicated that this criterion is generally important to

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employment groups but especially by those with fewer employees all (Appendix C18). A contradictory result when compared to the crosstabulation values is in reference to the R&D characteristic. The regression equation indicates that companies doing R&D place less significance upon the criterion than companies not doing R&D. The cross-tabulation analysis on the other hand indicates that it is the companies not doing R&D are the ones that place the greater emphasis upon the existence of a good transportation system for people (Appendix C9). This difference does not take away the importance that both types of companies place upon It only indicates that the level of importance is the criterion. different. The type of company finding this criterion important should logically be the one doing R&D. This is because of the importance of the research workers in such a setting. The final company characteristic included in this particular regression was ownership of the company. Foreign owned companies indicated that they placed more emphasis upon a good transportation system for people than Canadian owned companies. A possible reason for this is that companies that are foreign owned need to be able to get people to and fro between Canada and its headquarters in another country. As a result location near such things as international airports would be an important consideration.

5. SUMMARY AND CONCLUSIONS

The purpose of this paper was to gain a better understanding as to how high technology companies base their locational decisions. A number of points will now be brought up that is relevant to this purpose. One will concern the human aspect in the decision process which is something that has not been covered in this paper. A second point will refer to the way a community should treat the different locational criteria and what perspective should be taken when using them. Finally, some general recommendations will be put forward based upon what has been uncovered in this paper.

i) The Human Factor

In examining the company and the criteria that would be used in making a decision a very important factor has been neglected. It is the decision maker himself. This was not dealt with in the questionnaire for a number of reasons. First the questions asked would have had to be extensive in nature and the validity of the responses would have been severely questioned. Secondly, it is unlikely all of the questionnaires reached the original decision maker and this is a pre-requisite to be able to ask such questions. Such things as "The age, sex, income level, status, personality, educational level and mental ability of the decision maker have all been shown to influence his perception (Toyne, 1984, p.23). These characteristics would affect how information is understood and the way in which different locations are viewed. No definitive conclusion can ever really be reached on how a company will act because of the variability in the nature of the people making the decisions. The purpose in bring up the influence of the individual decision maker is only to outline the unpredictabilty of a location decision. This is especially the case when the human element is thrown in. This paper only deals with the characteristics of the company itself, there are other factors that are involved in the decision process and this should be remembered when examining any conclusions reached in this paper.

ii) Universality of locational criteria

While it is true that some criteria are consistently rated higher than others, it is not always the case that any single criteria is universally accepted by all types of companies. It has been the finding of this paper that no criteria is necessary in every situation. In examining the average responses to the criteria (Appendix B), it was found that none received the complete support of all the companies. The strongest response was for the criterion area for expansion which had a mean response rate of 2.921. A measure of 4, as stated earlier, is a neutral response. A measure of 3 therefore indicates marginal acceptance that the criterion in question would be important (Appendix A). This has implications for government and community policy towards attracting high-tech firms to designated areas. It means that specified criteria which are considered to be major factors in attracting high-tech firms cannot be used reliably. While certain criteria would be important to some firms, others would not be. You could have the situation where the top attracting criteria are not in fact attracting companies. This would result if only some of a firm's criteria for choosing a location is satisfied. The most important criteria may be covered but less important ones for the average company may not be. Thus, criteria important for a specific company is not taken into account. If an area does not satisfy these other criteria, then a company may not locate in that community. A policy of attracting companies based solely on the benefits a community can offer may not be the most effective method of attracting industry.

iii) Characteristics of the company

To be able to adequately understand the decision process attention should be focused on the company itself and not on the criteria. Once the characteristics of a company is uncovered, then the criteria that would attract the firm could be found. There exists significant differences in emphasis for companies that have specific characteristics when they examine their criteria for location. The most significant differences occur when dealing with ownership of the company, employment size and if the company engages in research and development.

Companies that are foreign owned are more likely to move from their founding location. This would affect government incentive policies towards foreign companies in that such incentives can't be relied upon to serve the purpose it was meant for. Foreign companies have a wider perspective of the marketplace. With a wider view, companies are more capable of taking advantage of changes in the market and are more likely to be successful. Finally, foreign companies have been at their present location for a <u>significantly longer</u> period of time than their Canadian counterparts. This indicates that foreign companies are more stable than Canadian companies and stability is a very important consideration for a host community. In terms of employment and stability foreign companies are superior to those found in Canada. This would indicate that foreign companies would be more desirable than Canadian ones when they are being attracted from outside the community. An important consideration to be made is for companies that develop within a community. A significant proportion of companies are founded in the are where the decision maker was born. This would indicate that in terms of ownership two things should be emphasized. First, companies that are foreign owned should be concentrated on over Canadian companies when trying to attract firms from outside the community. Secondly, special consideration should be given to developing companies from within the community as a large proportion of companies start in the founders home area. If such consideration and emphasis is given from the start then communities might be more capable of retaining such companies.

