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**AN EXAMINATION OF
THE PERSONAL NETWORKS OF
ENTREPRENEURS IN TECHNOLOGY-BASED COMPANIES**

by

LISA BADCOCK, B.COMM. (HONOURS)

*A thesis submitted to
the Faculty of Graduate Studies and Research
in partial fulfillment of
the requirements for the degree of*

Master of Management Studies

School of Business

Carleton University
Ottawa, Ontario

September 22, 1989

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Research acceptance of the thesis

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submitted by Lisa Badcock B.Comm. (Honours) in partial fulfillment of the
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Thesis Supervisor

Director, School of Business

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Ottawa, Ontario

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ABSTRACT

To take advantage of perceived opportunities, entrepreneurs reach beyond the boundaries of their companies to acquire external business resources such as financing, legal advice, and moral support from their personal networks. Because the role of the entrepreneur and the importance of external resources acquired by the entrepreneur change as the business develops, personal networks of entrepreneurs are investigated across the stages of business development. The investigation is conducted by interviewing technology-based entrepreneurs using a semi-structured instrument.

The research examines the theoretical dimensions and the practical characteristics which describe personal networks. The results reveal that personal networks of entrepreneurs with technology-based companies in the early stage of business development are larger and have fewer relationships among network members than personal networks of entrepreneurs with technology-based companies in the late stage of business development. Differences are also present in the types of external resources acquired by the entrepreneur from the network members. Entrepreneurs with technology-based companies in the early and late stages of business development obtain non-technical resources such as financing, accounting advice, and market information from their networks while entrepreneurs with technology-based companies in the middle stage of business development receive marketing resources from their networks. The major conclusion of the research is that the personal networks of technology-based entrepreneurs are different across the stages of business development.

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STATEMENT OF CONFIDENTIALITY

Due to the nature of the information gathered during the research, the respondents' names and company information disclosed during the interviews remain confidential.

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CHAPTER 1

INTRODUCTION

Ontario has a weak position in most high growth and emerging industries. Exceptions are telecommunications and aerospace. In areas like computer hardware and software, Ontario has been running a massive and steadily increasing trade deficit.

Ontario Premier's Council, 1988

To become internationally competitive in the future, Canadian industries must emphasize innovation and entrepreneurship. According to Florida and Kenney (1988), a fruitful climate for innovation and entrepreneurship depends on networks, interactions, and linkages. Government, academics, and practitioners can create a supportive environment for entrepreneurs by encouraging the development of these networks for business purposes. Echoing this theme, the network approach to entrepreneurship, developed in 1984 (Aldrich, Rosen, and Woodward 1987a), expands entrepreneurship theory by interpreting the entrepreneur's social interactions as channels through which external business resources for the company are acquired. The approach supplements the entrepreneurship framework by introducing a theory based on sociology, psychology, and economics.

Research on entrepreneurs' personal networks suggests that entrepreneurs must acquire external business resources to operate companies and that networks are sources of external business resources. Churchill and Lewis (1982) argue that the importance of resources to a company is different for each stage of business development. Changes in the importance

of external resources will be reflected in the structure of the personal networks that provide resources. Preliminary research has been conducted investigating the relationships between the pre-business network dimensions and business success, and the age of a company and network dimensions (Aldrich, Rosen, and Woodward 1987a, Rush, Graham, and Long 1987, Johannisson 1986, Carsrud, Gaglio, and Olm 1986, Birley 1985). A logical extension of this research involves an investigation of the dimensions which characterize the personal networks of entrepreneurs across the stages of business development. As noted in the quote by the Ontario Premier's Council (1988), companies in high growth and emerging industries face particular problems. An investigation of the networks and interactions of entrepreneurs representing these technology-based companies may permit insight into problems specific to that industry. Consequently, the research problem is as follows:

Across the stages of business development, are there differences in the dimensions which characterize personal networks of entrepreneurs representing technology-based companies?

To deal with this, three steps are necessary:

- 1) Categorize the companies of the entrepreneurs included in the research into stages of business development;
- 2) Characterize the entrepreneurs' personal networks with the dimensions associated with personal networks; and
- 3) Across the stages of business development, identify differences in the dimensions associated with personal networks.

The research will benefit at least three groups. First, future researchers of entrepreneurship may benefit because a more complete theory can be developed with the integration of entrepreneurship theory and the network approach. As well, further testing of the network approach to entrepreneurship will permit the development of a more rigorous theory.

As well, researchers of the management of technology will benefit from the research. Benninger (1988) noted that there is a lack of understanding concerning technology-based entrepreneurial growth firms in Ottawa. Investigation of technology-based entrepreneurs may contribute to an understanding of these firms and their entrepreneurs.

Second, entrepreneurs may use the conclusions of the research to develop personal networks appropriate for the stage of development of their businesses. Instead of pointing to successful entrepreneurs and describing their networks as guidelines for other entrepreneurs, the research provides a more rigorous set of criteria for developing and structuring personal networks. Entrepreneurs can use these criteria based on their roles in the companies and the companies' needs for external resources. Furthermore, the research provides guidance to entrepreneurs for participation in more formal networks, such as trade and professional associations.

Third, government policy makers can use the conclusions of the research to increase the effectiveness of assistance programs for entrepreneurs. The companies' external resource needs, as reflected in the resources acquired from the entrepreneurs' personal networks, are a byproduct of the research. Consequently, government policies and programs can be tailored to the resource needs and opportunities faced by entrepreneurs during each stage of business development.

The thesis consists of seven chapters. The present chapter is followed by a literature review which will situate the research problem in the context of entrepreneurship research. Once the research has been positioned, hypotheses will be presented in the third chapter. Chapter 4 documents and discusses the research design. The fifth chapter provides the results of the research while the sixth chapter presents an analysis of the results. In the seventh chapter, conclusions, limitations, and benefits of the research will be presented along with suggestions for future researchers.

CHAPTER 2

LITERATURE REVIEW

The literature review discusses research on entrepreneurship and personal networks. Then, the chapter reviews a model of business development to illustrate that, similar to the personal network theory, theories of business development emphasize the acquisition of external business resources. Finally, the research problem will be situated in the context of these two complementary theories.

Traditionally, researchers have had two choices in pursuit of an entrepreneurship framework. They could attribute the entrepreneurship process to personality characteristics. Alternatively, researchers could employ the socio-cultural view that entrepreneurial behaviour evolves from a society's beliefs, values, and traditions.

Personality Approach to Entrepreneurship

This approach to entrepreneurship suggests that personality characteristics explain entrepreneurial behaviour (Stevenson 1985). Extensive personality testing has been done to determine the extent to which personality traits predict entrepreneurship. The major traits associated with the personality approach are need for achievement, locus of control, and risk aversion. In one of the most cited studies on personality characteristics of entrepreneurs, McClelland (1961) found that a high need for achievement or desire to be successful may drive people to become entrepreneurs. Borland (1975) found significant differences in internal locus of control between students who expected to start a company and those who did not. With regards to risk aversion, Hull, Bosley, and Udell (1980)

found that this trait was important in identifying entrepreneurial types of individuals.

Though numerous studies supporting the personality approach have been conducted (Stevenson 1985, Hull, Bosley, and Udell 1980), evidence exists supporting those who oppose the approach. Other researchers have investigated need achievement and entrepreneurship and found no significant correlation. Hull, Bosley, and Udell (1980) found that while propensity to take risk was correlated with the creation of a business, personality constructs such as need achievement, desire for money and fame, social desirability, and internal locus of control were not significantly related to entrepreneurial behaviour. Cooper, Woo, and Dunkelberg (1988) found that personality differences between "hi-tech" owners and owners of new other businesses were not significant. Furthermore, Cooper, Woo, and Dunkelberg (1988) and Stevenson (1985) found no meaningful differences between various types of entrepreneurs or between entrepreneurs and the general population on the basis of personality. Though the personality approach is based on empirical research, Stevenson (1985) concluded that most of the results of studies with this approach have been inconclusive because situational conditions were ignored and inadequate research methodologies were used.

Socio-Cultural View of Entrepreneurship

The socio-cultural approach posits that entrepreneurial drive is based on national origins, culture, or religion and that groups of people succeed as entrepreneurs because they possess beliefs, values, and traditions congruent with those needed to be an entrepreneur (Aldrich and Zimmer

1985).

In fact, studies using this approach investigate a wide range of variables. Hagen (1962) determined that ethnic entrepreneurs seem to compensate for separateness in society and feelings of being discriminated against through entrepreneurial achievement. However, Borland (1975) found that the entrepreneurial experience of a student's father was the most important variable for predicting entrepreneurship. Lyles (1974) discovered that sons of self-employed fathers equate employment and entrepreneurship based on their experience in the family business. Yet, a third interpretation by Whyte and Braun (1966) found that entrepreneurs are a product of school systems and child rearing.

A Third Approach to Entrepreneurship

Neither the personality nor the socio-cultural approach incorporates the social relationships through which entrepreneurs obtain information and resources to take advantage of perceived opportunities in the environment, preventing researchers from pursuing a comprehensive understanding of the entrepreneurial process (Aldrich and Zimmer 1985, Carsrud, Gaglio, and Oim 1986, Carsrud, Oim, and Eddy 1985). Limitations of the two approaches have been documented by Aldrich and Zimmer (1985). They find fault with the socio-cultural approach because according to the literature, ethnic groups are said to develop entrepreneurial tendencies when they are relocated in a land of opportunity. Yet it can be argued that the proliferation of ethnic entrepreneurs is not a cultural phenomenon but one based on their new surroundings. Furthermore, the socio-cultural approach permits stereotyping cultures regardless of individual circumstances. Aldrich and Zimmer (1985)

warn of the danger of cultural stereotyping. Another criticism made by Aldrich and Zimmer (1985) of empirical studies on entrepreneurial personality characteristics and socio-cultural factors is that the research has been subject to selection bias (McClelland 1961). For example, entrepreneurs are given personality tests, yet control groups are infrequently used, resulting in weak relationships between personality characteristics and entrepreneurial behaviour.

Entrepreneurial activity is rarely exhibited in isolation. Entrepreneurs perceive opportunities and take advantage of them through social interactions. The network approach to entrepreneurship addresses interrelationships in the environment. Regardless of their personalities and cultural backgrounds, potential entrepreneurs must seek out opportunities and resources for the start up and operation of businesses. Personal networks function as channels through which resources are acquired.

For clarity, the network is viewed from one entrepreneur's vantage. Otherwise, the network may become an infinite series of relationships as each participant widens the network to satisfy his/her resource needs.

