

**RELATIONSHIPS OF YOUNG INFORMATION TECHNOLOGY COMPANIES AND  
GROWTH IN REVENUE**

by

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A thesis submitted to the Faculty of Graduate and Postdoctoral Affairs

in partial fulfillment of the requirements for the degree of

**Master of Applied Science in Technology Innovation Management**

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Chair, Howard Schwartz, Department of Systems and Computer Engineering

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A.J. Bailetti, Thesis Supervisor

Carleton University  
May 2011

## **Abstract**

This exploratory study examines the number and diversity of the relationships of young Canadian information technology companies and their growth in revenue. I examined 80 firms, and the 1900 relationships they established over a two year period. I correlated the relationship data with revenue growth, and used stepwise regression to find statistically significant associations between relationships and firm growth. Findings suggest that the number of relationships a young company establishes with large firms positively affects revenue growth and that the number of relationships a young company establishes with financial firms negatively affects revenue growth.

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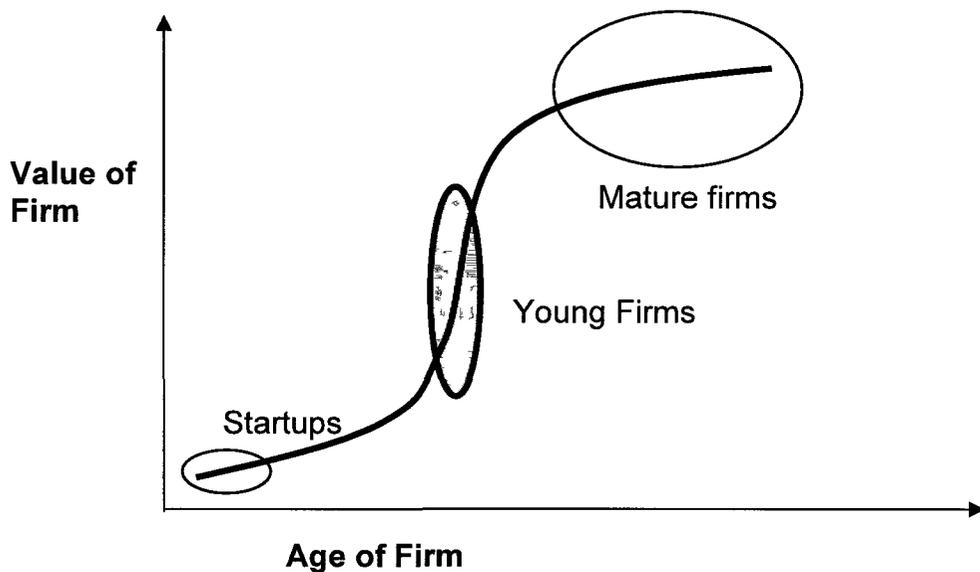
# 1. Introduction

## Objective

The objective of this research is to use historical versions of websites to explore the direct relationship between the volume and diversity of business relationships of young Canadian information technology companies and their subsequent growth in revenue.

Larson (1991), Coviello and Munro (1997), Lechner and Dowling (2003) have found that relationships with external organizations are beneficial for young firms. Gulati, Lavie and Singh (2009), however, note that not all relationships are equal, and that some relationships force exclusivity or monogamy, preventing a firm from forming other relationships. Clearly, providing a better understanding of what kinds of relationships they should seek out should assist a firm to grow.

For the purpose of this paper a young firm is a firm that is under ten years of age, and is no longer considered a startup, yet most of these firms are still private



**Figure 1: Relationship types correlation with firm growth**

The population being examined is an experimental population. Mature firms are primarily public firms, and as such, their financial information is audited, and databases of data about these firms exist. Because they are easier to observe, there is a large body of research in management literature that examines mature firms. The startup population is the focus of entrepreneurial research. For the startup population there are limited to no data, and collection is primarily interview and/or survey based. The population of young firms is made up of primarily private firms, and as such, databases of financial information about these firms are not commonly available, and there is limited research about firms in this area.

## Deliverables

This research has two deliverables. First, it provides the results of an exploratory stepwise regression correlating young information technology (IT) firm relationships with firm growth. Second, it provides criteria for categorizing young IT firm relationships based on public information in press releases and firm websites.

## Value of deliverables

The exploratory stepwise regression provides guidance as to what types of relationships might have the highest likelihood of benefiting or hurting a young IT firm. It makes several findings that should be explored more deeply to determine why particular relationships are more correlated with firm growth than others.

## Relevance

This research will be of interest to entrepreneurs and top management teams of young information technology firms. These firms have limited resources, and limited capabilities to create and sustain relationships. They have numerous priorities in terms of developing and marketing innovative products and services, seeking out resources for growth, and managing day to day operations. Given these constraints, an improved understanding of the value of relationships with other organizations can help them to develop a growth-seeking strategy.

This research will also be of interest to risk capital suppliers such as venture capitalists and angel investors. The method that I have used to evaluate firms in my research

uses publicly available information. This evaluation method could be used by an investor to gauge a firm's existing strategy, and/or it can be used by an investor to direct a firm's strategy in the area of relationship development.

This research will be of interest to other researchers. The technique used to measure firm relationships based on press releases has been used by a number of researchers (Ferrier, 2001). However, research using historical versions of websites is less common, having been used by a handful of researchers to examine firms in a number of fields such as law (Howell, 2006) or medicine (Veronin, 2002). I provide a detailed system for categorizing press releases into a number of relationship categories, guided by prior relationship research, but also guided influenced by new venture growth literature and Ferrier's method of using diversity and quantity of relationships.

### Contributions

This research makes at least two contributions. First, it provides guidance in terms of if and what types of relationships are correlated with future young firm growth. While all new firms are unique, the results of this research can help to guide strategies in the area of relationship development and maintenance.

The second contribution that this research makes is as a tool that can be used to evaluate a firm, and to benchmark that firm against the data collected by this research.

## Organization

This thesis is divided into seven chapters. Chapter 1 is this introduction. Chapter 2 reviews the literature. Chapter 3 identifies the research model and develops four propositions anchored around the model. Chapter 4 presents the research method. Chapter 5 provides the results of this research, and Chapter 6 is a discussion of the results. Chapter 7 contains the conclusions, limitation of this research and suggestions for future research.

## **2. Literature Review**

Chapter two is organized into four sections. The first two sections describe the literature streams relevant to my research. Section 2.1 examines the factors that contribute to new firm growth. Section 2.2 examines firm cooperation, relationships and ecosystems. Section 2.3 presents the commonalities and differences of the two streams of research reviewed in sections 2.1 and 2.2. Section 2.4 provides the lessons learned from the literature review.

### **2.1 New Venture Growth Factors**

This stream of literature examines the factors that affect a new firm's growth.

Many factors influence new venture growth, and also indicate possible reasons why some firms succeed while others fail. Initially, scholars examined what affected the growth of established firms, rather than newly established firms. Porter's Five Forces (1980) is a framework designed to examine the external industry factors that might affect a firm. Sandberg and Hofer (1987) proposed a new venture model that related the entrepreneur, the firm strategy, and industry structure. Chrisman, Bauerschmidt, and Hofer (1998) extended this model to include resources, firm structure, firm processes, and firm systems. The model is based on the resource-based view of the firm (RBV). Numerous papers have examined all of the factors outlined in the models proposed by Chrisman et al. (1998).

Chrisman et al. (1998) identified five groups of factors:

### 1. Characteristics about the entrepreneur

Personality characteristics (including confidence, needs, and self-reliance), values and beliefs, personal skills, experience and education, and behaviours and decisions (Bhide, 2000; Lee, Lee & Pennings, 1998; Baum, Calabrese & Silverman, 2000).

### 2. Characteristics about industry structure

Porter's Five Forces model (1980), Eisenhardt and Tabrizi (1995), Chistensen (1993) examined characteristics about industry structure. Bhide (2000) found that many firms on the Inc 500 list were there because they were in industries that were undergoing significant upheaval and change, and these firms hustled to stay ahead of the competition and grow. Chrisman et al. (1998) categorized numerous attributes of an industry that can affect new venture performance. These attributes included industry concentration, various barriers to entry, industry profitability and failure, demand, industry rivalry and the aggressiveness and diversity of competitors, and the nature of buyers and suppliers and who holds the power in these relationships.

### 3. Strategy

Entire journals are devoted to the topic of strategy, in particular the Strategic Management Journal. Strategic variables identified by Chrisman et al. (1998)

include planning and strategic formulation, goals and objectives, strategic direction, entry strategy, competitive weapons, segmentation, scope, investment strategy and political strategy. Ferrier (2001) examined competitive actions, their diversity and aggressiveness and how these actions affected market leader performance.