It should come as no surprise that companies of various sizes place emphasis on different criteria for a location. The larger companies tend to locate close to other similar companies. A community without an established high-tech industry should not try to attract larger companies as such a policy wold not likely succeed. The responses from the questionnaire would seem to indicate that an established hightech industry is required before a large company will consider a location.

Companies that engage in R&D have special needs and one of these is for services. The activities carried out by such a company make it necessary that access to required services be available. Thus a reasonable level of service activity should exist before a community tries to attract a firm which is engaged in R&D.

iv) Recommendations

There should be two sets of policies for attracting high technology firms to a community. One should be for companies that develop within the community itself. The second should be for attracting companies from outside the community.

a) companies that develop within the community

A large proportion of Canadian companies start oeprations within the founders home area. A significant proportion of these companies also move at some point to another location. A program should be initiated to both encourage the development of companies within the community and to also try to prevent firms from leaving once they establish themselves. Programs could include:

- ° financial assistance (not the same as an incentive to locate somewhere specific)
- ° assistance in marketing a product through advertising it 1) in community publications, 2) through the influence of the mayor or city council
- ° always show an interest in the company

b) Attracting companies

For communities in Ontario there are two types of companies that would move into an area. One is a company that makes a move from within Canada. The second is foreign companies which enter the country.

Programs can be developed for each:

1. Preliminary organization

- ° examine attributes of the community and find its positive and negative points
- ^o knowing the positive aspects of the community, decide which type of high-tech firm would be best suited and most likely to locate in the community
- ° concentrate on those types of companies
- ° do not create special programs requiring the development of designated areas or the upgrading of existing facilities.

2. To attract companies from within Canada

- ° a program should be developed that would identify companies that will likely make a move and concentrate attention on such companies
- ° develop a brochure to advertise good points and market the community

3. To attract foreign companies

* send delegations to other countries as Brantford and Sherbrook have successfully done or send letters to foreign embassies like Whitby has done (Wiley, 1984, M4).

Although a relatively large proportion of companies have been surveyed (17 percent) this does not mean any firm conclusions can be drawn from this study. It has not touched upon other factors such as human behaviour that relates to a location decision. As a result more study is needed to develop a better understanding of what criteria is used by high-tech companies when they locate.

APPENDIX A

QUESTIONNAIRE AND INTRODUCTORY LETTER

Dear Sir or Madam:

I am an undergraduate student at McMaster University working on my Thesis. The attached questionnaire pertains to my Thesis which concerns the criteria used by high technology companies in selecting a location for the manufacture of their products.

What I require is for someone at your Company who is familiar with the reasons or the selection process which caused you to locate where you did, to complete this questionnaire.

I respectfully request that you forward your response within 10 days of receipt.

Thank you for your consideration,

Sincerely,

David L. Tosh.

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The loca	following questions are designed to be answered by t tion to which this was addressed.	he Com	ipany
1.	Are your goods sold primarily to: industry?	()	
	public?	()	
	equally to both?	()	
2.	What is your primary method of transporting these goods?		
3.	Do you engage in any research and development at your location?	YES	NO
4.	Do you manufacture any newly developed product at your location?	YES	NO
	- If YES, please answer.		
	Are you the primary or only maker of this product?	YES	NO
5.	Was your Company founded at your present location?	YES	NO
6.	Is your Company foreign owned?	YES	NO
7.	How long has your Company been at its present location?		
	Indicate in years by circling:		
•	1 - 5 6 - 10 11 - 15 16 - 20 20 >		
8.	Please indicate the approximate number of employees located at your site by circling:		
	1 - 25 26 - 50 51 - 100 101 - 200 201 7		