Personal Networks and its Dimensions

Rush, Graham, and Long (1987) defined a personal network by what it does for entrepreneurs: transforms a dream into reality; increases aspirations; stimulates ideas; and provides practical help and support. Carsrud, Gaglio, and Olm (1987) defined the network as the number of direct contacts identified by the entrepreneur that contributed to the success of the new venture. Thorelli (1986) views the network as an alternative to vertical integration or as a means to reach new customers.

Many definitions of personal networks incorporate the notion of the acquisition of external resources by the entrepreneur (Carsrud, Gaglio, and Olm 1987, Aldrich, Rosen, and Woodward 1987a). Resources are skills, information, or control over materials or capital necessary for the success of the new venture (Carsrud, Gaglio, and Olm 1987). Aldrich, Rosen, and Woodward (1987a) define a network as the process of sharing contacts and obtaining resources. They describe networks as the essential building blocks for entrepreneurial success.

In the literature, researchers segment personal networks into five dimensions (Aldrich *et al* 1989, Aldrich, Rosen, and Woodward, 1988a, 1988b, 1987a, 1987b, Carsrud, Gaglio, and Olm 1986, Aldrich and Zimmer 1985, Birley 1985):

- 1) *Accessibility*
- 2) *Amount of resources*
- 3) *Density*
- 4) *Strength of ties*
- 5) *Reachability*

Accessibility denotes the degree to which the entrepreneur can obtain financial and non-financial resources (Aldrich, Rosen, and Woodward 1987a). *Accessibility* to resources, represented by the number of interactions with network members, increases if the entrepreneur maintains regular contact with network members. *Accessibility* was correlated with business success and was found to be significant in predicting the profitability of businesses less than three years old (Aldrich, Rosen, Woodward 1987a). However, no relationship was found between profitability and accessibility in businesses more than three years old (Aldrich, Rosen, Woodward 1987a). Aldrich,

Rosen, and Woodward (1987b) and Klofsten (1987) concluded that entrepreneurs spend significant amounts of time developing and maintaining contacts and speaking to other people about business, spending about half their time during the start up of the business developing contacts.

The *amount of resources* in a network represents the quantity of resources available to the entrepreneur (Aldrich, Rosen, and Woodward 1987a). Personal networks with more resources should be of greater help to entrepreneurs than those with fewer resources. Aldrich, Rosen, and Woodward (1987a) found that for businesses older than three years, the *amount of resources* was associated with business profitability, while for younger businesses, no relationship was evident between this variable and profitability.

Density refers to the extensiveness of ties between people in a network (Aldrich 1988b). The presence of ties between many of the network members is an indication of a dense network while few ties between network members is evidence of a loose network. Aldrich, Rosen, and Woodward (1987b) found that networks were loose rather than dense, with nearly half of the contacts strangers to each other. Over time, networks grow stronger, moving from loose to tight (Swedish Academy of Engineering Sciences 1982).

Strength of ties is related to the ability of the entrepreneur to obtain diverse resources. A network consisting of members who are casual acquaintances will have weak ties between network members. A network consisting of members who are close friends will have strong ties between network members. Granovetter (1982) proposes that weak ties in the personal network will provide the entrepreneur with access to diverse or

more varied information because contacts do not share values, sources, and other contacts. Carsrud, Gaglio, and Olm (1987) support the view that strong tie networks inhibit the successful development of entrepreneurial ventures. However, there was no comparable evidence for the existence of loose ties in the development of business ventures. Contrary to the results of Granovetter (1982), support exists for strong ties in research by Aldrich, Rosen, and Woodward (1987a) who found that business starters had personal networks that were more closely linked than those who did not start businesses.

Density and *strength of ties* are related constructs. *Density* is measured by the presence of ties between members in a personal network. *Strength of ties* is measured by the degree of the relationship between pairs of network members. By definition, personal networks characterized by strong ties will be dense. However, personal networks with weak ties may be loose or dense.

The fifth dimension is *reachability* or the presence of intermediaries between pairs of people (Aldrich and Zimmer 1985). These intermediaries are linking pins in a network.

Stages of Business Development

Researchers have categorized similarities in changes that occur as businesses develop (Kazanjan, 1988, Churchill and Lewis, 1982, Greiner 1972, Steinmetz 1969). Among the changes that occur as the business develops is the quantity and quality of resources for the operation of the business. The acquisition of external resources for the company by the entrepreneur partly explains the development and maintenance of the

entrepreneurs' personal network.

To examine the dimensions of personal networks across the stages of business development, the model of the stages of business development supported by Churchill and Lewis (1982) was chosen as an exemplary model. This model is based on the self-categorization of companies by their owners, making the model more useful and meaningful to entrepreneurs than other methods of categorization. According to Churchill and Lewis (1982), the five stages of business development for the entrepreneur, *Existence*, *Survival*, *Success*, *Takeoff*, and *Big Company*, are characterized by variables such as delegation, importance of external business resources, and cash flow.

During the first two stages of business development, *Existence* and *Survival*, the business and the owner are synonymous. The relative importance of external business resources acquired by the entrepreneur decreases as the business leaves the first two stages of development.

In the third stage of business development, *Success*, the business begins to envelop the entrepreneur's network. Human resources within the company gain importance. The entrepreneur hires an accountant to replace the bookkeeper. External business resources acquired by the entrepreneur are less important than in the earlier stages of development. The entrepreneur and the business separate.

In the fourth stage, *Takeoff*, the entrepreneur is relatively separate from the business. While financing growth becomes important, overall, external business resources acquired by the entrepreneur become less important than in stage three, *Success*.

Finally, in stage five, *Big Company*, the entrepreneur and the business

are distinct and the external business resources acquired by the entrepreneur are less important than in previous stages. The business is managed by a professional manager.

Summary

Changes in the importance of external business resources acquired by the entrepreneur have been noted in the literature review. The review of the dimensions of entrepreneurs' personal networks suggests that the structure and the role of the network are not constant. Contradictory results were found in the literature for two of the dimensions, *strength of ties* and *density*. Aldrich, Rosen, and Woodward (1987b) indicated that during periods of high resource use, activity in personal networks increased. Activity includes the number of contacts made per week, the number of people involved, and the amount of time the entrepreneur spends talking with those in the network. Aldrich, Rosen, and Woodward (1987a) found significant differences in the size of the network, *accessibility*, and the *amount of resources*, depending on the age of the business. The authors concluded that over time, the entrepreneur's personal network changes with external resource requirements.

The changing role of entrepreneurs in their companies flows from changes in the five stages of business development. Changes in the role and structure of entrepreneurs' personal networks have been associated with independent variables such as the age of the business. Research examining networks across the stages of business development may provide further evidence that personal networks are not stable because the model of the stages of business development chosen (Churchill and Lewis 1982)

categorizes businesses into stages by factors other than the size or age of the company.

CHAPTER 3

HYPOTHESES

The foregoing literature review revealed that further research is required to examine entrepreneurs' personal networks across the stages of business development. Four hypotheses were developed and used to guide the research design. *Reachability* was omitted from the research. Unlike the other dimensions, the data needed to examine *reachability* have to be gathered from people other than the entrepreneur. Members of entrepreneurs' networks may be unwilling to divulge information about their relationship with the entrepreneur or they may reside beyond the geographical limits imposed by the time and financial restraints of the research. As such, examination of *reachability* is left to future endeavors.

Hypothesis 1:

Entrepreneurs whose businesses are in the initial stages of business development have personal networks with lower *accessibility* than entrepreneurs in the latter stages of business development.

Due to experience and priority given to network development and maintenance, entrepreneurs in the latter stages can obtain more resources than entrepreneurs in the initial stages.

Hypothesis 2:

Entrepreneurs whose businesses are in the initial stages of business development have personal networks with lower *amount of resources* than entrepreneurs in the latter stages of business development.

As a function of time and expansion of the business, the number of contacts in the entrepreneur's network, and thus the quantity of resources, should increase.

Hypothesis 3:

Entrepreneurs whose businesses are in the initial stages of business development have personal networks with higher *density* than entrepreneurs in the latter stages of business development.

During the initial stages, *density* or the interconnectedness of the network ought to be high due to the presence of friends and relatives from previous social and business networks. In time, these contacts may be replaced by business acquaintances.

Hypothesis 4:

Entrepreneurs whose businesses are in the initial stages of business development have personal networks with higher *strength of ties* than entrepreneurs in the latter stages of business development.

During initial stages, the personal networks of entrepreneurs were closely linked (Aldrich, Rosen, and Woodward 1987a). The members of the initial network may be replaced by business acquaintances, decreasing the *strength of ties* in the network.

CHAPTER 4

RESEARCH DESIGN

The research design was shaped by the research objective and access to resources. The research objective is to investigate networks of technology-based companies in the Ottawa-Carleton Region as represented by a founding entrepreneur.

The research design has two components: the research method and the data collection instrument. The research was designed to ensure that accurate, reliable, valid, and timely data were gathered (Tull and Hawkins 1987, Davis and Cosenza 1985).

Research Method

To investigate the personal networks of a group of entrepreneurs, two research methods are commonly used, the *ex post facto* method and the experimental method. According to Davis and Cosenza (1985), the *ex post facto* method is appropriate because variables such as the stage of business development and the dimensions of personal networks are not inherently manipulable. In addition, fostering relationships between entrepreneurs and network members is a lengthy process. The need to gather data from respondents in a natural setting eliminated the use of an experimental method in an artificial setting, such as a laboratory.

The theoretical concepts and constructs of the personal network approach to entrepreneurship have been developed and associated variables have been documented, reducing the usefulness of a case study. Results from field research are more easily generalized than results from a case study. Consequently, the research method employed elements of surveys and

field research to test hypotheses and discover salient variables associated with personal networks. A survey instrument was derived from a mail questionnaire developed by Aldrich, Rosen, and Woodward (1987a). Dangers associated with transforming a mail questionnaire into a survey instrument were overcome by a pretest of the survey instrument. During the pretest, additions to the transformed questionnaire were examined and respondents' input was incorporated into the instrument. Interviews, often used in field research, are appropriate because they ensure that a majority of the data is gathered even though the network approach may be unfamiliar to respondents.

Entrepreneurs in the same industry have similar backgrounds and their companies have similar characteristics. To reduce variation in the data attributable to these characteristics, entrepreneurs from one industry were chosen for the study.

Initially, the population for the research was to be sampled. Upon further analysis of the limited size of the population and the expected response rate of approximately 46% (Sheridan 1988), a population survey was undertaken. All of the entrepreneurs in the population were contacted for the research due to the expectation of non-response. In addition, the number of companies in the population was small enough to be manageable for interviews.

Population

Population: Technology-based companies as defined by the National Science Foundation, whose name appeared in the 1988 *Software Developer's Directory* and the 1988 *Manufacturer's Directory*, which had published sales data, and which had at least one founding entrepreneur still with the company.