#### 4. Resources

The resource-based view of the firm was first introduced by Wernerfelt (1984) in which he proposed that rather than examine a firm's products, an academic should examine the firm's resources from which it can draw value. This concept has been extended to include knowledge resources (intellectual property and patents) (Gould & Gruben, 1996), and social resources (relationships with other organizations) (Florin, Lubatkin & Shulze, 2003). Chrisman et al. (1998) identified intangible assets (access to capital, distribution, labour, suppliers and raw materials; culture; databases; reputation; social networks; management team; skills; location; intellectual property), and tangible assets (financial, equipment, facilities, size, and land).

#### 5. Organizational Structure, Systems, and Processes

A number of studies have examined the makeup of the firm founding team and/or top management team (Colombo & Grilli, 2005; Barringer, Jones & Neubaum, 2005). These studies have found that having a diverse founding team is favourable to firm performance. Teece and Pisano (1994) proposed a model of

dynamic capabilities in which a firm's ability to change and adjust over time is affected by the processes embedded within the firm. Of particular interest is the ability of the firm to learn and distribute knowledge, integrate outside knowledge and processes, and reconfigure and transform itself. Chrisman et al. (1998) identify systems and processes in the area of financial control, human resource systems, management information systems, and speed of implementation of new processes and systems.

The new venture growth literature has examined firm success from a number of perspectives. The most common method used to measure firm performance was by examining revenues. Revenue numbers are easy to retrieve for public firms, and when private firms are being compared by the press, they are almost always compared based on revenue. Other factors that can be used to measure firm performance would be by changes to the number of employees, or firm market share in a particular market.

Baghai, Coley and White (1999) propose a concept that goes beyond the model proposed by Chrisman et al. (1998). They suggested that to create and sustain growth, a firm must actively pursue opportunities in three horizons: the immediate, the short term and the long term.

Feeser and Willard (1990) examined high growth and low growth young firms in a particular industry and found that high growth firms were "more likely to derive revenues

from foreign sales”, and did not find support for their proposition that high growth firms were more likely to acquire other firms.

## **2.2 Networks/Alliances/Joint Ventures/Ecosystems**

This stream of literature examines networks, alliances, joint ventures and ecosystems. It focuses on how the systems work, who participates in these relationships, and how they benefit the organizations working together.

Street and Cameron (2007) completed a thorough review of the literature in the area of networks and alliances. They found that researchers have examined three units of analysis: the firm, a dyadic partnership (two firms - which firm extracts the most value from the other firm), and an entire network. Moore (2006) identified a trend that competition was no longer between individual firms, but was now between ecosystems of firms, ecosystem vs. ecosystem.

Similar to the new venture growth literature, and Chrisman et al.'s (1998) extended new venture growth model, Street and Cameron (2007) found that the network literature examined attributes around the entrepreneur, the management team, and the firm.

The network literature stream also examined attributes of the partner in a particular relationship, as well as characteristics of the network in which a firm interacted.

Network analysts have developed a number of numeric values for describing a network:

the density of the network, the centrality of the network (i.e., the more central the network, the more ties between the nodes), the degree of the network (i.e., the number of nodes that must be passed through to connect two nodes), the cohesion (how many nodes would have to be removed to break the network apart), and the betweenness (i.e., valuing nodes that are nodes that must be passed through for two nodes to reach each other).

In 1991, Larson examined firm cooperation in her case-based study, and found "... partnering with targeted firms that can provide key resources is a desirable and feasible strategy". Hagedoorn (1990, 1993) has published a number of studies examining firm cooperation. He has laid the groundwork for classifying cooperation by the level amount of interdependence between two firms.

The number of papers researching ecosystems has increased significantly over the past five years. In a relatively early paper, Moore (2006) examined ecosystems and called for a need to re-examine anti-trust legislation in the light of this becoming commonplace for business interworking. In *The Network Challenge* (Kleindorfer, Wind & Gunther, 2009), the authors compile twenty-eight papers grouped into seven parts: The network challenge, foundations, innovation and coordination in networks, strategy and business models, organizing in a networked world, network-based sources of risk and profitability, and contagion and containment.

## 2.3 Merging the Streams: Young Company Alliance Literature

Table 1 compares the new venture growth and the network stream. The network stream includes the literature on alliances, joint ventures and ecosystems.

**Table 1: New Venture Growth Stream and Network Stream Comparisons**

	<b>New Venture Growth Stream</b>	<b>Common</b>	<b>Network Stream</b>
<b>Unit of Analysis</b>		•Firm	•Dyadic partnership •Network
<b>Input Characteristics</b>	•Processes and Systems	•Entrepreneur •Firm (including organizational structure) •Industry/Environment •Resources •Strategy •Geographic Location •Strategic	•Partner •Relationship •Network characteristics
<b>Processes / Operations</b>			Relationship Management: •Trust •Organizational learning •Formation
<b>Output/Outcome</b>	•Employment	•Revenue •Market share	•Business development •Competitive advantage •Resources

Both literature streams examine the firm as the unit of analysis, but network literature also examines the dyadic partnership and the network.

Both literature streams examine the entrepreneur, firm, industry/environment, strategy, and geographic location, but the new venture growth stream also examines the firms' processes and systems, while network literature also examines an individual partner, network characteristics, and aspects of a relationship itself.

Examining the processes and operations that the organizations undertake, both streams examine strategy. The network literature considers relationship management, in particular: trust, organizational learning, and how relationships are formed.

Both literature streams focus on outcomes such as revenue and market share. The new venture growth literature has also examined employment growth. In addition to revenue and market share, the network literature stream has also measured results with business development objectives, gaining competitive advantages, and gaining access to both tangible and intangible resources.

The combined streams can be considered part of the young company alliance literature stream. This stream specifically examines how and what types of alliances can be correlated with growth. Baum et al. (2000) examined all biotechnology startups in Canada for a period of six years. Their results suggest that the alliances established were related to early firm performance, and that this in turn affected later performance. Lee et al. (2001) examined startups in South Korea, where government and academic relationships played a large role in startup development. Consequently, they were only able to find a statistically significant correlation between relationships with venture

capitalists and performance. Lindsey (2008) also examined the role of venture capitalists, not just in terms of providing financial resources to a firm, but also as a facilitator of helping portfolio firms establish crucial strategic relationships.

Ferrier (2001) examined how the diversity, speed, intensity, and unpredictability of competitive actions are used to win over a direct competitor.

## **2.4 Lessons learned**

Three streams of literature were reviewed: The new venture growth stream of literature, the network stream of literature, and the young company alliance literature stream.

There are two key lessons learned from this review.

**Despite significant commonalities between the new venture growth stream of literature, and the network stream of literature, the streams are independent**

Table 1 outlines the commonalities in these streams of research. It is interesting to note that there is almost no overlapping research in this area – the two exceptions being Baum et al. (2000), and Lee et al. (2001). Despite a number of models developed for new venture growth, none of these models examined network or relationship strategies as being an input into their growth models.

While the ecosystem concept is relatively new, the idea of firms working together has been well explored by Hagedoorn beginning in 1990, and others. There is limited

practical research in this area as it would apply to a new venture. Gans and Stern (2003) developed a practical framework to guide how technology entrepreneurs can work with (or against) an incumbent firm, but there are few papers with similar application for new ventures.

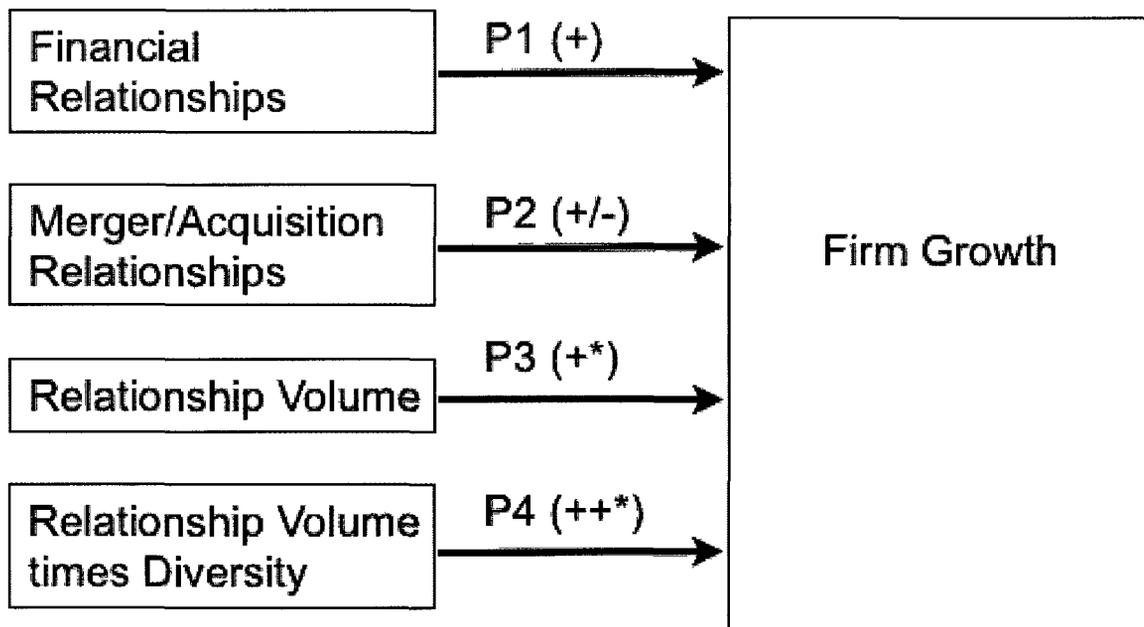
### **Mixed results from network stream literature**