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9.	The loca this for to l <u>very</u> for	following are factors involved in considering tion. As this is a very important part coust list over carefully. Can you now go down each factor indicate its relative importanc ocate at your present site. The scale used (important (VI) to not important at all (NI each and as well fill out the entire list.	ng ld the i ha).	a yo 1 in is P	sit u j ist you a i lea	te ble ta ur ran ase	for ase gai dec ge ci	r in cis fr irc	ead and ion om le
	a.	Potential of the local market	/I) 1	2	3	4	5	6	(NI) 7
	b.	Access to the national market	1	2	3	4	5	6	7
	с.	Availability of highly skilled labour	1	2	3	4	5	6	7
	d.	Presence of a University	1	2	3	4	5	6	7
	e.	Government incentives (tax relief, grants, etc.)	1	2	3	4	5	6	7
	f.	Research facilities in area (other than a University)	1	2	3	4	5	6	7
	g.	Land prices and rents	1	2	3	4	5	6	7
	h.	Availability of capital	1	2	3	4	5	6	7
	i.	Location near other, similar companies	1	2	3	4	5	6	7
	j.	Near available services either technical or professional	1	2	3	4	5	6	7
	k.	Near major suppliers	1	2	3	4	5	6	7
	1.	Founder being a resident of the area	1	2	3	4	5	6	7
	m.	Residential attraction (includes school system, recreational and cultural opportunities, etc.)	1	2	3	4	5	6	7
	n.	Transportation costs	1	2	3	4	5	6	7
	0.	Good transportation for people (includes an airport)	1	2	3	4	5	6	7
	p.	Good transportation for materials and products	1	2	3	4	5	6	7
	q.	Existence of area for potential expansion	1	2	3	4	5	6	7
	r.	Image of community compatible with high-technology	1	2	3	4	5	6	7
	s.	Access to the headquarters of government offices	1	2	3	4	5	6	7

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Question 9. Continued

- t. Other reason(s) (VI) (NI) 1 2 3 4 5 6 7 (leave blank if there are none)
 - If there are some other reasons please list them in the space provided.

10. Did the presence of a university as indicated in question (9), section (d) receive a rating of 1, 2 or 3?

YES NO

- If YES then please fill in the following indicators of why the university was a significant factor. The same scale of measuring importance is used here as was used in question
 9. Again please fill in for all the factors.
 - (VI) (NI) Had programs in your company's field 1) 1 2 3 4 56 7 2) It is a source of new employees 2 5 1 3 4 6 7 3) Company was created from some connection 1 2 3 4 5 6 7 with the University
 - 4) Other reason(s) 1 2 3 4 5 6 7
 - If there are some other reasons please indicate them below.

11.

a. This question is concerned with how satisfied your company is with its present location. From the following scale ranging from <u>very satisfied</u> (VS) to <u>very dissatisfied</u> (VD) please indicate (by circling) how satisfied you are with your present location.

> (VS) (VD) 1 2 3 4 5 6 7

b. For the above scale did you circle 5, 6 or 7?



- If YES then please list below in order of importance these factors, (taken from #9), that you feel make your site unsatisfactory. Please include, if appropriate, a brief explanation accompanying these factors. If there are no factors found in question 9 that apply then please add in any that you feel are significant.

12.	Please indicate below you following cities. Base satisfy your criteria for from would be very satis	ur firm's fee your answer o r location. <u>factory</u> (VS)	lings n how The sc to <u>wou</u>	on wel ale 1d	beir 1 ea bei not	ng ich ing be	oca cit use sat	ted y w d r isf	in the ould anges actory
	a. Windsor		(VS) 1	2	3	4	5	6	(NS) 7
	b. Mississauga		1	2	3	4	5	6	7
	c. Toronto (Metropolita	n)	1	2	3	4	5	6	7
	d. Ottawa		1	2	3	4	5	6	7
	e. Hamilton		1	2	3	4	5	6	7
	f. London		1	2	3	4	5	6	7
	g. Kingston		1	2	3	4	5	6	7
	h. St. Catherines		1	2	3	4	5	6	7
	i. Kanata		1	2	3	4	5	6	7
	j. Sudbury		1	2	3	4	5	6	7
	k. Kitchener - Waterloo		1	2	3	4	5	6	7

13. If there is anything else you wish to add please feel free to do so in this space.

- END -

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Thank you very much for the time you have spent completing this questionnaire.