Extent: Ottawa-Carleton Region.

Time: February and March, 1989.

Survey Unit: One founding entrepreneur from each company in the population.

Size: 87.

Normally, a technology-based company has a higher research and development expenditure relative to other industrial sectors, employs technically trained people, and has a high rate of technological change (Cooper 1986). From the National Science Foundation (1981), the operational definition of the technology-based company is one that belongs to one of the following industries:

- 1) Chemicals and pharmaceuticals
- 2) Computers
- 3) Electrical equipment and communications
- 4) Professional and scientific equipment
- 5) Aircraft and missiles.

The population was chosen for several reasons. First, the concentration of technology-based companies in the Ottawa-Carleton Region facilitated contact with the survey units. Second, the companies are similar regarding location and amount of money spent on research and development relative to other industries. Third, these companies are subject to rapid technological obsolescence, making expedient acquisition of external resources important. Finally, preliminary telephone calls made to

technology-based companies in the Ottawa-Carleton Region indicated that at least one founding entrepreneur was present in 65% or 118 of the companies contacted. This group of entrepreneurs is large enough to justify the research. The companies contacted were identical to those in the population with the addition of companies without published sales data.

The preliminary population was derived from three lists of companies in the Ottawa-Carleton Region and a series of telephone calls. The lists are the *Software Developer's Directory* for 1988, the *Manufacturer's Directory* for 1988, both published by the Ottawa-Carleton Economic Development Corporation, and a list of "Area Hi-Tech Manufacturing Firms" (Stewart 1988) published by the *Ottawa Citizen* on March 15, 1988. The two directories, the *Software Developer's Directory* and the *Manufacturer's Directory*, were the primary lists used to compile the population because the directories represented most technology-based companies in the Ottawa-Carleton Region. The six month period between the publication of the directories and the research is responsible for any differences between the companies included on the list representing the population and the actual companies in the population. The following steps were taken to derive the final population:

- 1) A comprehensive list was compiled which included all companies that met the criteria of a technology-based company.
- 2) Each company was contacted to determine if one of the founding entrepreneurs was still with the company. Due to the death rate and mobility of businesses, some companies in the directories could not be contacted. Those companies in which a founding entrepreneur was not present were eliminated from the list. For those companies in which one of the founding entrepreneurs was present, the name of at least one entrepreneur was obtained.

- 3) Because sales data were needed to categorize the population, companies lacking these data were excluded.

Ten percent of the companies in the population did not provide sales information. Discussions with the researchers who collected the company profiles for the directories revealed that missing data were due to ignorance of the support staff filling out the profiles rather than due to some organizational difference between firms that provide information and those that do not.

Data Collection Plan

Data were required from respondents in companies from each stage of business development. Since data categorizing companies in the population by stage of business development were not available, sales data were used as a proxy. Greiner (1972) and Steinmetz (1969) documented the use of sales data as the predictor of stage of business development. From a pretest of the survey instrument, an association was discovered between the self-reported stage of business development and the company's sales category. This association is illustrated in Figure 1. Feldt (1958) concludes that it is efficient to categorize a sample when the correlation between the proxy and the variable it is replacing is greater than 0.2. The *Pearson coefficient of correlation* between the stages of business development and the sales categories was 0.7094 in the pretest, making sales an appropriate proxy.

From the pretest and an analysis of the sales categories used in the directories, the following categories of sales in Canadian dollars were developed:

Figure 1. Pretest Results Graphing Reported Sales Category and Reported Stage of Business Development

- 1) Less than \$500,000
- 2) \$500,000 to \$1,000,000
- 3) \$1,000,001 to \$3,000,000
- 4) \$3,000,001 to \$5,000,000
- 5) Over \$5,000,000.

A final population was prepared in which companies were categorized by these sales categories. The population contained 87 companies. The population is broken down by sales category in Table 1.

TABLE 1
NUMBER OF COMPANIES REPRESENTING
SALES CATEGORIES IN POPULATION

	<u>N</u>
Sales are less than \$500,000	26
Sales are between \$500,000 and \$1,000,000	15
Sales are between \$1,000,001 and \$3,000,000	26
Sales are between \$3,000,001 and \$5,000,000	12
Sales are over \$5,000,000	8
Total	<u>87</u>

If a company had more than one entrepreneur, respondents were chosen by the alphabetical order of the entrepreneurs' last names. The invitation contained a description of the stages of business development allowing the entrepreneur to classify the company (see Appendix A). Within three weeks the companies were contacted by telephone to arrange half hour interviews with the entrepreneurs through their personal secretaries.

At most, three callbacks were made to each company to avoid antagonizing the entrepreneurs. Those who did not agree to an interview

after three callbacks were categorized as non-respondents. Interviews were arranged about one week after the entrepreneur agreed to participate and were conducted at the entrepreneur's place of business. After a preliminary explanation of the purpose of the research, the interview was recorded. Data was gathered using a semi-structured interview schedule (see Appendix B).

Data Analysis

Qualitative and quantitative data from the research were analyzed. For the quantitative data collected, descriptive statistics for the measures of personal network dimensions across the stages of business development were calculated and compared to the hypotheses.

From recordings of the interviews, the respondents' comments were analyzed for other variables which influenced the structure and role of personal networks in addition to those investigated with the survey instrument.

Data Collection Instrument

The constructs and concepts from personal network theory are newer and less precise than other theories of entrepreneurship. Using the semi-structured interview schedule, salient concepts of personal networks were discovered from respondents comments while data was collected for dimensions documented in the literature. Shortcomings undetected by the instrument when it was used as a mail questionnaire were discovered. Structured questions in the instrument ensured that the respondent was not sidetracked on a particular issue. Also, structured questions facilitated

comparison of data between respondents. In retrospect, the choice of the semi-structured interview schedule as an investigative tool was an appropriate one.

The instrument elicited data for the four dimensions of personal networks: *accessability*, *amount of resources*, *density*, and *strength of ties*. Queries for the dimensions were derived from a mail questionnaire by Aldrich, Rosen, and Woodward (1987a) while operational definitions were drawn from the literature of the network approach. As well, personal and company data were solicited with the instrument, shown in Appendix B.

Accessability

Accessability was operationally defined with three variables. The first two variables were the number of hours per week the entrepreneur spends developing contacts and the number of hours per week the entrepreneur spends maintaining contacts. The third variable recorded the frequency of the contacts, or the number of times per week the people in the network are contacted.

Amount of Resources

Amount of resources can be defined with two components: the number of contacts and the average dollar value of resources provided by the contacts. These data would indicate the dependency of the entrepreneur on the personal network for external resources. A tradeoff was made between the calibre of data that could be collected and the value of that data for the research. The value of resources is difficult to estimate. As a result, *amount of resources* was calculated by the number of people with whom

entrepreneurs regularly discussed the operation of their businesses.

Density

Operationally, *density* is defined as the ratio of the actual number of ties between contacts in a personal network and the maximum number of connections possible. The respondents were asked to indicate the presence or absence of relationships between pairs of network contacts. Figure 2 illustrates a sample of the calculation of the *density* in a personal network.

Strength of Ties

The *strength of ties* can be represented with two concepts - the *strength of ties* between network members and the *strength of ties* between the entrepreneur and network members. For both measures, respondents were asked to refer to five people with whom they discuss the operation of the current business. Names were not requested to avoid socially desirable answers from the respondents. This was based on other studies which document questions referring to five network members (Aldrich *et al* 1989, Aldrich, Rosen, and Woodward 1988a, 1987a). During the pretest, respondents indicated that networks of five contacts were easier to envisage than networks with seven or more contacts. Next, the respondents were asked to describe their relationship with each of the five people. As well, respondents were asked to rate the relationship between pairs of contacts on a three point scale. For the *strength of ties* between network members, the number of contacts in each of the three categories on the scale was summed, weighted, and calculated as a percentage. A sample calculation of the strength of ties between the network members is

Figure 2**CALCULATION OF THE DENSITY IN A PERSONAL NETWORK**

Possible ties between network members = 10

Actual ties between network members = 3

$$\begin{aligned}
 \text{Density} &= \frac{\text{Actual ties between network members}}{\text{Possible ties between network members}} \\
 &= \frac{3}{10} = 0.3
 \end{aligned}$$

displayed in Figure 3. For the *strength of ties* between the entrepreneur and network members, the proportion of business relationships in the network was calculated.

Stage of Business Development

The respondents were given a list of descriptions for the stages of business development (Churchill and Lewis 1982) and asked to indicate the stage which best described their company and their involvement in it (Kazanjian 1988). The descriptions of the stages of business development are:

- 1) The organization of your business is simple. You do everything and directly supervise employees. You and the business are synonymous. You do all of the critical tasks and are the major supplier of energy, direction, and capital.
- 2) Your company is a viable business entity. The organization of the business is still simple. There may be a foreman or sales manager making minor decisions but you are involved with almost everything.
- 3) Your company has grown large enough to permit functional hiring of functional managers to take over some of your duties. The organization of the business is functional in design with an operations manager, marketing manager, and a comptroller instead of a bookkeeper. Yet, these still function under your direction. You and the business are moving apart.
- 4) Your business is decentralized and, at least in part, divisionalized with controls over delegated responsibilities. You and the business are reasonably separate yet the company is dominated by your managerial presence and stock ownership.
- 5) The business has many controls. Decision making is decentralized and the key managers share in the development of strategy. You and the business are quite separate both managerially and financially.

Figure 3

CALCULATION OF THE STRENGTH OF TIES BETWEEN MEMBERS IN A PERSONAL NETWORK

SCALE PAIRS OF NETWORK MEMBERS	RELATIONSHIP		
	1 STRANGERS	2 SOMEWHAT ACQUAINTED	3 WELL ACQUAINTED
NETWORK MEMBERS 1 AND 2	.		
NETWORK MEMBERS 1 AND 3	.		
NETWORK MEMBERS 1 AND 4		.	
NETWORK MEMBERS 1 AND 5			.
NETWORK MEMBERS 2 AND 3	.		
NETWORK MEMBERS 2 AND 4	.		
NETWORK MEMBERS 2 AND 5	.		
NETWORK MEMBERS 3 AND 4	.		
NETWORK MEMBERS 3 AND 5			.
NETWORK MEMBERS 4 AND 5	.		
TOTAL	7	1	2

WEIGHT TOTALS: $7 \times 1 = 7$ $1 \times 2 = 2$ $2 \times 3 = 6$

SUM WEIGHTED TOTALS: $7 + 2 + 6 = 14$

POSSIBLE NUMBER OF TIES = 10

DIVIDE SUM OF WEIGHTED TOTALS BY NUMBER OF POSSIBLE TIES: $\frac{14}{10} = 1.4$

CHAPTER 5**RESULTS**

From the 87 companies invited to participate in the research, responses are shown in Table 2.