Most of the case based literature in this stream identifies that seeking out partnerships is a strong and beneficial strategy (Larson, 1991; Coviello & Munro, 1997). Gulati, Nohria and Zaheer (2006) point out that there are limitations and disadvantages to partnering, in particular monogamous alliances that restrict alliances with other partners, and the coordination costs of managing strategic relationships. Recent research from Gulati et al. (2009) finds "... studies report persistently low success rates for alliances and suggest that many firms fail to realize the potential gains from partnering activity". They go on to ask "What types of partners are most desirable for increasing the gains from a partnering experience?"

This research seeks to build on the work of Lee et al. (2001) and Baum et al. (2000) to attempt to further clarify the answer to this question by examining a new set of firms, specifically, young Canadian information technology companies.

### 3. Research Model

Figure 2 provides a model developed to anchor the propositions examined in this research.



\* it is expected that too many relationships will begin to have a negative impact on firm growth

Figure 2: Relationship types correlation with firm growth

On the left hand side of Figure 2, the four relationship types for which there exists previous research with respect to relationships and the effect on firm success are identified.

### **3.1 Financial relationships**

Financial relationships can assist a firm in three ways. First, they can provide financial resources to the firm, which establishes credibility for the firm. Second, the financial resources can be used to fund growth. Third, organizations establishing financial relationships with a young firm will want to see it succeed, and will help that firm make additional relationships with other firms.

Lee et al. (2001), in their analysis of Korean startup IT firms, examined many relationship types, and found that only relationships with venture capitalists were positively correlated with success. Thus, Proposition 1 is proposed as follows:

Proposition 1: The number of financial relationships positively affects a firm's growth.

### **3.2 Merger/Acquisition relationships**

Mergers and acquisitions are an alternative growth strategy to organic growth. Bhide (2000) found that there was no significant difference in growth rate between firms that grew organically versus firms that grew by acquisition.

Proposition 2: The number of merger/acquisition relationships is not correlated with a young company's growth.

### **3.3 Volume of relationships**

Ferrier (2001) found that the volume of competitive actions that a firm undertook were correlated with firm performance, and found a U-shaped relationship with market share gain. The network stream of literature asserts that firms establish relationships to gain access to resources, drive business development, and develop competitive advantages. If we translate Ferrier's model from competitive actions to establishing relationships, one could argue that the volume of relationships should have similar characteristics to what Ferrier found with competitive actions. Thus, Proposition 3 is proposed as follows:

Proposition 3: The volume of relationships versus growth is a non-linear relationship that is initially positive, but becomes negative as the number of relationships a firm can efficiently maintain is exceeded.

### **3.4 Volume and diversity of relationships**

Ferrier (2001) found that competitive attack complexity (which was measured as being a diverse set of attacks) exhibited a U-shaped relationship with firm performance. The network stream of literature asserts that firms establish relationships to gain access to resources, drive business development, and develop competitive advantages. If we translate Ferrier's model from competitive actions to establishing relationships, one

could argue that the volume of relationships and the diversity of relationships should have similar characteristics to what Ferrier found with competitive actions. It is expected that this variable will be a better measure of relationship success than relationship volume alone. Thus, Proposition 4 is proposed as follows:

Proposition 4: The diversity and volume of relationships as compared to growth is a non-linear relationship, that is initially positive, but becomes negative as the number of diverse relationships that a firm can efficiently maintain is exceeded.

## 4. Research Method

This chapter has been organized into five sections. Section 4.1 contains an overview of the research method. Section 4.2 identifies the sample used in this research. Section 4.3 details the second step of the research method, which includes the press release search and website examination. Section 4.4 details the categorization of relationship data found. Section 4.5 details how the data was analyzed.

### 4.1 Research Method Overview

Table 2 provides an overview of the steps and activities undertaken for this research.

**Table 2: Research Method Overview**

<b>Step</b>	<b>Dominant activity undertaken to produce deliverables</b>
1. Identify firms of interest	Identify sample of 80 young Canadian IT companies, using Branham 300, between 2002 and 2010.
2. Press release and website examination	In the two year period before appearing on the list, find all press releases mentioning the observed firms. Examine historical version of observed firm website to collect additional relationship data about firm.
3. Categorization and measurement of relationships	Categorize press releases that mention the observed firms, and firms external to the observed firms.
4. Analyze data	Correlate firm growth with firm relationships, examining in particular the types of relationships, volume of relationships, diversity of relationships and changes in the two year period.

## 4.2 Sample

The unit of analysis was a young Canadian IT firm.

The population is an experimental population of young Canadian firms (as can be seen in Figure 1). For the purpose of this study, I considered any firm less than ten years of age to be a young firm.

I decided to use a sample size of 80 firms. I felt that this would be sufficient to find statistically significant findings for several variables within a model, as well as being sufficient for the evaluation of the propositions presented in Section 3. The data for each firm took approximately eight hours to gather manually, and so not all firms that met the criteria on the Branham list were examined.

The firms in the sample were drawn from the Branham lists for 2002 through 2010. The firms in the sample met the following criteria:

- The firm must have appeared on the list more than once. The reason behind this criterion was that I found that firms might have a strong year and appear on the list, and then disappear from future lists. By ensuring the firms had appeared on the list more than once, I was able to reduce this “halo effect”.
- The firm must have been under eight years of age when it first appeared on the list, such that the firm remained under ten years of age across the years in which I examined firm growth, to be considered a young company.

- The firm must have had at least \$100,000 of revenue in the first year of observation for which I examined the firm. Firms with smaller initial revenue were found to grow disproportionately as a percentage.

The Branham lists were used to collect revenue data, as many young firms do not normally share their revenue information.

129 firms met the criteria I specified in section 4.2 across the Branham lists. As indicated above, because of time and effort constraints, 80 firms were randomly selected from the set.

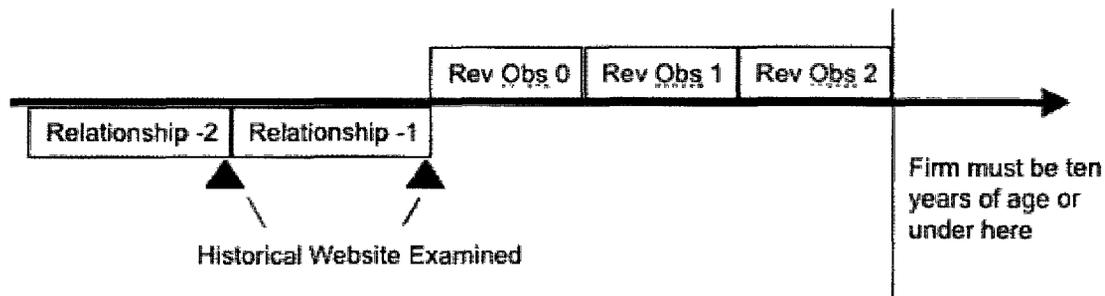
### **4.3 Data Collection**

I collected relationship information in the two years prior to the first revenue observation on the Branham list. I collected press release information: if the firm was publicly traded, I used press releases from [sedar.com](http://sedar.com), otherwise I used press releases that could be found on the firm's website in the present or historically. I also searched [news.google.ca](http://news.google.ca). I also examined two historical snapshots of the firm's website on [archive.org](http://archive.org) to find additional relationship information (as can be seen in Figure 4).