David L. Tosh

APPENDIX B

MEASURE OF THE MEAN VALUES FROM THE QUESTIONNAIRE

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	<u>n</u>	mean	<u>std dev</u>
Goods sold to	79	.266	•548
Do you do R&D	79	.114	.320
Do you make any new products	70	.100	.302
Are you the only make of the product	70	.357	.483
Was company founded at present location	71	.859	1.199
Is company foreign owned	69	.768	.894
Length of time at location	76	2.645	1.494
Number of employees	69	2.652	1.634
Criteria for locating:			
a) potential of local market	76	5.632	1.945
b) access to national market	76	4.724	2.108
c) availability of skilled labour	77	3.494	1.875
d) presence of a university	77	5.442	1.824
e) government incentives	75	5.427	1.960
f) research facilities in area	77	5.117	1.933
g) land prices and rents	74	3.171	1.708
h) availability of capital	77	5.626	2.194
i) location near other similar companies	77	4.909	2.171
j) near available services	76	3.789	1.878
k) near major suppliers	77	3.623	1.709
1) founder resident of area	77	3.429	2.403
m) residential attraction	76	4.605	2.034
n) transportation costs	77	4.351	1.931
o) good transportation for people	75	3.600	1.945
p) good transportation for materials and products	76	2.939	1.607
q) area for expansion	76	2.921	1.711
r) image of community	65	4.600	2.803
s) access to government offices	64	5.328	1.936
t) other reasons	3*	3.333	3.215
Was presence of university important (question 9) If it was:	79**	.646	.481
1) had programs in your field	23	2.087	1.203
2) source of new employees	24	1.667	1.049
3) company has some connection with university	22	5.227	2.308
4) other reason(s)	15	2.333	1.589
Satisfaction of present site	75	2.667	1.580
* Respondent's were asked to leave question blank ** 28 said it was important.	if it	did not	apply.

	<u>n</u>	mean	<u>std dev</u>
How would following cities satisfy your criteria for location:			
a) Windsor	65	5.538	1.582
b) Mississauga	66	3.273	1.660
c) Toronto (Metropolitan)	68	3.397	1.838
d) Ottawa	66	4.273	1.942
e) Hamilton	64	5.094	1.581
f) London	64	5.219	1.638
g) Kingston	66	5.273	1.660
h) St. Catherines	53	5.623	1.180
i) Kanata	54	4.426	2.160
j) Sudbury	53	6.585	.842
k) Kitchener-Waterloo	52	4.635	1.547

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APPENDIX C

CROSS-TABULATIONS

1. Ownership of the company (OWN) versus length of time at present location (LONG).



2. Was company founded at its present site (PRES) versus ownership of the company (OWN).



 Ownership of the company (OWN) versus good transportation for people (0).



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5. Ownership of the company (OWN) versus access to the national market (b).



6. Number of employees (EMPL) versus location near other similar companies (i).

EMPL	• • • • •	* * * * *	• • • •	C R C S S		LATIC		• • • •	• • • • • • • •
	COLNT Row PCT Cul PCT Tot PCT		[2]	[3]	L 4 1	. 5 1	6	NI [7]	RCW TCTAL
1-25	1	3 12.0 100.0	4 16.C 3C.0 5.9	0 0 0 0	1 4.0 14.3 1.5	4.0 25.0 1.5	0 0 0 0	16 64.0 51.6 23.5	25 36.8
26-50	2	O C O C	13.3 15.4 2.9	13.3 40.0 2.9	1 6.7 14.3 1.5	6.7 25.0 1.5	2 13.3 4C.0 2.9	7 46.7 22.6 10.3	15 22.1
51-100	3	0 C 0	20.0 7.7 1.5	0 0 0 0	1 2C.0 14.3 1.5	20.0 25.0 1.5	0 0 0 0	40.0 6.5 2.9	5 7.4
101-200	4	O G C O	C C C C	0 0 0 0	28.6 28.6 28.6 2.9	14.3 25.0 1.5	2 28.6 40.0 2.9	2 28.6 6.5 2.9	7 10.3
201>	5 I QW	O C O O	37.5 46.2 8.8	3 18.8 60.0 4.4	2 12.5 28.6 2.9	Q C C C	1 6.3 20.0 1.5	25.0 12.9 5.9	16 23 .5
RAN CHI SQ	COLUMN TOTAL UARE -	34.67263	13 19•1 WITH 2	7.4 7.4	10.3 5 OF FREED	5.9 DOM. SIGN	7.4	31 45.6 = .0734	10C.0
									-



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9.

Does company do R&D (RD) versus good transportation for people (0).



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11. Was the company founded at its present location (PRES) versus land prices and rents (g).