TABLE 2
DESCRIPTION OF RESPONSES FROM INVITATIONS TO
PARTICIPATE IN RESEARCH DURING
FEBRUARY AND MARCH OF 1989

Positive response	30
Negative response	49
Entrepreneur is absent	8
Total	<u>87</u>

The response rate was 34%. Thirty respondents were interviewed. Forty-nine of the entrepreneurs declined to be interviewed, most citing time constraints. Based on a comparison of sales data and number of employees for the respondents' and non-respondents' companies, the data were likely not adversely affected by the non-response rate. For respondents' and non-respondents' companies, the sales categories for 1988 are displayed in Figure 4. The distribution of the categories is similar for both groups. The average number of employees for respondents' and non-respondents' companies is similar. The average for respondents' companies is 31.8 while for non-respondents' companies, the average is 30.8. The percentage of respondents and the percentage of the companies in the population from each of the two major directories used in the research were compared. In the population, the proportion of companies from each directory was similar

Figure 4. Comparison of Sales Categories for Fiscal 1988 Between Respondents' and Non-respondents' Companies

to the that of the respondents' companies. Eighty percent of companies in the population were taken from the *Software Developer's Directory*, with the remaining 20% from the *Manufacturer's Directory*. The *Software Developer's Directory* lists most of the technology-based companies in the Ottawa-Carleton Region while the *Manufacturers' Directory* lists companies other than technology-based ones. Seventy-seven percent of respondents' companies were listed in the *Software Developer's Directory* while the remainder came from the *Manufacturer's Directory*. The results of these three comparisons suggest that respondents are similar to non-respondents and that the data are relatively free from non-response bias.

Characteristics of Respondents and Their Companies

Before the results are presented, the respondents and their companies will be described to provide data for comparison with other studies of entrepreneurs.

The 30 respondents had the following characteristics:

1. All of the respondents were male.
2. 50% (n=15) of the respondents were from 41 to 50 years of age (see Figure 5).
3. 87% (n=26) of the respondents had at least some university education (see Figure 6). Eight respondents had earned post graduate degrees.
4. 93% (n=28) of the respondents were employed before they started their present companies with 71% (n=20) in the computer industry (see Figure 7).

Figure 5. Breakdown of Respondents into Age Categories

Figure 6. Breakdown of Respondents into Highest Education Level Achieved

Figure 7. Respondents' Previous Employment by Industry

5. 43% (n=13) of the respondents reported that the present company was not their first attempt at entrepreneurship as defined in this research.
6. Of the 13 respondents who had owned and operated a business other than the one in which they are presently involved, 39% (n=5) had owned computer-related firms (see Figure 8).
7. 73% (n=22) of respondents' companies were in the computer industry (see Figure 9).
8. 50% (n=15) of the respondents' fathers were self-employed. One third of the respondents reported that their father's occupation was government related. This is attributed to the prominence of the Federal Government as an employer in Ottawa.
9. 63% (n=19) of the mothers of the respondents were housewives. 20% (n=6) of the entrepreneurs' mothers were self-employed.

The respondents' companies had the following characteristics:

1. The age of the companies ranged from 1 year to 15 years with an average of 6.4 years.
2. For fiscal 1987, sales categories in Canadian dollars for the companies are shown in Figure 10. Figure 11 indicates sales for the companies in fiscal 1988.
3. In 1987 the average number of employees was 24.5. This grew to 31.8 in 1988.
4. Of the 30 respondents, six reported being in Stage 1, six reported being in Stage 2, nine reported being in Stage 3, six reported being in Stage 4, and three reported being in Stage 5 (see Figure 12).
5. Approximately 73% (n=22) of respondents had a board of directors.

Figure 8. Breakdown of Second-Time Entrepreneurs' Previous Company by Industry

Figure 9. Breakdown of Respondents' Present Company by Industry Category

Figure 10. Breakdown of Respondents' Companies by Sales Categories for Fiscal 1987

Figure 11. Breakdown of Respondents' Companies by Sales Categories for Fiscal 1988

Figure 12. Respondents' Self-Categorization of Companies into Stage of Business Development

6. Of the 22 respondents who had a board of directors, 45.5% (n = 10) reported more than 3 people on the board.
7. At the time of the research, the number of active owners in the companies ranged from 1 to 5.
8. Exactly 80% (n = 24) of respondents reported membership in at least one professional organization.

Results Pertaining to the Dimensions of Personal Networks

For each of the four dimensions of personal networks, results will be presented. The measures of the dimensions of personal networks and any discussion of results will be given for three stages of business development rather than five because the stages of business development were collapsed. With fewer stages and more respondents in each stage, differences in the measures of dimensions across the stages of business development are not dominated by a few respondents.

Stages 1 and 2 became the "early stage," stage 3 became the "middle stage," and stages 4 and 5 became the "late stage." Collapsing of sequential stages was appropriate because Churchill and Lewis (1982) and Kazanjian (1987) see the stages of business development as a sequential process. Churchill and Lewis (1982) collapsed stages 1 and 2 due to the similarity of the factors which characterize the stages. For stage 3, the levels of these factors are different than those that describe stages 1 and 2. In stages 4 and 5, the importance of external business resources acquired by the entrepreneur diminishes, separating these stages from the first three. The breakdown of respondents into these newly formed stages of development is shown in Figure 13. The number of respondents in each of the resultant

Figure 13. Respondents' Self-Categorization of Companies into Collapsed Stages of Business Development

stages is similar making the comparison of results between stages more meaningful than if the results of a few respondents were compared with those of a hundred respondents.

The nonparametric chi-square test is often used to test the strength of relationships between categorized data. This test is not applicable to the categorized results for the dimensions displayed in Tables 4, 6, 9, 10, 11, and 12 because each of these displays of data fails to meet one of the conditions necessary for the chi-square test - no more than 20% of the cells can have less than five respondents (Norusis 1986). In each of these tables, more than 20% of the cells have less than five respondents in each, and in some cases, cells have zero values, restricting the use of the test. Though the categories can be collapsed to increase the number of respondents in each cell, valuable data would be eliminated (Siegel 1956). The categories in each table were chosen because they illustrate salient divisions of the data. In addition, other empirical studies of entrepreneurs' personal networks yielded inconclusive results when the measures of dimensions were dichotomized (Aldrich, Rosen, and Woodward 1987b, Carsrud, Gaglio, and Olm 1986).

Accessibility

The first measure of *accessibility* is the number of hours per week respondents spent developing contacts. The means, standard deviations, skewness, and kurtoses for this measure across the stages of business development are shown in Table 3.

TABLE 3
NUMBER OF HOURS PER WEEK SPENT DEVELOPING
PERSONAL NETWORK CONTACTS

Stage of Business	Mean	Standard Deviation	Skewness	Kurtosis
Early Stage	4.6667	4.9421	0.863	-0.044
Middle Stage	6.2222	4.9188	0.493	-0.638
Late Stage	3.1111	4.7022	2.442	6.540

Table 3 indicates that the distribution of results for respondents in each of the three stages of business development is skewed. The distributions are non-normal, hence, parametric testing is not appropriate. Consequently, the statistics were replaced by categorized data as shown in Table 4.

TABLE 4
RESPONDENTS CATEGORIZED BY NUMBER OF HOURS PER WEEK
SPENT DEVELOPING PERSONAL NETWORK CONTACTS

Stage of Business	Number of Hours		Total
	0 to 5 Hours	6 to 20 Hours	
Early Stage	7	5	12
Middle Stage	4	5	9
Late Stage	8	1	9
Total	19	11	30

About half of the respondents with companies in the early and middle stages of business development spent five or fewer hours per week developing contacts and half spend between six and twenty hours. While only one of the respondents with companies in the late stage of business development reported spending more than five hours per week developing contacts, the majority of respondents with companies in this stage of business development spent five or fewer hours.

Compared to entrepreneurs with companies in the early stages of business development, those with companies in the late stage of business development spend fewer hours per week developing contacts.

The second measure of *accessibility* is the number of hours per week respondents spent maintaining contacts. The means, standard deviations, skewness, and kurtoses for this measure across the stages of business development are shown in Table 5.

TABLE 5
NUMBER OF HOURS PER WEEK SPENT MAINTAINING
PERSONAL NETWORK CONTACTS

Stage of Business	Mean	Standard Deviation	Skewness	Kurtosis
Early Stage	4.0833	5.0715	1.126	0.286
Middle Stage	6.0000	9.3675	2.582	7.087
Late Stage	6.4444	13.0395	2.642	7.258

Table 5 indicates that the distribution of results for respondents in each of the three stages of business development is skewed. The

distributions are non-normal, hence, parametric testing is not appropriate. Consequently, the statistics were replaced by categorized data as shown in Table 6.

TABLE 6
RESPONDENTS CATEGORIZED BY NUMBER OF HOURS PER WEEK
SPENT MAINTAINING PERSONAL NETWORK CONTACTS

Stage of Business	Number of Hours			Total
	0 to 5 Hours	6 to 20 Hours	21 to 40 Hours	
Early Stage	9	3	0	12
Middle Stage	7	1	1	9
Late Stage	7	1	1	9
Total	23	5	2	30

While none of the respondents with companies in the early stage of business development reported spending more than twenty hours per week maintaining contacts, the majority of respondents with companies in this stage of business development spent five or fewer hours. Similarly, all but two of the respondents with companies in the middle and late stages of business development reported spending five or fewer hours per week developing contacts.

There is little evidence of differences in the number of hours spent by respondents per week maintaining contacts across the stages of business development.

The third measure of *accessibility* is the frequency of respondents' contacts with network members, as shown in Table 7.

TABLE 7
FREQUENCY OF CONTACTS BETWEEN RESPONDENTS
AND NETWORK MEMBERS

Stage of Business	More than or equal to once a month	Less than once a month and more than once a year
Early Stage	67%	33%
Middle Stage	78%	22%
Late Stage	100%	0%

All of the respondents with companies in the late stage of business development contacted network members at least once a month unlike respondents with companies in the early and middle stages of business development.

Compared to entrepreneurs with companies in the early stages of business development, those with companies in the late stage of business development contact members of their personal networks more frequently.

Amount of Resources

For the measure of the *amount of resources*, the number of people with whom the respondents regularly discussed the operation of the business in the last six months, means, standard deviations, skewness, and kurtoses across the three stages of business development are shown in Table 8.