I examined historical views of their website in the two years prior to their first year of revenue reported on the Branham list. I categorized press releases and news information that appeared on their site, as well as information about other partner firms, either through partner pages, or reseller/distributor pages. For the 80 firms I

categorized a total of 1,943 relationships for the two year period. The relationships were categorized as outlined in section 4.4. Additional variables were generated that represented total number of relationships, diversity, and others as outlined in section 4.3. A sample showing the detailed results for a single firm can be seen in Appendix B. These 80 detailed results were then rolled up to a single large spreadsheet which can be provided as Appendix C.

For each firm in the sample, I used revenue data from the Branham list. Based on the first revenue data available from the Branham list, I collected relationship data for two years prior. I expected that a relationship could take one or more years to have an impact on a young firm's results. Baum et al. (2000) lagged several of their independent variables by one year. I went back two years so that I could collect more data, and to understand changes in relationships in the period before revenue and growth data was measured. Figure 3 shows the periods of time that I collected relationship and revenue data for a firm.



**Figure 3: Timeline of when data was collected**

I examined a historical version of the firm's website on the Internet Archive (Archive.org). The Internet Archive contains snapshots of websites from 1996 to present day, as well as other multimedia available on the Internet from 1999 to present day. As of February, 2011, the archive consisted of 150 billion web pages.

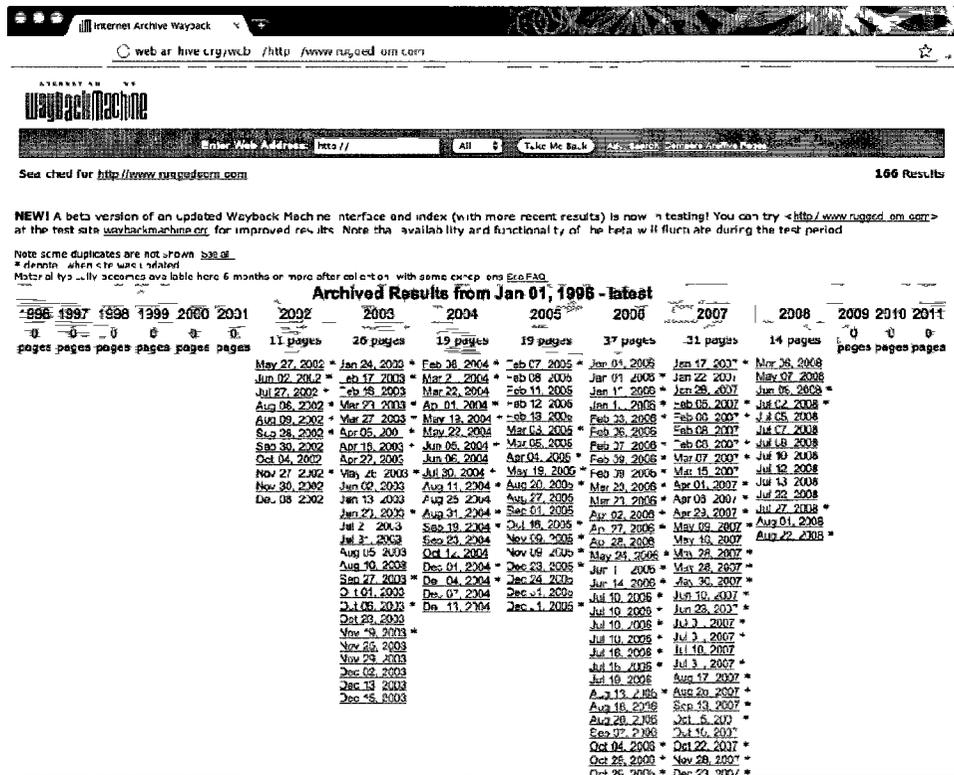


Figure 4: Archive.org output for www.ruggedcom.com

For the purpose of finding press releases, I began by examining the historical version of the website at the beginning of the year for which I had my first revenue observation and searching it for news, events, and/or press releases. Often the site contained all press releases prior to that moment in time. In some instances, it contained only the most recent events, in which case I browsed earlier snapshots of the website, allowing

me to piece together a clear image of the relationships established in the period that I was interested in.

If the firm was publicly traded on the TSX venture exchange, I also examined all press releases available for the time period that I was interested in on sedar.com (the System for Electronic Document Analysis and Retrieval).

Finally, I examined two snapshots of the website (at the end of each year in which I was gathering relationship information) to find additional firm relationship information on partner and/or reseller/distributor web pages if this information was available.

## **4.4 Variable Measurement**

### **Independent variables measured**

The relationship categories that were measured were based on the results of an initial survey of press releases for ten of the sample firms. The categorization was driven by logical groups, and influenced by a review of the literature, in particular Baum et al. (2000) and Lee et al. (2001).

I examined relationship data over a two year period. For each relationship type, I counted a relationship at most once per year. If evidence of the relationship was found in both years, it was counted once in each year. For each of the variables 1-14 below, their measurement can be expressed as:

Variable = Number of unique relationships<sub>Y-1</sub> + Number of unique relationships<sub>Y-2</sub>

Appendix A provides the categorization method used in this research.

The method of counting just one relationship per year fails to measure the intensity of relationships. Measuring intensity could make data gathering more difficult and less consistent and reproducible, and as such is not measured by this research.

### **Variable 1. Relationships with large firms**

Baum et al. (2000) examined the role that incumbent biotechnology firms played with startup biotechnology firms, and found that a startup might pursue relationships with incumbents to overcome the liability of newness or the liability of smallness.

Rothaermel (2001) examined this issue from the incumbent's perspective, and found that incumbents that focused on exploiting complementary assets outperformed their peers that focused on exploring new technology.

Using the criteria in Appendix A:

Relationships with large firms = Number of unique relationship with large firms <sub>Y-1</sub>  
+ Number of unique relationships with large firms <sub>Y-2</sub>

## **Variable 2. Relationships with associations, standards bodies or industry organizations**

Baum et al. (2000) examined startup biotechnology firms that joined industry organizations and found that these biotechnology firms underperformed their peers. They suggested these firms might have less experience than their peers, and that they joined these organizations to overcome a lack of experience in the industry. Research has suggested that standards bodies are a way for firms to share risk, reducing the impact of failure on an individual firm. A firm can join these organizations to increase its social capital, which in turn can be used as an advantage over a competitor. For the purpose of this study, relationships with associations, standards bodies or industry organizations were grouped together.

Using the criteria in Appendix A:

Relationships with associations, standards bodies or industry organizations =  
Number of unique relationships with associations, standards bodies or industry organizations  $\gamma_{-1}$  + Number of unique relationships with associations, standards bodies or industry organizations  $\gamma_{-2}$

## **Variable 3. Supplier relationships**

Kogut (2000) shows how supply chain networks can increase speed to market. Supply chain networks allow firms to focus on their core capabilities by outsourcing non-core capabilities. The resource-based view indicates that this is one method to maximize

profitability. Baum et al. (2000) found that a biotechnology company's relationship with laboratory facilities was positively correlated with patents generated and statistically significant.

Using the criteria in Appendix A:

Supplier relationships = Number of unique relationship with suppliers  $\gamma_{-1}$  +  
Number of unique relationships with suppliers  $\gamma_{-2}$

#### **Variable 4. Distributor relationships**

Coviello and Munro (1997) found that for a software firm to penetrate an international market, it had to have a partner located in the target country. This is one example of how distributors can help a young IT firm reach a broader market. The tradeoff of working with distributors is that it removes the company from a direct relationship with customers.

Using the criteria in Appendix A:

Distributor relationships = Number of unique relationships with distributors  $\gamma_{-1}$  +  
Number of unique relationships with distributors  $\gamma_{-2}$

#### **Variable 5. Customer relationships**

Yli-Renko, Autio and Sapienza (2001) showed how a strong relationship with a key customer could increase knowledge acquisition, and this in turn increased new product development and enhanced technological distinctiveness. For this study, I was not able to determine a single key customer for the observed firm, but instead examined the quantity of key customer relationships in which the customer was promoted through a press release or listed as a key customer.

Using the criteria in Appendix A:

$$\text{Customer relationships} = \text{Number of unique relationships with customers}_{Y-1} + \text{Number of unique relationships with customers}_{Y-2}$$

### **Variable 6. Financial relationships**

Financial relationships were calculated using information about relationships with financial firms and/or information about funding events for the firm (since presumably these would have been implemented with the assistance of a financial firm).

A number of studies (Lee et al., 2000, Bhide, 2000, Lindsey, 2008) have examined the benefits gained by young firms working with venture capital firms. Based on these studies, a startup firm that gained capital was able to rapidly implement its strategy. The venture capital firm was also able to introduce the funded firm to other potential partners and increase the young firm's credibility.