12. Was company founded at its present location (PRES) versus Founder resident of area (1).





13. Was company founded at its present location (PRES) versus location near other similar companies (i).

* * * 0TT * * *	* * * * * * *	• • • • •		C R Q S S	5 T A B U	L A T I C + + + + + +) N O F	• • • •	• • •
	COUNT RUW PCT COL PCT TOT PCT	S 1 1 1	L 2	I 3	[4]	. 5 .	[6]	NI [7]	RCH TUTAL
VS	1	1 20.0 33.3 1.9	C C C	1 20.0 16.7 1.9	1 20.0 16.7 1.9	0 0 0 0	1 2C.0 16.7 1.4	1 20.0 4.2 1.9	[]]]]]
	2	1 11.1 33.3 1.9	22.2 66.7 3.7		22.2 33.3 3.7	O C O C	22.2 33.3 3.7	22.2 8.3 3.7	i 9 i 16.7 i
	3	C 0 0 0 0	C C C	36.4 66.7 7.4	0 0 0 0 0	Q Q Q Q	4.1 9.1 16.7 1.9	54.5 25.0 11.1	i 11 i 20.4 i
	4	0 0 0 0 0	C C C C	0 0 0	0 0 0 0	3 75.0 50.0 5.6	0 0 0	25.0 4.2 1.9	7.3
	5	0 C 0 C	12.5 33.3 1.9		12.5 16.7 1.9	25.0 33.3 3.7	U 0 0 0	50.0 16.7 7.4	i 8 1 14.8 1
	6	1 9.1 33.3 1.9		I 1 9.1 I 16.7 I 1.9	2 18.2 33.3 3.7	1 9.1 16.7 1.9	U 0 0 0 0	6 54.5 25.0 11.1	11 1 20.4
NS	7	I O I C I C					33.3 33.3 3.7	4 66.7 16.7 7.4	i 6 1 11.1 1
RAW CHI	COLUPN TOTAL SQUARE -	5.6 54.81932	3 5.6 WITH	11.1 36 DE GREES	11.1 5 OF FREE	11.1 DOM. SIG	11.1 NIFICANCE	44.4	100.0

15. Access to government offices (S) versus Ottawa (OTT).

• • •				CRESS	TABU	LATI			
* * *	* * * * * *	* * * * *	• • • • •	* * * * *	* * * * *	9 T K	* * * *	* * * * *	• • •
_	COUNT RUH PCT CUL PCT TUT PCT	I IVS I I I I I I	L 2	<u>1</u> 31	L 4]	<u> </u>	, С б I	NS 7	RCW Tutal
AI	1		0 0 0 0 0	1 1 c v . 0 1 4 . 3 1 . 9	0 0 0 0	0 0 0	0 0 0 0	 C C O O	1.4
	2		1 50.0 12.5 1.9	1 50.0 14.3 1.9	0 0 0 0	0 0 0	0 0 0 0	0 0 0 0	2 8.8
	3	2 33.3 40.0 5.8	1 16.7 12.5 1.9	2 33.3 28.6 3.8	0 0 0 0	C C O C	0 0 0 0	1 16.7 5.7 1.4	6 11.3
	4		0 C 0 C	1 50.0 14.3 1.9	0 0 0 0	1 50.0 11.1 1.9	0 C 0	C 0 0 0	2 3.0
	5 -		14.3 14.3 12.5 1.9		28.6 50.0 3.8	O C O O	57.1 80.0 7.5	0 0 0 0	7 13.2
	6	I 1 I 11.1 I 20.0 I 1.9	2 1 22.2 1 25.0 1 25.0	I 11.1 I 11.1 I 14.3 I 1.9	22.2 22.2 50.0 3.8	11.1 11.1 11.1 1.9	0 0 0	22.2 23.3 23.5 25.5	4 17.0
NI	7	I 7.7 I 7.7 I 40.0 I 3.6	3 1 11.5 1 37.5 1 5.7	I 1 I 3.8 I 14.3 I 1.9	0 0 0 0	7 26.5 177.8 13.2	1 3.8 20.0 1.9	12 46.2 80.0 22.0	20 1 49.1
	COLUMN TOTAL	1 5 9.4	15.1	13.2	4 7.5	1	5 9+4	15 28.3	1 10.01
RAW CHI	SQUARE =	63.32110	WITH .	36 DEGREES	S UF FREE	DOM. SIG	IFICANCE	00 33	3