TABLE 8
NUMBER OF PEOPLE WITH WHOM RESPONDENTS REGULARLY
DISCUSSED OPERATION OF BUSINESS WITHIN
LAST SIX MONTHS

Stage of Business	Mean	Standard Deviation	Skewness	Kurtosis
Early Stage	19.8333	25.96	3.134	10.352
Middle Stage	9.1111	8.7528	2.045	4.388
Late Stage	63.2222	84.1201	1.111	-0.482

Table 8 indicates that the distribution of results for respondents in each of the three stages of business development is skewed. The distributions are non-normal, hence, parametric testing is not appropriate. Also, the data in Table 8 are affected by outliers. Three respondents reported networks with 100 or more contacts. Regular contact with 100 or more network contacts was considered unlikely. Consequently, categorized data excluding the outliers is presented in Table 9.

TABLE 9
RESPONDENTS CATEGORIZED BY NUMBER OF PEOPLE
WITH WHOM THEY REGULARLY DISCUSSED OPERATION
OF BUSINESS IN LAST SIX MONTHS (OUTLIERS EXCLUDED)

Stage of Business	Number of People			
	0 to 5	6 to 20	21 to 50	Total
Early Stage	1	10	1	12
Middle Stage	4	4	1	9
Late Stage	4	1	1	6
Total	9	15	3	27*

* Three outliers

Most of the respondents in the early stage of business development had networks ranging from six to twenty people. Only one of the respondents with companies in the early stage of business development had a network of five or fewer people while the majority of entrepreneurs with companies in the late stage of business development had networks with five or fewer members.

Compared to respondents with companies in the early stage of business development, those with companies in the late stage of business development reported smaller personal networks.

Density

For the measure of *density*, the ratio of actual ties to possible ties in personal networks, the respondents' results were categorized into three levels of *density* in Table 10. The measure for *density* ranges between 1:3 to 3:3. The ratios for the measure were divided into three groups. A ratio less than 1:3 represents a network with relatively loose ties, a ratio between 1:3 and 2:3 (inclusive) represents a network with ties that are neither loose nor dense, while a ratio greater than 2:3 represents a network with relatively dense ties.

TABLE 10
RESPONDENTS CATEGORIZED BY RATIO OF ACTUAL
TIES TO POSSIBLE TIES IN PERSONAL NETWORK

Stage of Business	Ratio of Actual Ties to Possible Ties			Total
	Less than 1:3	1:3 to 2:3	Greater than 2:3	
Early Stage	8	4	0	12
Middle Stage	2	5	2	9
Late Stage	0	2	5	7
Total	10	11	7	28*

* Two cases of missing data

The majority of respondents with companies in the early stage of business development had networks with a *density* ratio less than 1:3 while not one respondent in this stage had a *density* ratio greater than 2:3. The majority of respondents with companies in the late stage of business development had networks with a *density* ratio greater than 2:3 while not one respondent in this stage had a *density* ratio less than 1:3.

Compared to respondents with companies in the early stage of business development, those with companies in the late stage of business development have denser personal networks.

Strength of Ties

The first measure of *strength of ties* refers to ties between network members. For this measure, the respondents' results are categorized into three levels in Table 11. The measure for *strength of ties* between network members ranges between 1 and 3. The values for the measure were divided

into three groups. A value less than 1.6667 represents relatively weak ties between network members, a value between 1.6667 and 2.3333 (inclusive) represents ties that are neither weak nor strong, while a value greater than 2.3333 represents relatively strong ties between network members.

TABLE 11
RESPONDENTS CATEGORIZED BY STRENGTH OF TIES BETWEEN
NETWORK MEMBERS IN RESPONDENTS' PERSONAL NETWORK

Stage of Business	Strength of Ties			Total
	< 1.6667	1.6667 to 2.3333	> 2.3333	
Early Stage	9	3	0	12
Middle Stage	7	1	1	9
Late Stage	1	1	5	7
Total	17	5	6	28*

* Two cases of missing data

A majority of respondents with companies in the early stage of business development had networks with *strength of ties* between network members less than 1.6667 while not one of the respondents in this stage reported *strength of ties* between network members greater than 2.3333. A majority of respondents with companies in the late stage of business development had networks with *strength of ties* between network members greater than 2.3333 while only one of the respondents in this stage reported *strength of ties* between network members less than 1.6667.

Compared to respondents with companies in the early stage of business development, those with companies in the late stage of business

development have stronger ties between network members.

For the second measure of *strength of ties*, the percentage of business relationships between respondents and network members, the respondents' results are categorized into three levels in Table 12. This measure of *strength of ties* ranges between 0% and 100%. The values for the measure were divided into three groups. A value less than 33% represents relatively strong ties between the respondents and network members, a value between 33% and 67% (inclusive) represents ties that are neither strong nor weak, while a value greater than 67% represents relatively weak ties between respondents and network members.

TABLE 12
RESPONDENTS CATEGORIZED BY PERCENTAGE OF BUSINESS
RELATIONSHIPS WITH PERSONAL NETWORK MEMBERS

Stage of Business	Percentage of Business Relationships			Total
	Less than 33%	33% to 67%	Greater than 67%	
Early Stage	2	6	4	12
Middle Stage	1	7	1	9
Late Stage	3	3	2	7
Total	6	16	7	28*

* Two cases of missing data

While the majority of respondents with companies in the middle stage of business development reported that the percentage of business relationships in their personal networks ranged from 33% to 67%, similar numbers of respondents in the early and late stages of business development

reported percentages of business relationships in all three ranges.

Across the stages of business development, there is little evidence of differences in the percentage of business relationships with network contacts in the respondents' personal networks.

Recollective Data

Although no longitudinal data were gathered, respondents with companies in the middle and late stages of business development were asked to recollect any changes that they had experienced in their personal networks since starting their companies (see Tables 13 and 14, respectively).

TABLE 13
RECOLLECTIVE RESULTS FROM RESPONDENTS
WITH COMPANIES IN MIDDLE STAGE OF BUSINESS
DEVELOPMENT (n=9)

	Increased	Decreased	No Change
People in the respondents' network	22%	22%	56%
Interrelationships between members of the network	33%	33%	33%
Hours spent developing and maintaining contacts	45%	33%	22%

TABLE 14**RECOLLECTIVE RESULTS FROM RESPONDENTS WITH COMPANIES IN LATE STAGE OF BUSINESS DEVELOPMENT (n=9)**

	Increased	Decreased	No Change
People in the respondents' network	63%	0%	37%
Interrelationships between members of the network	37%	0%	63%
Hours spent developing and maintaining contacts	0%	75%	25%

The recollective data can not be used to support inferences about longitudinal changes in the personal networks. Although the questions used to gather recollective data were similar to those used to measure the dimensions of personal networks, middle and late stage companies represent a select group of surviving companies. The recollective data can not be compared to cross-sectional results without data on the survival characteristics of early and middle stage companies.

Qualitative Results

Issues relevant to the development of personal networks were raised during the interviews. Respondents had developed contacts and built personal networks in a variety of ways.

Personal networks were transferred from past employment and previous entrepreneurial ventures and integrated into the present network. Some respondents stressed that they started building their personal networks while previously employed. One respondent reported that he acquired resources for his company using a contact made during his previous

employment. He said:

In the previous company that I was with that [contact] was the accountant for the company. That was who they used and I was fairly pleased with what he did so when I formed this company, I went and saw him as well.

Interconnections between companies that evolved from respondents' past employment were documented by respondents' comments. One respondent noted:

In Ottawa, a lot of small companies know people in other companies and they talk.

Another respondent commented that:

...so you tend to meet and develop relationships with other people, in my case anyway, just because by and large, you are really not competing with each other and sharing information and ideas is a very useful thing to do.

Personal networks provide non-technical rather than technical resources to technology-based entrepreneurs. One respondent noted:

Also, we had to develop some of the business contacts almost from scratch and in our case, we were very fortunate to meet up with a local entrepreneur/venture capitalist who is involved in a lot of small companies in Ottawa. He assisted us in getting our initial financing. We piggy-backed on his network. He has also helped us attract certain people to the board of directors and if we are looking for staff he knows of people. He acts as a catalyst. Technical people are not adept at maintaining non-technical networks.

Another respondent reiterated the point by saying:

[Our network] has increased quite significantly. I think we are a typical company started by three technical people and as such it has been my experience that technical people have zero network. Well, they have networks of technical people but in terms of other things...

Often, respondents delegated the task of developing and nurturing personal networks to their employees. One respondent whose company was in the late stage of business development stated that:

We delegated that sort of thing very early on in the life of the company.

Another respondent with a company in the late stage of business development reported:

I probably don't spend a lot of time at it. We have kind of an unusual organization here. I'm the president of the company but about a year and a half ago, I hired a vice president of operations. Since he has been here, and one of the reasons I hired him was he (develops and maintains contacts). My main responsibility in the company was to develop... although I assist him in doing that, that is his primary mission. My primary mission is being sort of a technical spokes person, managing the new product development process and so on. I'm the chairman of the board so certainly I spend a lot of time, but he is the guy who probably develops and nurtures our external network more than I do. I don't spend a lot of time nurturing and developing a network of people.

A third respondent whose company was in the late stage of business development commented on the time he spent developing his personal network by saying:

No, I'd say less now because we have personnel in the company whose job that is. My role in the company is as the software developer. Someone else in the company makes contacts.

Several of the respondents implied that parents are network contacts who provide a variety of resources to the respondents. From the respondents' comments, the roles of self-employed parents include:

- 1) Moral Supporter
- 2) Role Model/Mentor
- 3) Employer
- 4) Network Extender

One respondent admitted that he used his father for moral support when he said:

Every time we talk the company comes up one way or another. Sometimes I get frustrated with what's going on or I don't see a way of handling something. So I'll throw it at him and see what he thinks. He has a tremendous amount of expertise. Business is business.

Another respondent recalled that his father was his mentor and his employer. He stated:

I used to work for him years ago in a large city. Then his company merged and I worked for the people he merged with. And then I left and started my own company. So I started on my own and he went off and worked for someone else also.

Both father and son worked in the same industry. The respondent attributed owning a software development company to his father.

After referring to his mother as a network contact, one respondent

described the resources she provided by saying:

Overall business, I would say, again, with a strong accounting perspective and networking very obviously because she has owned her own business for ten years. Oh, things like bank relationships, again, the accounting, things like that.

The respondent reported that he met his accountant through his mother indicating that personal networks can be enlarged through self-employed parents. A number of other strategies for building personal networks were reported by respondents. One respondent stated:

When you hire someone like that, you're hiring his expertise but you are also buying his network of contacts. He then hires other senior managers and they have their own networks. It's partly his skills you're interested in but it's also who he knows...You hire someone that has a network - it's like rabbits.