Using the criteria in Appendix A:

Financial relationships = Number of unique relationships with financial firms  $_{Y-1}$  +  
Number of funding events  $_{Y-2}$  + Number of unique relationships with financial firms  $_{Y-1}$  +  
Number of funding events  $_{Y-2}$

### **Variable 7. Product integration relationships**

A product integration relationship is one in which the firm integrates its technology with another non-large partner firm's technology, or in which a non-large partner integrates its technology with the observed firm. Sharing development allows the firms to reach a market faster, focus on their core capabilities, and spread product development costs and risks.

Using the criteria in Appendix A:

Product integration relationships = Number of unique product integration  
relationships $_{Y-1}$  + Number of unique product integration relationships $_{Y-2}$

### **Variable 8. Strategic relationship with another small firm**

This variable is similar to product integration, in that I considered non-large partner relationships only. In this instance, the strategic relationship can include co-marketing and co-selling agreements in which firms share customer lists and allow each other to market directly to each other's customers.

Using the criteria in Appendix A:

Strategic relationship with another small firm = Number of unique small firm relationships<sub>Y-1</sub> + Number of unique small firm relationships<sub>Y-2</sub>

### **Variable 9. Merger/acquisition relationships**

Bhide (2000) found no evidence that growth by acquisition was faster than organic firm growth. Mergers and acquisitions require capital to purchase another firm. In our study, mergers and acquisitions were almost always preceded by another relationship.

Using the criteria in Appendix A:

Merger/Acquisition relationships = Number of mergers or acquisitions<sub>Y-1</sub> +  
Number of mergers or acquisitions<sub>Y-2</sub>

### **Variable 10. Top management team relationships**

Bantel and Jackson (1989) have shown that the composition of the top management team, when it is educated and diverse, is significantly related to an organization's innovation. From a social capital perspective, changes to the top management team brings a new executive, and that executives' relationships, which in turn can increase the social capital of the firm; however, an outgoing executive brings their relationships with them. For the purpose of this study, I counted once per incoming top management team member, and did not account for outgoing management.

Using the criteria in Appendix A:

Top management team relationships = Number of new top management team members<sub>Y-1</sub> + Number of new top management team members<sub>Y-2</sub>

**Variable 11. Network relationships (NETWORK = large partner + standard/association)**

Network relationships is the sum of the number of large partner relationships and the number of standard/association relationships.

**Variable 12. Supply chain relationships (CHAIN = Supplier + Distributor)**

Supply chain relationships is the sum of the number of supplier relationships and the number of distributor relationships.

**Variable 13. Close partner relationships (CLOSE = Integration + Strategic Small Firm)**

A new variable, close partner relationships, was created to measure the sum of product integration relationships and strategic relationships with other small firms.

**Variable 14. Volume - the total of relationships found in variables 1-10.**

A variable I called volume refers to the sum total of the number of relationships a firm maintains.

## **Variables 15-28: Delta variables**

Variables 1-14 were repeated with the change in number of relationships observed between the two years. A positive delta denotes an increase in number of observed relationships, and a negative delta indicates a decrease in the number of observed relationships. These variables were denoted with a prefix of “D”.

For variables 1-14, the value can be expressed as:

$$\text{Delta Variable N} = \text{Variable N}_{Y-1} - \text{Variable N}_{Y-2}$$

## **Variable 29. Volume times diversity**

Diversity was based on the Herfindahl-Hirschman index across variables 1-10. This produced a number between 0 and 1, which was then multiplied against the total number of relationships to calculate this variable. As outlined in proposition 4, it was expected that this might better measure the effectiveness of a firm’s relationships.

The Herfindahl-Hirschman index can be expressed as:

$$\text{Diversity} = 1 - \sum_{i=1}^V (n_i/N)^2$$

Where:

V is the total number of variables

$n_i$  is the value of an individual variable,  $i$ .

N sum of all variables

This produces a value between 0 and 1.

Volume times diversity can be expressed as:

$$\text{Volume times diversity} = \text{Total \# of relationships} \times \text{Diversity}$$

## **Dependent Variable**

The dependent variable was adjusted annual growth rate of the firm. I first calculated the firms annual growth rate:

$$\text{Annual growth rate} = (\text{Revenue}_{y2} - \text{Revenue}_{y0})^{(1/2)}$$

I took the growth rate of the firm over two years, annualized it, and then standardized it by using the NASDAQ-100 Index. Standardizing the results boosted the results of a company that was reporting results in the 2000-2002 period, when the NASDAQ fell from 3570 to 1550. It penalized companies that reported results in the 2003 to 2005 period when the NASDAQ rose from 983 to 1519 points. The adjusted annual growth rate is expressed as:

$$\text{Adjusted annual growth rate} = \text{Annual Growth Rate} / \text{NASDAQ-100 Multiplier}$$

The NASDAQ-100 index was chosen as the index for standardization over a Canadian index because the Canadian index that would most fit my sample would be either the TSX Venture Exchange, or the TSX information technology subindex. The TSX Venture Exchange was the exchange on which several of the sample firms were traded, however, information technology companies make up only 216 of 2001 companies (as of Dec 31, 2009). The TSX information technology subindex, was not used because it

is made up of just five firms as of 2011, each with a market capitalization over \$1B, and in the research period had been dominated by Nortel. The NASDAQ index has over 60% of the index weighted in computer and telecom firms (Hughes, 2011).

**Table 3: NASDAQ-100 Index and multiplier used to standardize revenue growth rates**

<b>Year</b>	<b>NASDAQ 100 Index</b>	<b>Annualized Two Year Change</b>
2000	3570.05	0.659
2001	2593	0.616
2002	1550.17	0.981
2003	983.05	1.243
2004	1493.08	1.070
2005	1519.63	1.086
2006	1710.75	1.037
2007	1792.28	0.811
2008	1841.42	
2009	1180.25	

#### **4.5. Data Analysis**

The first step of my data analysis was to examine the descriptive statistics and a table of correlations for all variables.

I standardized the dependent variable as outlined in Section 4.4. In order to use multiple regression, I needed to ensure that the dependent variable was normal by

examining the kurtosis and skewness of the variable. I used the rule of thumb that the absolute value of the standard error kurtosis must be less than two, and that the absolute value of the standard error of skewness must be less than two. In the event that the dependent variable was found not to be normal, it was normalized using a recommended calculation.

I did not normalize the independent variables as recommended by McClelland and Judd (1993), in which they observe that having normalized predictor variables will result in the data being clustered in the center, and providing statistically weaker results.

Models were generated and evaluated to test the propositions outlined in chapter 3.

The models that were tested were:

Proposition 1:

$$\begin{aligned} \text{Adjusted Annual Growth Rate} &= \text{constant} \\ &+ b \times \text{Number of financial relationships} + \text{error} \end{aligned}$$

$$\begin{aligned} \text{Adjusted Annual Growth Rate} &= \text{constant} \\ &+ b \times \text{Delta number of financial relationships} + \text{error} \end{aligned}$$

Proposition 2:

$$\begin{aligned} \text{Adjusted Annual Growth Rate} &= \text{constant} \\ &+ b \times \text{Number of merger/acquisition relationships} + \text{error} \end{aligned}$$

$$\begin{aligned} \text{Adjusted Annual Growth Rate} &= \text{constant} \\ &+ b \times \text{Delta number of merger/acquisition relationships} + \text{error} \end{aligned}$$

Proposition 3:

Adjusted Annual Growth Rate = constant

+  $b_1$  x Relationship volume

+  $b_2$  x Relationship volume <sup>2</sup> + error

Adjusted Annual Growth Rate = constant

+  $b_1$  x Delta relationship volume

+  $b_2$  x Delta relationship volume <sup>2</sup> + error

Proposition 4:

Adjusted Annual Growth Rate = a

+  $b_1$  x Relationship volume times diversity

+  $b_2$  x Relationship volume times diversity <sup>2</sup> + error

For each of the models to be considered valid the alpha must be less than or equal to 0.05.

Following model testing, an exploratory analysis of the variables was performed using stepwise regression.

The relationship data was correlated with the firm's annualized growth rate. Because the data for the firms was for varying time periods, I standardized the annualized growth rate as detailed in section 5.1. I then performed a stepwise regression against the independent variables, and included quadratic terms for all independent variables to look for non-linear relationships for the observed firms. As outlined by Hays (1994), the stepwise regression is an exploratory tool, and the coefficients of the stepwise

regression should not be used as a predictive model. The stepwise regression was performed to find the smallest number of variables that would explain the most amount of variance in the data.

## 5. Results

This chapter is organized into four sections. Section 5.1 provides the descriptive statistics of the sample used in this research. Section 5.2 provides the correlations among variables used in the research. Section 5.3 provides an evaluation of the propositions from Section 4.5. Section 5.4 provides the results of the stepwise regression.