17. Government incentives (e) versus Ownership of the company (OWN).



18. Good transportation for people (0) versus Number of employees (EMPL).

* * * * Empl	• • • • •	* * * * *		C R O S S	Т А В U) N O F	• • • •	
	CUUNT I RUM PCT I CUL PCT I TUT PCT I	0 V I 1	Ļ 2	Į 3 į	4	5	6	NI 7	RON TUTAL
1-25	1	4.3 11.1 1.5	6 20.1 31.6 9.1	4 1 17.4 1 40.0 1 6.1	7 30.4 40.7 10.6	1 4.3 20.0 1.5	1 4.3 33.3 1.5	3 13.0 60.0 4.5	34.8
26-50	2	5 33.3 55.6 7.6	4 20.7 21.1 6.1	2 13.3 20.0 3.0	3 20.0 20.0 4.5	1 6.7 20.0 1.5	0 0 0 0	0 0 0 0	15 22.7
51-100	3	C C C C	1 20.0 5.3 1.5	1 20.0 1 10.0 1 1.5	20.0 6.7 1.5	0 0 0	20.0 33.3 1.5	20.0 20.0 1.5	خ 7.0
101-200	4	0 0 C C	3 42.9 15.8 1.4.5		28.0 13.3 3.0	0 0 0 0	1 14.3 33.3 1.5	14.3 20.0 1.5	7 1C.6
200>	5	3 18.8 33.3 4.5	5 31.3 1 20.3 1 7.6	I 18.8 I 18.8 I 30.0 I 4.5	2 12.5 13.3 3.0	3 18.8 60.0 4.5	0 0 0 0	0 0 C 0	16 24.2
	CULUMN TUTAL	13.0	19 28.8	10 15.2	15 22.7	5 7.6	4.5	5 7.0	100.00
RAN CHI SG	WARE -	25.35810	HITH	24 DEGREES	5 OF FREEI	00 %. SIG	IFICANCE	380	Ď

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APPENDIX D

REGRESSION EQUATIONS AND A LIST OF ABBREVIATIONS

Abbreviations

SOLD:	to what sector does the company sell its products
RD:	does the company do any research and development
NEW:	does the company manufacture any newly developed product
ONLY:	if the company does make a new product, is it the only make of it
PRES:	was the company founded at its present location
OWN:	ownership of the company, foreign or not
LONG:	how long has the company been at its present location
EMPL:	number of employees at the site
A:	potential of local market
B:	access to the national market
C:	availability of highly skilled labour
D:	presence of a university
E:	goernment incentives
F:	research facilities in area (other than a university)
G:	land prices and rents
Η:	availability of capital
I:	location near other, similar
J:	near available services eitehr technical or professional
K:	near major suppliers
L:	founder being a resident of the area
M:	residential attraction
N:	transportation costs
0:	good transportation for people (includes and airport)
P:	good transportation for materials and products
Q:	existence of area for expansion
R:	image of community compatible with high technology
S:	access to the headquarters of goernment offices
Τ:	other reasons
FIEL:	university had programs in companies field
SOR:	university is a source of new employees
CONN:	company created from some connection with a university
WIN:	Windsor
MISS:	Mississauga
TOR:	Toronto (Metropolitan)
011:	Uttawa
HAM:	Hamilton
LON:	London
KING:	Kingston
S1:	St. Catherines
KAN:	Kanata
SUD:	Sudbury
KIT:	Kitchener-Waterloo

.

<u>D.1</u>

Dependent: Independent: EMPL, RD, SOLD, NEW, LONG, OWN, ONLY, PRES

Variables in the equation:

Variable	В	Т	Sig T
NEW	88779	-3.911	.0002
PRES	.52768	2.381	.0198
(CONSTANT)	4.68480	15.298	.0000

Regression equation:

i = 4.6840 - .88779 (NEW) + .52768 (PRES)

D.2

Dependent: e Independent: EMPL, RD, SOLD, NEW, LONG, OWN, ONLY, PRES Variables in the equation:

Variable	В	Т	Sig T
RD	-2.96408	-3.482	.0008
SOLD	-1.13366	-2.445	.0168
OWN	.62945	2.490	.0150
(CONSTANT)	5.13758	16.201	.000

Regression equation:

r = 5.13758 - 2.96408 (RD) - 1.13366 (SOLD) + .62945 (OWN)

<u>D.3</u>

Dependent: O Independent: EMPL, RD, SOLD, NEW, LONG, OWN, ONLY, PRES

Variables	in the e	quation:			
		Variable	В	Т	Sig T
		EMPL	.17463	1.745	.0851
		RD	-2.63661	-3.769	.0003
		OWN	1.06071	5.222	.0000
		(CONSTANT)	2.09542	5.904	.0000

Regression equation:

0 = 2.09542 + .17463 (EMPL) - 2.63661 (RD) + 1.06071 (OWN)

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