Another respondent saw hiring employees as a strategy to develop network contacts. He commented:

I knew a few people, saw who was available, tried to see from that relationship other people that they know. Like anything else, do a bit of research, keep the ones you want.

Respondents reported using fax machines, long distance telephone calls, conference calls, mail, and telex machines to develop and maintain contact with network members. In one case, a respondent reported that his only contact with his company's lawyer was by telephone. He had never met the lawyer in person. Another respondent stated that when one network member moved to another city, he continued regular contact with the network

member through long distance telephone calls.

Respondents continuously cited trust as a critical characteristic of their present networks. One respondent commented:

(My wife) has a staff of three people in her own firm. It's a comfort for me because the financial performance and status of the company at any given time is critical and I need to know the company's position at any given time before a decision is made. Well, I can trust my wife implicitly and therefore having her handle this kind of work is an invaluable asset.

Another respondent, though he did not specifically mention trust in his network, said the following:

I have had a hard time distinguishing between clients and friends. Most of my clients become friends because they are long range... usually it is a long term relationship.

The respondent implied the utility of trust in his personal network when he spoke of the longevity of his network contacts.

CHAPTER 6

ANALYSIS

This discussion analyzes the results in the context of the research design and previous research. The quantitative results of the survey are compared with the research hypotheses and qualitative data are compared to the literature on network theory.

Accessibility

Hypothesis 1, "entrepreneurs whose businesses are in the early stage of business development have personal networks with lower *accessibility* than entrepreneurs in the late stage of business development," is contradicted by two of the three measures of *accessibility* and supported by one.

The first measure of *accessibility* is the number of hours respondents spent per week developing contacts. The results for this measure do not support the hypothesis. Instead of spending fewer hours per week developing contacts than respondents with companies in the late stage of business development, respondents with companies in the early stage of business development spent more hours.

The second measure of *accessibility* is the number of hours respondents spent per week maintaining contacts. The results for this measure do not support the hypothesis. Instead of spending fewer hours per week maintaining contacts than respondents with companies in the late stage of business development, respondents with companies in the early stage of business development spent about the same number of hours.

The comparison of the hypothesis and results for the first two

measures of *accessibility* is limited because the results are inconclusive. The operational definitions and associated questions as developed by Aldrich, Rosen, and Woodward (1987a) do not accurately represent the complexity of the construct of *accessibility* of resources in the personal network. These measures of *accessibility* do not recognize that entrepreneurs may differentiate between types of contacts. Some respondents found that questions concerning time spent developing and maintaining contacts were ambiguous. Though the questions referred to all contacts, these respondents were unsure if they should include marketing contacts (customers and suppliers) in their answers, indicating that entrepreneurs may spend more time developing and maintaining market contacts than other contacts.

As a consequence of the ambiguity of the questions concerning the first two measures of *accessibility*, the process used to gather the data affected the respondents' answers. Some respondents gave quantitative answers only when prompted. As a result of such prompting, the values reported by respondents for these two measures of *accessibility* were similar between the stages of business development and between measures (see Tables 4 and 6, respectively).

Based on the concerns raised in this analysis, the number of hours that respondents spend per week developing and maintaining contacts are neither valid nor reliable measures of *accessibility*, limiting the usefulness of any comparison with the hypothesis.

The third measure of *accessibility* is the frequency with which the respondents contacted network members. The results for this measure support Hypothesis 1, "entrepreneurs with businesses in the early stage of business development have personal networks with lower *accessibility* than

entrepreneurs in the late stage of business development." Compared to respondents with companies in the early stage of business development, those with companies in the late stage of business development contacted network members more often.

Amount of Resources

The *amount of resources* was measured by the number of people with whom the respondents regularly discussed the operation of the business in the last six months. Hypothesis 2, "entrepreneurs whose businesses are in the early stage of business development have personal networks with lower *amount of resources* than entrepreneurs in the late stage of business development," is not supported by the results of the measure of *amount of resources*. Instead of having networks with fewer contacts than respondents with companies in the late stage of business development, respondents with companies in the early stage of business development have networks with more contacts.

The comparison of the result and Hypothesis 2 is limited because "the number of people with whom respondents discussed the operation of the business in the last six months," developed by Aldrich, Rosen, and Woodward (1987a), is not a precise measure of the *amount of resources* in personal networks. Neither the number of resources acquired from each network member nor the value of these resources is considered in this measure.

As further evidence of the inappropriateness of this measure for the construct, three respondents gave numbers for the measure which were considered too high to be valid answers especially when compared to

answers given by other respondents and data from previous empirical research. These three answers were classified as outliers and excluded from the results because they exceeded the average answers in the research by a factor of at least ten. These respondents may not have understood the question or were giving socially desirable answers.

However, the number of people with whom the respondents regularly discussed the operation of the business measures a variable that characterizes the personal networks of entrepreneurs. This variable measures the size of the personal networks from which respondents acquired external resources for their companies. Compared with companies in the early stage of business development, those with companies in the late stage of business development reported smaller personal networks. This result may have occurred because external business resources acquired by the entrepreneur are not as critical for companies in the late stage of business development as they are for companies in the early stage of business development (Churchill and Lewis 1982). Therefore, the size of the personal network for the acquisition of external business resources is smaller for the respondent whose company is in the late stage of business development.

This result concurs with other results of the research. From the recollective data, respondents with companies in the late stage of business development reported spending less time developing and maintaining network contacts than earlier in the development of their companies, a result which is reflected in the small size of the present network to acquire external resources.

Density

The results do not support Hypothesis 3, "entrepreneurs whose businesses are in the early stage of business development have personal networks with higher *density* than entrepreneurs in the late stage of business development." Instead of having networks with looser ties than respondents with companies in the early stage of business development, respondents with companies in the late stage of business development have networks with denser ties.

For respondents with companies in the late stage of business development, the inclusion of family members in the networks influenced *density*. The family members knew other people in the respondents' networks. Respondents indicated that they did not meet network members through other network members. Two explanations are suggested for the dense ties in the networks of respondents with companies in the late stage of business development. Network members knew each other before joining the respondents' network and/or network members met through business dealings with the respondents.

The *density* of the personal networks of respondents in the early stage of business development was influenced by the prominence of professionals in the network who were strangers to each other. According to Aldrich, Rosen, and Woodward (1987a), the absence of ties between network members provides the entrepreneur with access to impersonal and objective information.

Strength of Ties

The results describing both the *strength of ties* between network

members and between the respondents and network members do not support Hypothesis 4, "entrepreneurs whose businesses are in the early stage of business development have personal networks with higher *strength of ties* than entrepreneurs in the late stage of business development."

The first measure of *strength of ties* refers to ties between network members. Instead of having weaker network ties than respondents with companies in the early stage of business development, respondents with companies in the late stage of business development had stronger ties between network members. The results were influenced by the inclusion of family members in the networks of respondents in the late stage of business development. By definition, family members are well acquainted. In addition to family, professionals such as lawyers and bank managers are included in the personal network of respondents in the late stage of business development. Often, these network members were well acquainted. One inference that can be drawn from these results is that the professionals included in the personal networks of entrepreneurs in the late stage of business development are well known by other professionals.

The networks of respondents with companies in the early stage of business development are dominated by unassociated professionals, not family members, so the ties between network members are not strong. Granovetter (1982) and Aldrich, Rosen, and Woodward (1987a) proposed that a network with weak ties offers a diversity of resources to the entrepreneur.

The second measure of *strength of ties* is the proportion of business relationships as opposed to family and friends in the respondents' personal networks. Again, the results did not support Hypothesis 4, "entrepreneurs

whose businesses are in the early stage of business development have personal networks with higher strength of ties than entrepreneurs in the late stage of business development." Instead of having stronger ties (a lower percentage of business relationships) than respondents with companies in the early stage of business development, respondents with companies in the late stage of business development had similar strength of ties (similar percentage of business relationships).

Qualitative Results and Personal Network Theory

According to the personal network literature, the structure of the entrepreneurs' personal networks affects the external resources acquired by the entrepreneur for the operation of the business. Loose ties in a network encourage the acquisition of objective and impersonal information into the network. Weak ties allow the entrepreneur to acquire diverse resources for the operation of the business and improve the reachability of the network providing new resources and other links to future networks. The respondents' comments revealed issues such as the transferral of personal networks, the roles of self-employed parents, and strategies to expand networks that affect the structure of the dimensions of personal networks.

Some respondents built and nurtured extensive personal networks during previous employment for the purposes of technical resource acquisition. Johannisson (1986) states that entrepreneurs who left employment and started a business were equipped with an elaborate network. He alluded to the importance of the personal network by stating that it is the entrepreneur's most important resource because it is maintained by interaction, and it usually survives the failure of individual ventures

(Johannisson 1986). Contacts providing technical resources from previously formed networks can cross the boundaries of the organization into new business. Once technical resources are secured for the new company, the entrepreneur must think about the acquisition of less technical resources such as financing, legal and accounting advice, marketing skills, and managerial/administrative skills. Researchers have concluded that for entrepreneurs in technology-based companies, resources acquired from within the company are different than those acquired externally from the entrepreneurs' personal networks. Knight (1985) found that entrepreneurs in high technology companies were technically trained and had little or no experience dealing with business matters such as financing. He determined that many of the entrepreneurs realized this and dealt with outside sources to acquire business resources. Leonard-Barton (1983) found that high technology firms have technical depth in upper management levels and outsiders are relatively unimportant sources of technical resources. Consistent with these findings, respondents in the study acquired business resources from outside sources while their boards of directors and other owners provide technical resources. Seventy-three percent of respondents had a board of directors. Seventy-seven percent of respondents received technical resources from members of their board of directors. Respondents said that other owners of the company provided technical resources. For each of the network members to whom respondents referred, business resources and moral support accounted for no less than 92.8% of the external resources acquired from the company. Technical resources accounted for no more than 7.2% of the external resources acquired from each of the members of the personal network (see Table 15). This result

was consistent for each of the network members recalled by the respondents.

TABLE 15
**PERCENTAGE OF BUSINESS AND TECHNICAL RESOURCES
PROVIDED BY MEMBERS OF RESPONDENTS' PERSONAL NETWORK**

Resources	First Contact	Second Contact	Third Contact	Fourth Contact	Fifth Contact
Business and Moral Support	96.6%	92.8%	95.7%	100.0%	94.1%
Technical	3.4%	7.2%	4.3%	0.0%	5.9%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

Non-technical resources can be gained through an extended network of friends of friends, business colleagues, referrals, and so on. As the personal network is broadened, several of the network dimensions change: the *strength of ties* between the entrepreneur and network members; the *strength of ties* between the members of the network; and the *density* of the network.