### 5.1 Sample (N=80)

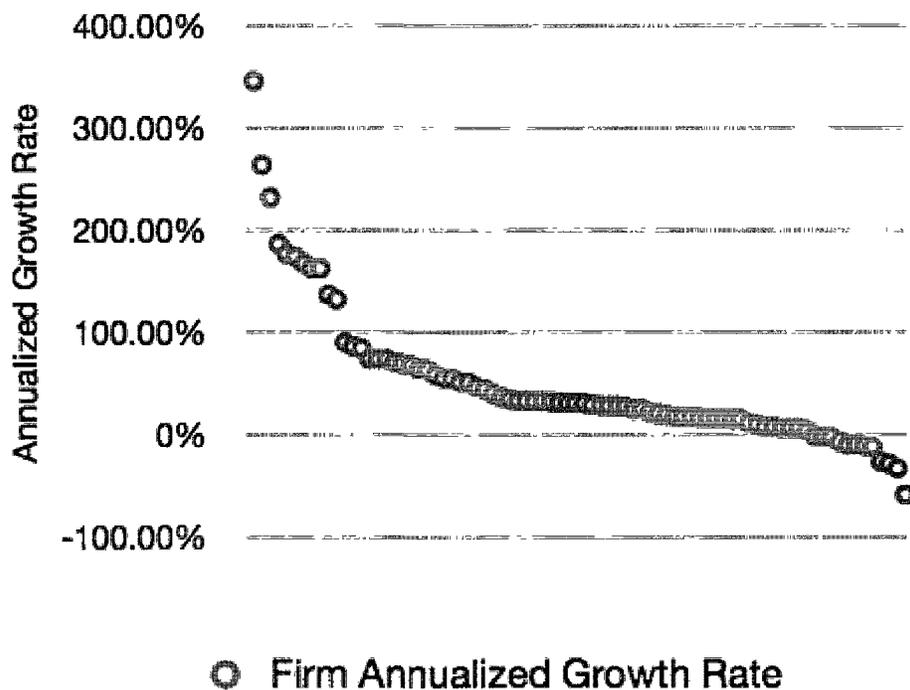


Figure 5: Annualized growth rate for sample (n=80)

It is important to note that firms on this list are not made up of purely successful firms. The annualized growth rate of firms varied from 345% to -59%, with 12 of 80 firms having a negative annualized growth rate (as visible in Figure 5 above).

The adjusted annual growth rate is the dependent variable. It varied from 0.6224 to 5.5175, with a mean of 1.7428 and a standard deviation of 0.8583. The adjusted annual growth rate was normalized by taking the log of the adjusted annual growth rate in order to generate the variable normalized adjusted annual growth rate. The kurtosis of the normalized variable was 0.8265 and the skewness was 0.6090 which indicates that the data is normally distributed.

For each observed company, for the two year period subsequent to their first revenue observation, I collected counts of numbers of relationships as outlined in Section 4.4. I also calculated the change in each relationship type between year-2 and year-1.

In addition to standardizing revenue using NASDAQ index information to account for annual differences in revenue, I also added control variables for the age of the firm, the industry that the firm was in and the geographic region in which the firm operated. These control variables were not statistically significant, and none of them individually or together improved the model found in the stepwise regression below.

## **5.2 Descriptive Statistics and Table of Correlations**

Table 3 (below) shows the descriptive statistics and variable correlations for the data (n=80). The correlations were performed using the Spearman rank correlation coefficient, which was used since most of the variables are not normal.

In the correlation table, I observed that the variable representing the total number of relationships (variable 14), is correlated to many of the other variables, as I would expect. This correlation carries through to the delta total, and volume times diversity. It is most correlated with the relationships that were most common, specifically customer relationships.

Table 4: Mean, Standard Deviations, and Correlation Matrix (n=80)

Variable	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
1 Large Partner	2.55	3.71																													
2 Standard / Association	1.6	4.43	0.02																												
3 Supplier	3.98	9.20	0.09	0.02																											
4 Distributor	2.11	5.43	-0.06	0.09	0.13																										
5 Customer	8.69	16.93	-0.08	0.08	0.21	0.16																									
6 Financial	1.20	2.21	-0.17	-0.05	0.02	0.04	0.14																								
7 Integration	0.23	0.84	0.08	0.07	-0.06	0.29	0.12	0.1																							
8 Partner	1.95	2.84	-0.08	0.12	0.01	0.2	0.05	0.08	0.26																						
9 Merger / Acquisition	0.48	1.15	0.05	0	0.09	-0.06	0.31	<b>0.61</b>	0.03	0.2																					
10 TMT	1.55	2.40	-0.11	0.18	0.13	0.06	0.33	0.38	0.13	0.16	0.29																				
11 Network	4.15	5.70	<b>0.76</b>	<b>0.55</b>	0.07	0.06	0.04	-0.19	0.1	-0.03	<b>0.02</b>	-0.05																			
12 Supply Chain	6.09	10.43	0.02	0.08	<b>0.81</b>	<b>0.55</b>	0.3	-0.03	0.13	0.11	0.01	0.08	0.11																		
13 Close Partner	2.18	3.28	-0.08	0.12	0.03	0.25	0.07	0.1	0.39	<b>0.98</b>	0.2	0.19	-0.03	0.15																	
14 Total	24.33	24.47	0.04	0.2	0.42	<b>0.23</b>	<b>0.77</b>	<b>0.22</b>	0.21	<b>0.22</b>	0.33	0.35	<b>0.23</b>	<b>0.53</b>	0.26																
15 Delta Large Partner	0.20	1.45	0.21	0.11	0.01	-0.07	-0.1	-0.11	0.13	-0.02	0.1	-0.09	0.18	-0.04	-0.01	-0.13															
16 Delta Standard / Association	0.30	1.41	0.16	0.27	-0.06	-0.01	-0.04	0	0.13	0.2	0.04	0.06	<b>0.25</b>	-0.01	<b>0.22</b>	0.11	0.15														
17 Delta Supplier	-0.03	2.80	-0.09	0.13	0.09	0.07	-0.01	-0.27	0.02	-0.09	-0.33	-0.01	0	0.09	-0.07	-0.65	0.25	0.16													
18 Delta Distributor	0.11	4.63	0.04	-0.1	-0.03	0.13	-0.16	-0.2	0.05	0.15	-0.15	-0.07	-0.1	0.04	0.12	-0.14	0.03	0.11	0.2												
19 Delta Customer	1.96	6.89	-0.25	-0.07	0.11	0.14	0.31	0.09	0.18	0.15	0.13	0.2	-0.2	0.22	0.18	0.3	0.15	-0.01	0	-0.12											
20 Delta Financial	0.10	0.99	-0.26	0.08	-0.06	-0.01	-0.09	0.08	0	-0.13	-0.07	-0.08	-0.21	-0.02	-0.09	-0.15	0.22	-0.01	0.24	0.08	0.01										
21 Delta Integration	0.13	0.80	0.03	0.04	-0.05	0.08	0.04	0.11	0.48	0	-0.09	0.03	0.07	0.03	0.12	0.12	0.02	0	0.04	-0.26	0.26	0.14									
22 Delta Partner	0.58	1.57	-0.12	0.01	-0.02	0.33	-0.01	-0.08	0.28	0.41	-0.08	0.09	-0.09	0.12	0.42	0.1	0.2	0.02	0.14	0.1	0.33	-0.18	0.06								
23 Delta Merge	0.25	0.79	0.06	-0.09	0.01	-0.28	0.24	0.31	0.11	0.21	<b>0.61</b>	0.26	-0.09	-0.07	0.21	0.2	0.21	0.09	-0.02	0.23	0.19	0.08	-0.05	-0.05							
24 Delta TMT	0.60	1.44	-0.07	0.27	0.06	-0.01	0.19	0.15	-0.03	-0.01	0.05	<b>0.56</b>	0.03	0.07	-0.03	0.14	-0.01	-0.07	0.01	-0.08	0.25	0.08	-0.06	0.08	0.13						
25 Delta Network	0.50	2.16	0.21	0.19	-0.04	-0.03	-0.04	-0.11	0.18	0.09	0.09	-0.01	0.26	-0.03	0.11	0.01	0.8	<b>0.66</b>	0.29	0.16	0.11	0.15	0	0.17	0.25	-0.04					
26 Delta Supply Chain	0.09	5.65	-0.03	0.02	0.07	0.19	-0.11	-0.26	0.01	0.1	-0.28	-0.06	-0.09	0.12	0.08	-0.12	0.16	0.13	<b>0.72</b>	<b>0.75</b>	-0.14	0.16	-0.2	0.23	0.07	-0.02	0.22				
27 Delta Close Partner	0.70	1.97	-0.12	-0.03	0	0.33	0.02	-0.03	0.38	0.38	-0.09	0.12	-0.11	0.13	0.43	0.13	0.18	-0.01	0.16	0.03	0.39	-0.15	0.28	<b>0.96</b>	-0.05	0.02	0.14	0.17			
28 Delta Total	4.19	9.21	-0.16	0	0.06	0.15	0.14	-0.04	0.27	0.22	0.01	0.17	-0.17	0.14	0.25	0.14	0.49	0.12	0.41	0.32	<b>0.53</b>	0.2	0.15	<b>0.59</b>	0.31	0.28	0.47	0.47	<b>0.58</b>		
29 Volume times diversity	13.02	13.78	0.09	0.27	0.48	0.37	<b>0.67</b>	0.37	0.28	0.32	0.42	<b>0.63</b>	0.29	<b>0.62</b>	0.37	<b>0.83</b>	-0.08	0.1	-0.05	-0.14	0.26	-0.11	0.14	0.13	0.22	0.22	0.03	-0.1	0.16	0.15	
30 Adjusted Annual Growth	0.20	0.18	0.04	0.02	-0.23	0.01	-0.33	-0.02	-0.27	-0.16	-0.12	-0.09	0.07	-0.25	0.21	-0.29	0.06	-0.02	0.04	0.04	-0.14	0.00	-0.14	0.12	0.03	-0.16	0.07	0.04	0.07	-0.01	-0.23