The multiple roles that self-employed parents play in the entrepreneurs' personal network were illustrated by respondents' quotes about external resource acquisition. For example, an entrepreneur may have worked for his self-employed father, implying that the parent may have been a mentor as well as an employer. Or, an entrepreneur who turns to his self-employed mother for moral support may find his parent suggesting one of her network contacts as a resources provider for the entrepreneur. In this situation, the role of moral supporter is combined with that of

network extender. The inclusion of self-employed parents in the personal network may affect the structure of the network depending on the roles the parents play in the network, the resources they provide to the entrepreneur, and the structure of the parents' personal networks. For example, self-employed parents with weak ties in their networks can provide their self-employed children with objective business information, because the members of the parents' networks do not have similar beliefs and norms.

Analogous to the separation of network members into formal and informal contacts postulated by Birley (1985), the strategies to expand a personal network can also be separated into formal and informal strategies. With a formal strategy, an unassisted call would be made to a resource provider. An example of this type of strategy obtained from respondents' comments was the use of a telephone directory to choose a banker whose premises are physically close to the entrepreneur's. With an informal strategy, a present member of the network would initiate a tie between the entrepreneur and a resource provider. Examples of this type of strategy provided by respondents include a referral from a former employer for an accountant and an introduction by the entrepreneur's sister-in-law to a software publisher. The type of expansion strategy implemented may affect the *amount of resources*, the *strength of ties*, and the *density* of the network.

Entrepreneurs can strategically structure their personal networks by transferring a previous employment network to the new company, exploiting self-employed parents as network members, or implementing expansion strategies to acquire external resources.

Network Characteristics and Personal Network Theory

In addition to the theoretical constructs used by researchers to describe the personal networks of entrepreneurs, networks can be described by more practical characteristics such as the resources provided by network members and the length and nature of the relationship between the entrepreneur and network members. Across the three stages of business development, these characteristics of the network members change.

According to Carsrud, Gaglio, and Olm (1986), the necessary resources and information to ensure the successful development of a company include product service ideas, financing, access to new technology, competitive information and market data. For each of the three groups of respondents in the present study, network members provided different resources. For respondents with companies in the early stages of business development, financing, legal and accounting advice were provided by network members. Bank managers, lawyers, and accountants constituted the majority of members in the network. Early stage respondents fell into two categories, non-technical entrepreneurs and technical entrepreneurs. The technical entrepreneurs were employed in technology-based industry and held engineering degrees or equivalents. Non-technical entrepreneurs were previously employed in a non-technical industry and held social sciences degrees or equivalents. Family members were not included in the personal networks of technical entrepreneurs while at least one family member was included in the personal networks of non-technical entrepreneurs.

For respondents with companies in the middle stage of business development, market information and strategic information were provided by network members who were suppliers, customers, and other business

associates. Lawyers, accountants, and bank managers played a minor role in the network.

For respondents with companies in the late stage of business development the network provided moral support, legal advice and financing from family members, bank managers and lawyers, respectively.

Aldrich, Rosen, and Woodward (1987b) stated that professionals such as bankers, lawyers and accountants account for a small percentage of the total number of relationships in the entrepreneur's personal network. In this study, professionals dominated the networks of respondents with companies in early and late stages of business development, contradicting the findings of Aldrich, Rosen, and Woodward (1987b). This contradiction is explained by Carsrud, Gaglio, and Olm (1986) who suggested that when a majority of respondents come from a skill-based or a managerial background, the resources sought from the personal network are those outside their experience and prior business contacts. The majority of respondents were technical entrepreneurs who acquired non-technical resources from their personal network.

One explanation for the prominence of suppliers, customers, and business associates as network members for respondents with companies in the middle stage of business development is that external resources acquired by the respondent have become market oriented as the business develops (Churchill and Lewis 1982).

Aldrich, Rosen, and Woodward (1988a) reported that, as time passes, entrepreneurs develop friendships with their lawyers and bank managers. Respondents with companies in the late stages of business development indicated that lawyers and bank managers became friends. An explanation

for this result is that several companies in the late stages of business were expanding their operations. The respondents participated in the expansions and had been closely involved with their bankers and lawyers to acquire external business resources.

Another characteristic of network members is the nature of their initial contact with the entrepreneur. For network members of respondents with companies in the early and middle stages of business development, the majority of initial contacts with respondents occurred through business referrals or during the respondents' previous employment. For network members of respondents with companies in the late stage of business development, initial contacts with respondents occurred through social channels as well as business referrals. Previous employment contacts may have been excluded as network members for respondents in companies in the late stage of business development because over time, potential contacts from previous employment diminish. The entrepreneur may lose touch with these potential network members as they move or change jobs.

Aldrich, Rosen, and Woodward (1988a) found that entrepreneurs who are starting companies build personal networks to meet external business resource needs. They conclude that entrepreneurs rely on networks that predate their businesses (Aldrich, Rosen, and Woodward 1987b). The results of the research oppose that conclusion, with the exception of non-technical respondents with companies in the early stage of business development. The members of the non-technical entrepreneurs' network knew the respondents before the company started. For technical entrepreneurs with companies in the early stages of business development and respondents with companies in the middle and late stages of business development, the founding of their

companies predated initial contact with most network members. Network contacts to provide non-technical resources were developed around or after the start of the company. A possible explanation for the result is that contacts providing non-technical resources were not developed during the respondents' previous employment. This explanation is justified by the dominance of bank managers, lawyers, and accountants (providers of non-technical resources) in personal networks of respondents with companies in the early stage of business development.

CHAPTER 6

CONCLUSION

Conclusions from the quantitative and qualitative results will be presented followed by benefits and limitations of the research. Implications of the research for entrepreneurs and researchers studying entrepreneurship will conclude the chapter.

The hypotheses developed for the research suggest that the structure of the personal networks of these entrepreneurs changes across the stages of business development. The results of the research provide evidence that the personal networks of these entrepreneurs are different across the stages of business development but the results contradicted the direction of the changes predicted by the hypotheses.

The ties between entrepreneurs and network members are similar for entrepreneurs with technology-based companies in the early stage of business development and for those with companies in the late stage of business development. Personal networks have weaker ties between network members for entrepreneurs with technology-based companies in the early stage of business development than for those in the late stage of business development. The lack of ties between network members of entrepreneurs in the early stage of business development gives these entrepreneurs access to diverse resources and impersonal and objective information. For entrepreneurs with companies in the late stage of business development, their personal networks consisted of family members and professionals. The ties reported between network members in the personal networks of these entrepreneurs were extensive. These strong ties may be an indication that these entrepreneurs develop relationships of trust with the personal network

members. The relationships in the personal networks of entrepreneurs with technology-based companies in the early stage of business development were less dense than for entrepreneurs in technology-based companies in the late stage of business development.

For entrepreneurs in all three stages of business development, a division existed between the types of resources obtained within the business and those acquired from the personal network. Most of the technical resources needed by the company were provided by sources within the companies such as the board of directors and other owners while most of the non-technical business resources were acquired from the entrepreneurs' personal networks.

Benefits and Limitations

Entrepreneurs and researchers can benefit from the research. The research supports the model of the stages of business development and several of the dimensions of the personal network approach to entrepreneurship. Shortcomings of other dimensions were recognized and suggestions were made to improve them.

Variables associated with personal networks were discovered. These variables include the presence of a previous personal network and the roles of self-employed parents in the personal network. Depending on their resource needs, entrepreneurs can implement the strategies documented and developed in the research for the development and maintenance of their personal networks.

Several limitations exist though efforts were made to lessen their impact. The limitations are in the research design and the use of network

theory for the research. The respondents, consciously or unconsciously, may have given socially desirable answers. The risk of socially desirable answers was lessened through the design of the survey instrument which refrained from asking specific information such as names or addresses about network contacts.

The introduction of the personal network approach may have provoked respondents to provide questionable answers because they did not view entrepreneurship in this way. This concern was reduced with a verbal preamble explaining to every respondent the personal network concept and its purpose.

No conclusions can be made on the process of personal network development along the stages of business development. The study investigated the dimensions of personal networks across the stages of business development using a cross-sectional design. A longitudinal method was not used due to time and financial constraints.

Certain limitations must be considered before the results are generalized to populations other than entrepreneurs in technology-based companies in the Ottawa-Carleton Region. The generalizability of results is enhanced by the minimal effects of non-response bias and excluding companies without sales data. However, the respondents were entrepreneurs operating in a region dominated by the Federal Government. Entrepreneurs in industries outside of the Ottawa-Carleton Region may not experience a high degree of government influence in their personal networks.

Another limitation was that the respondents were male and not exclusively from a distinct culture. The networks of female entrepreneurs or entrepreneurs dominated by an ethnic culture may differ from those of male

entrepreneurs, particularly in the maintenance and development of the networks.

Implications for Future Researchers

Researchers should undertake more exploratory research before some of the dimensions of the personal network approach are empirically investigated. The first two measures of *accessibility* could be improved if the terms "develop contacts" and "maintain contacts" were refined and better understood by future researchers and respondents. Exploratory research should be conducted and used to define the two tasks so that respondents' answers will be reliable and valid. The network approach assumes that entrepreneurs regularly contact network members but there are at least two tactics used by respondents to develop and maintain their personal networks. Some respondents consciously spend time developing and maintaining their personal networks. They may feel it is financially prudent and secure to maintain contacts if resources required are not available within the company. Socially, they may enjoy the contact with their peers.

Other respondents take an "ad hoc" approach to developing and maintaining contacts, contacting network members when they have a specific resource requirement. These entrepreneurs do not consciously develop and maintain contacts for their personal networks. Measures of accessibility should be derived for both types of respondents.

The usefulness of the construct, *amount of resources*, should be explored. A more useful construct to entrepreneurs may be the value added to the company by members of personal networks.

Until more precise definitions for these personal network constructs

and concepts are developed, researchers can investigate the ties between network members. The constructs and operational definitions relating to the ties between network members are well developed and recognized by respondents. The relationship between *density* and the *strength of ties* in entrepreneurs' personal networks should be investigated.

To uncover other variables, researchers should conduct interviews with entrepreneurs across industry, gender, region, and ethnic background. The new variables can be incorporated into the network approach. As a result, further empirical research will be generalizable and useful to entrepreneurs. Longitudinal research should investigate the dimensions of personal networks over time.

The entrepreneur's perceptions of the personal network have been excluded from research using the network approach. The approach assumes that entrepreneurs structure their personal networks to meet their resource needs. For example, entrepreneurs build networks with weak ties when they need diverse resources or encourage loose ties when they want objective impersonal information. These assumptions have not been tested. In the future, researchers should explore how entrepreneurs view their networks and include these views in the network approach.

Implications for Entrepreneurs

While the structure of personal networks for entrepreneurs in the late stages of business development is suitable for their external resource needs and their roles in the companies, entrepreneurs with companies in the early stage of business development have personal networks which allow them to exploit perceived opportunities in the environment. The networks are large

giving the entrepreneur access to many resources. The entrepreneur has access to diverse resources and objective information because these networks have neither extensive nor strong ties between members. If potential entrepreneurs model their personal networks after those of entrepreneurs with companies in the early stage of business development, they will likely have the resources and information to seize opportunities in the environment. Government policy makers and academics can help potential entrepreneurs structure their networks, thus fostering innovation and entrepreneurship.

Entrepreneurs should determine their companies' resources needs and examine those that are available internally and externally. Entrepreneurs should use strategies discovered during the research to build personal networks depending on the external resources requirements of their companies. These strategies include using previous networks and self-employed parents, and delegating network development.

The entrepreneur can use professional and trade associations to stimulate the exchange of resources between themselves and organizations external to the company. Furthermore, technical journals published by these associations are prime sources of current technical information.

The structure of personal networks parallels not only changes in the role of technology-based entrepreneurs but also the external resource needs of their companies. Social interactions for resource acquisition, as represented by personal networks, are integral elements of the entrepreneurship process. The weak position in Canada's high growth and emerging industries, determined by the Ontario Premiers' Council (1988) at the outset of the thesis, will improve as technical entrepreneurs use their

personal networks to reach beyond the boundaries of the company, accessing new sources of innovation and technology and exploring opportunities in the environment.

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Appendix A Sample of Invitation
The Research Centre For High Technology Management

86

Carleton University

January 31, 1989

Dear Mr. M.

I am a graduate student in the School of Business at Carleton University where I am studying the management of technology. Connected with my studies, I am particularly interested in entrepreneurs operating technology-based companies.

I am requesting your input in a new study which will investigate the network of external contacts that an entrepreneur develops to obtain resources for the start up and operation of a business. Insight into the resources obtained from your network and the maintenance and development of external contacts is essential for the industry, future researchers, and this research effort.

If you agree to participate in this study, I will arrange an interview with you at a convenient time. During the interview, we would discuss the history of your company and the network of external contacts you have developed and maintained. I would like to assure you of the confidentiality of the information you contribute to this research. Neither your name nor the name of your company will be mentioned in the research results.

When the research is completed, you will receive a summary of the results so that you can compare your personal network with that of other entrepreneurs in technology-based companies in the Ottawa-Carleton area.

I will be contacting your office in a week to discuss the possibility of your cooperation in this study. If you wish to speak to me before this time, you can call me at (613) 564-2854.

Thank you.

Lisa Badcock
Research Assistant

Carleton University, Arts Tower, Room 901, Ottawa, Ontario, K1S 5B6, (613) 564-4373

The Research Centre For High Technology Management

Carleton University

If you agree to participate in this entrepreneurship study, could you please read the following descriptions of the stages of business development and think about the one into which your business falls.

I will need this information when I call you to set up an interview.

Thank you,

Lisa Badcock

A) The organization of your business is simple. You do everything and directly supervise employees. You and the business are synonymous. You do all of the critical tasks and are the major supplier of energy, direction, and capital.

B) Your company is a viable business entity. The organization of the business is still simple. There may be a foreman or sales manager making minor decisions but you are involved with almost everything.

C) Your company has grown large enough to permit hiring functional managers to take over some of your duties. The organization is functional in design with an operations manager, marketing manager, and a comptroller instead of a bookkeeper. Yet these still function under your direction. You and the business are moving apart.

D) Your business is decentralized and, at least in part, divisionalized with controls over delegated responsibilities. You and the business are reasonably separate yet the company is still dominated by your managerial presence and stock ownership.

E) The business has many controls. Decision making is decentralized and the key managers share in the development of strategy. You and the business are quite separate both managerially and financially.

Appendix B

INTERVIEW SCHEDULE

Thank you for agreeing to speak with me. I want to reiterate that the information you share with me today will be confidential.

1. From the following descriptions, please indicate which of the following scenarios best describes you and your business.

A) The organization of your business is simple. You do everything and directly supervise employees. You and the business are synonymous. You do all of the critical tasks and are the major supplier of energy, direction, and capital.

B) Your company is a viable business entity. The organization of the business is still simple. There may be a foreman or sales manager making minor decisions but you are involved with almost everything.

C) Your company has grown large enough to permit hiring functional managers to take over some of your duties. The organization is functional in design with an operations manager, marketing manager, and a comptroller instead of a bookkeeper. Yet these still function under your direction. You and the business are moving apart.

D) Your business is decentralized and, at least in part, divisionalized with controls over delegated responsibilities. You and the business are reasonably separate yet the company is still dominated by your managerial presence and stock ownership.

E) The business has many controls. Decision making is decentralized and the key managers share in the development of strategy. You and the business are quite separate both financially and managerially.

Before I ask you questions about your personal network, I would like to explain what I would like you to consider and include while you are answering the questions. For the purposes of this study, a personal network consists of those people, male or female, with whom you discuss business matters. However, these people are not internal to the business. As a result, a personal network does not include the board of directors, other entrepreneurs in the business or employees. One of the main purposes of a personal network is the acquisition of resources for the business, resources such as customers, suppliers, tax advice and financial information.

2. From time to time, most people discuss important business matters or plans with people other than the board of directors or partners in the company. Looking back over the past six months:

A) With how many people would you estimate you have discussed aspects of running your own business? _____

B) How many hours per week do you spend developing contacts with persons with whom you can discuss business matters? _____

C) How many hours per week do you spend maintaining contacts with people with whom you can discuss business matters? _____

D) How many times would you estimate that you meet with people with whom you can discuss business? _____

3. Please indicate up to five people with whom you feel especially willing or able to discuss your ideas about running your current company. Feel free to use names, initials, or pseudonyms.

1) _____ 4) _____
 2) _____ 5) _____
 3) _____

4. Please think about the relationships between the five people you just named. For each pair, indicate the relationship between these two people as far as you know it.

	Strangers	Somewhat Acquainted	Well Acquainted	Not Sure
A) Persons (1) and (2)	1	2	3	4
B) Persons (1) and (3)	1	2	3	4
C) Persons (1) and (5)	1	2	3	4
D) Persons (1) and (4)	1	2	3	4
E) Persons (2) and (3)	1	2	3	4
F) Persons (2) and (4)	1	2	3	4
G) Persons (2) and (5)	1	2	3	4
H) Persons (3) and (4)	1	2	3	4
I) Persons (3) and (5)	1	2	3	4
J) Persons (4) and (5)	1	2	3	4

5. I would like to know more information about the persons you named in the previous question.

I.D.	Sex	Age	Relationship to you	Times per week you discuss business	How long known	How you met
1. _____	_____	_____	_____ _____ _____	_____	_____	_____
2. _____	_____	_____	_____ _____ _____	_____	_____	_____
3. _____	_____	_____	_____ _____ _____	_____	_____	_____
4. _____	_____	_____	_____ _____ _____	_____	_____	_____
5. _____	_____	_____	_____ _____ _____	_____	_____	_____

6. a) Since you started this business, has the number of people
in your personal network

- 1) increased?
- 2) decreased?
- 3) stayed the same?

6. b) Please comment on any changes that may have occurred?

7. a) Since you started this business, has the number of interrelationships
or ties between the people in your personal network

- 1) increased?
- 2) decreased?
- 3) stayed the same?

7. b) Please comment on any changes that may have occurred?

8. a) Since you started this business, has the time you spend developing
and maintaining contacts with people with whom you can discuss
running this business

- 1) increased?
- 2) decreased?
- 3) stayed the same?

8. b) Please comment on any changes that may have occurred?

9. a) Since you started this business, have your relationships with the people
in your personal network been

- 1) acquaintances?
- 2) friendships?
- 3) family ties?

9. b) Please comment on any changes that may have occurred?

10. Do you have a board of directors?

Yes___

No___

11. a) If yes, how many people are on the board of directors? _____

b) What resources do each of the members of the board bring to the business?

12. a) How many owner/managers are there in the company? _____

Yes____ No____

12. b) What resources do each of the owner/managers bring to the business?

13. Could you please indicate into which age bracket you fit? _____

- 1) under 20
- 2) 21 to 30
- 3) 31 to 40
- 4) 41 to 50
- 5) 51 to 60
- 6) 61 and over

14. Sex

- 1) male
- 2) female

15. Can you tell me what was the highest level of education that you reached? _____

- 1) some high school
- 2) high school diploma
- 3) technical or vocational school
- 4) some university
- 5) bachelor's degree
- 6) some graduate work
- 7) post graduate degree

16. a) Do you have any memberships in social service organizations such as the Kiwanis, Lions Club or the Rotary Club? _____

- 1) Yes
- 2) No

16. b) If so, in which organizations do you belong?

17. a) Are you a member of any professional or trade associations? _____

- 1) Yes
- 2) No

17. b) If so, in which associations are you a member?

18. How many years have you lived in Ottawa? _____

19. What was your father's major occupation when you were growing up?

20. Was he self-employed or did he own his own business? _____

1) Yes 2) No

21. What was your mother's main occupation while you were growing up?

22. Was she self-employed or did she own her own business? _____

1) Yes 2) No

23. Were you employed before you started this company? _____

1) Yes 2) No

24. Where did you work, in which industry did you work?

25. What were your duties?

26. a) Have you ever owned and operated a business before this one? _____

1) Yes 2) No

26. b) If yes, what products or services did your company sell, develop, and manufacture? _____

26. c) What did you do in the business? _____

26. d) How long did you run this business? _____

27. a) What products or services does your company sell, develop, and manufacture? _____

27. b) What do you do in the business? _____

27. c) How long have you run this business? _____

28. Can you please indicate in which bracket the total sales for your company falls for each of the last two fiscal years?

1987

- 1) less than \$500,000
- 2) \$500,000 to \$1,000,001
- 3) \$1,000,000 to \$2,000,001
- 4) \$2,000,000 to \$3,000,001
- 5) \$3,000,000 to \$4,000,001
- 6) \$4,000,000 to \$5,000,001
- 7) over \$5,000,001

1988

- 1) less than \$500,000
- 2) \$500,000 to \$1,000,001
- 3) \$1,000,000 to \$2,000,001
- 4) \$2,000,000 to \$3,000,001
- 5) \$3,000,000 to \$4,000,001
- 6) \$4,000,000 to \$5,000,001
- 7) over \$5,000,001

29. Can you tell me how many employees your business employed during the last two fiscal years?

1987 ____

1988 ____

END

30/08/90

FIN