The correlation table shows that the variables I added that were the sum of two other variables (variables 11, 12, and 13) are highly correlated with their component pieces. The same observation can be made with their delta variable counterparts: delta network (constructed from delta large partner and delta standard/association), delta supply chain (constructed from delta supplier and delta distributor), and delta close partner (constructed from delta integration and delta partner).

The variable “volume times diversity”, which is the total number of relationships, multiplied by the diversity (calculated via the Herfindahl-Hirschman Index) has similar correlations. Besides being highly correlated to total number of relationships, it is observed that this variable is highly correlated to customer relationships (similar to the total variable). It is also observed to have a high correlation with TMT relationships and supply chain relationships.

As one might expect, mergers and acquisitions are correlated to financial relationships, since mergers and acquisitions require capital to implement.

### **5.3 Models**

Tables 5 through table 8 present the results of the ordinary least squares regression analyses used to test propositions one through four. The first two regressions in table 5 show the results of regression analysis with financial relationships. The results for proposition 1a encompassed the total number of financial relationships in the two year period prior to the adjusted annual growth rate observations. The results shown for the

regression for Proposition 1b illustrates the change in financial relationships in the two year period prior to the adjusted annual growth rate observations. Neither of these models were statistically significant, and proposition 1 was not supported.

**Table 5: Results of Regression Analysis for Adjusted Annual Growth Rate with Financial Relationships**

<b>Results of Regression Analysis for Adjusted Annual Growth Rate with Financial Relationships (n=80)</b>		
	Proposition 1a	Proposition 1b
Number of financial relationships	-0.002186	
Delta number of financial relationships		-0.0274
Adjusted R <sup>2</sup>	-0.01	0.01

No statistical significance under  $p < 0.10$

Table 6 shows the results of two regression analyses in which I examined proposition two, that mergers and acquisitions have no statistically significant relationship with adjusted annual growth rate. The first regression, 2a, looked at the total number of merger/acquisition relationships in the two year period prior to the adjusted annual growth observations. The second regression, 2b, looked at the change in number of merger/acquisition relationships in the two year period prior to the adjusted annual growth observations. The regressions demonstrate no statistically significant relationship, so I found support for this proposition.

**Table 6: Results of Regression Analysis for Adjusted Annual Growth Rate with Merger/Acquisition Relationships**

<b>Results of Regression Analysis for Adjusted Annual Growth Rate with Merger/Acquisition Relationships (n=80)</b>		
	Proposition 2a	Proposition 2b
Number of merger/acquisition relationships	-0.01235	
Delta number of merger/acquisition relationships		-0.01434
Adjusted R <sup>2</sup>	-0.01	-0.01

No statistical significance under  $p < 0.10$

Table 7 shows the results of two regression analyses in which I examined proposition 3, that the volume of relationships in the two year period were correlated with adjusted annual growth rate. I added a quadratic term to the analysis to look for evidence of non-linear relationships - my proposition was for a curve rising and then falling, as the firm exceeds its capabilities to efficiently maintain relationships. In the first analysis, proposition 3a, I found that relationship volume was significant at  $p < .10$ . My expectation would have been for the linear term to be positive, and the quadratic term to be negative - so this did not support proposition 3. The adjusted R<sup>2</sup> for the entire model is 0.047 which is not a particularly significant value. Proposition 3b examined the change in total number relationships in the two years prior to our annual growth rate observations, and I found that this regression produced weaker results than those of 3a.

**Table 7: Results of Regression Analysis for Adjusted Annual Growth Rate with Relationship Volume**

<b>Results of Regression Analysis for Adjusted Annual Growth Rate with Relationship Volume (n=80)</b>		
	Proposition 3a	Proposition 3b
Relationship Volume	-0.003945*	
Relationship Volume <sup>2</sup>	0.00002111	
Delta Relationship Volume		0.002533
Delta Relationship Volume <sup>2</sup>		-0.00008919
Adjusted R <sup>2</sup>	0.047	-0.01

\* p < .10; \*\* p < .05; \*\*\* p < .01

Table 8 shows the results of our regression analysis for proposition 4. Here I looked at the relationship volume times diversity, where diversity was calculated using the Herfindahl-Hirschman index of the relationships. My expectation was that this would produce a stronger result than I found in proposition 3. I found that the adjusted R<sup>2</sup> is similar to that of P3a, however I found no statistically significant terms for either the linear or quadratic term. I could not support the proposition that the model described by P4 was stronger than P3, and I could not support the proposition that relationship volume times diversity would be represented by a curve initially rising, and then falling as a firm exceeded its capabilities.

**Table 8: Results of Regression Analysis for Adjusted Annual Growth Rate with Relationship Volume Times Diversity**

<b>Results of Regression Analysis for Adjusted Annual Growth Rate with Relationship Volume Times Diversity (n=80)</b>	
	<b>Proposition 4</b>
Relationship volume times diversity	-0.00536
Relationship volume times diversity <sup>2</sup>	0.00003975
Adjusted R <sup>2</sup>	0.046

No statistical significance under  $p < 0.10$

## 5.4 Stepwise Regression

A stepwise regression was used as an exploratory tool to determine which variables had the most impact on our dependent variable, adjusted annual growth rate. A forward stepwise regression begins with a constant term only, and then examines all models with a single variable added. It selects the best model with a single variable, and then examines all models with a second variable added. This process is repeated until the best variable found no longer improves the model, given that each variable added reduces the degrees of freedom of the regression. Stepwise regressions were performed with various sets of variables, however the best stepwise regression output occurred when the stepwise regression was performed with:

1. All of the relationship variables as outlined in section 4.4, including total number of relationships, and volume of relationship time diversity, as well as all of the delta relationship variables (the changes in relationships in years Y-2 to Y-1).
2. A quadratic term for all of the relationship variables. The quadratic term is intended to find non-linear relationships between the independent variables and the dependent variable.

The stepwise regression produced a model that found that the adjusted annual growth rate was best explained by:

1. A negative relationship with a quadratic term for delta financial relationships.
2. A negative relationship with the volume of relationships times the diversity of relationships.
3. A positive relationship with a quadratic term for delta large partner relationships.

This can be expressed by the model:

$$\begin{aligned} \text{Adjusted annual growth rate} &= \text{constant} \\ &+ B_0 \times (\text{Delta financial relationships})^2 \\ &+ B_1 \times (\text{Relationship volume times diversity}) \\ &+ B_2 \times (\text{Delta large partner relationships})^2 \\ &+ \text{error} \end{aligned}$$

Where  $B_0$  and  $B_1$  are negative and  $B_2$  is positive as can be seen in Table 9 below. The delta financial relationships term was found to be statistically significant at  $p < 0.01$ , and

relationship volume times diversity and relationships with large partners squared was found to be statistically significant at  $p < 0.05$ .

Delta financial relationships squared varied from 0 to 25, with a mean of 0.7 and a median of 0. Relationship volume times diversity varied from 0 to 67.2, with a mean of 13 and a median of 9.9. Delta large partner relationships squared varied from 0 to 81 with a mean of 2.1 and a median of 0.

The matrix of correlations in Table 10 indicated that there were no significant correlations between the variables found by the stepwise regression.

I also measured the Cook's distance of the model found by stepwise-regression. Cook distance is used to verify that the model is not being influenced by a small number of outlier observations. It measures changes to the model when each of the observations is dropped. The rule of thumb is that the Cook's distance for each observation should be less than  $4 / (n - p - 1)$ , where  $n$  is number of observations,  $p$  is number of variables, so for my model, a Cook's distance greater than  $4 / (80 - 3 - 1) = 4 / 76 = 0.052$ . One observation exceeded this rule. Removing the observation and rerunning the stepwise regression resulted in the same model, with similar values regression estimates.

The exploratory model found had an  $R^2$  value of .2007, and an adjusted  $R^2$  value of .1691. It is known that there are numerous factors that affect the growth of a firm, from the composition of the firm, to access to capital, to developing a product or service that

meets a real customer need, and setting up a sales process to bring in revenue. The fact that I found an adjusted  $R^2$  value over .10, looking just at press releases and the firms' websites for relationships in the two year period prior to revenue growth observations was remarkable.

**Table 9: Results of Regression Analysis (n=80)**

<b>Variables</b>	
Intercept	0.250737***
Delta financial relationships <sup>2</sup>	-0.016150**
Relationship volume times diversity	-0.003264*
Delta large partner relationships <sup>2</sup>	0.004489*
R <sup>2</sup>	0.2007
Adjusted R <sup>2</sup>	0.1691
F	6.36***

\* p < .05 ; \*\* p < .01 ; \*\*\* p < .001

**Table 10: Descriptive Statistics and Correlation Matrix (n = 80)**

<b>Variables</b>	<b>Mean</b>	<b>S.D.</b>	<b>1</b>	<b>2</b>
1. Delta Financial Relationships <sup>2</sup>	0.975	3.356366		
2. Relationship volume times diversity	13.021	13.77889	-0.0045	
3. Delta large partner relationships <sup>2</sup>	2.125	9.190495	0.0904	-0.0221

## **6. Discussion of Results**

Chapter 6 is organized into two sections. Section 6.1 highlights results of the stepwise regression analysis, identifying factors that were correlated with firm growth. Section 6.2 describes key findings of the research. Section 6.3 links the results of this research with the results in the literature.

### **6.1 Firm relationship factors correlated with firm growth**

The results of this study identify three factors that affect the growth in revenue of a young IT company:

1. A negative relationship with a quadratic term for delta financial relationships.
2. A negative relationship with the volume of relationships times the diversity of relationships.
3. A positive relationship with a quadratic term for delta large partner relationships.

The first variable selected by stepwise regression was a quadratic term for the change in relationships with financial firms. This variable represents the change in relationships with financial partners from Y-2 to Y-1. Because the term is quadratic, a change in financial relationships that was positive or negative is considered equal by this term. If the change in financial relationships was two (two more financial relationships in Y-1 when compared to Y-2), this term would produce the value of four. If the change in financial relationships was negative three (three less financial relationships in Y-1 when

compared to Y-2), this term would produce a value of nine. The regression model suggests that the correlation with adjusted annual growth rate and this term is negative. This is counter to the findings of Baum et al. (2000), and Lee et al. (2001). This could be explained by the fact that the young companies examined in this study are likely older than the firms in the other studies; the average age of the firms in my study is four years, while Baum et al. (2000) examined firms starting at age 0. Many of the firms I studied were on the TSX venture exchange - indicating that they had already established relationships with financial firms.

The second term selected by stepwise regression was the total number of relationships established (the volume of relationships) multiplied by the diversity of the relationships as calculated by the Herfindahl-Hirschman index. This variable represents the volume and diversity of the relationships that a firm has with other firms. The diversity portion was a weighting between 0 and 1, and was based on the Herfindahl-Hirschman index. This was multiplied by the total number of relationships found in the two year period that relationships were examined. This variable was based on the work of Ferrier (2001) where he found that in the area of competitive actions, the more diverse and intense actions that were taken, the better the firm did versus a competitor. It was expected that the correlation between firm growth and relationship volume and diversity would be represented by an upside down U shape. With low diversity, low relationship volume firms performing poorly, while moderate to high diversity, and a moderate number of relationships would perform best, and then as number of relationships exceeded some value at which a firm could no longer maintain all relationships, that performance would

degrade. The fact that I found that the correlation between relationship volume and diversity was linear, and negative could be explained by the fact that young firms must focus on specific niches in order to grow. Young firms that establish many diverse relationships might be unfocused. This finding should be explored further.

The final term selected by stepwise regression is a quadratic term representing the change in the number of relationships with large partners. Large partners were defined as partners with over \$1B of revenue. Partnerships of these types typically involve changes in behaviour at the observed firm, but little or no change in behaviour at the large partner firm. Because the variable was squared, both a decrease or increase in the number of large partners were counted equally. This was the only variable that was found by stepwise regression which has a positive correlation with the firm growth rate. It is interesting that this term emerged in the stepwise regression, whereas close partners or partner integration was not as significant. Several papers discuss the benefits of working with large partners, such as papers by Stuart, Hoang, and Hybels (1999) which found that incumbents can lend credibility to new ventures.

Of interest are the variables that failed to be found statistically significant through a stepwise regression:

Mergers and acquisitions - Bhide (2000) found that there was no significant difference in organic growth versus growth by mergers and acquisitions. My research does not conflict with Bhide (2000).

Distribution partnerships - I expected to see that young firms that created distribution networks, or business models that facilitated partners for broad distribution of a product would be associated with higher growth, but did not find support for this in my stepwise regression.

Supplier partnerships - Supplier partnerships were included by my stepwise regression, but were not statistically significant with  $p < .05$  and so were removed from my model. The coefficient that was found by the stepwise regression was negative. My expectation had been that a young firm that wanted to rapidly reach a market would call upon supplier relationships to deliver non-core technologies to a product offering, and so a firm with a high number of supplier partnerships was expected to be associated with high growth, however I did not find support for this, and in fact have weak support for the opposite.

Close partnerships - Working with close partners would allow equals or near equals, with varying experience and markets to work together to improve their performance versus their competition. This variable was not found to be statistically significant in our stepwise regression model.

Total number of relationships - Young companies have a limited amount of resources available to them. Several case studies have shown that relationships are good,

however trying to create too many relationships might exceed the capabilities of the firm. It was expected that the relationship might follow an arc in which firms benefited from a large number of relationships and then observing the gains decrease past a certain point. Including quadratic terms in the stepwise regression allowed this to be found, however it was not found to be statistically significant.

Standards and associations - Baum et al. (2000) found that firms that joined associations in the biotechnology industry were negatively correlated with performance. They posit that this might be due to the founders trying to make up for personal and firm weaknesses by joining these organizations. If a person were to consider standards and associations with a network view, in which firms assist each other, it would be expected that these types of relationships would be beneficial. This was not found to be statistically significant in the stepwise regression.

Top management teams (TMT) - A young company is defined primarily by its top management team. I thought that as new members were introduced to the TMT, that they might bring with them their past relationships. It is difficult to measure the effectiveness of an individual leader via the method I were using to collect information about relationships, and as such it was not unexpected that this variable was not found to be present in the stepwise regression model.

## **6.2 Key Findings**

The following are the three most valuable lessons learned from this research which was not known before conducting this study.

### **Increase in the number of relationships with large firm positively affects a young company's growth in revenue**

For young information technology companies, the relationship type most significantly correlated with firm growth in a positive respect, was relationships with large firms. Changes to these relationships (presumably increasing these relationships, but also establishing enough relationships that they might decrease at some point in the future) were both seen to be positively correlated with growth. Young companies have limited resources, therefore when a young company is considering various relationship opportunities (either partnering with a partner its own size, an association of firms, or with a large firm), the relationship with the large firm should be considered a priority. Researchers have found that relationships with large firms lend credibility to the young company, and helps the young company overcome the liability of newness (Gulati & Higgins, 2003).

### **Secure funding early**

For young information technology companies, a relationship with financial firms was found to be negatively correlated with growth. This is counter to the findings of Lee et al. (2001). The difference of findings can likely be explained by the fact that the mean age of firms that I examined was four years, compared to their study of firms in which

firms were examined from the moment they were created. Finding from this research suggests that firms should find funding early, and then limit their need for additional funding.

### **Use longitudinal data**

Using longitudinal information greatly improved the statistical significance of the results found by my study. Initially, I examined total numbers of relationships and types by the observed firms. Because of the way I counted relationships (evidence of a relationship with another firm in a given year was counted once), firms that established relationships and then coasted (not updating their website and issuing few or no additional press releases) had what were likely stagnant relationships counted twice (once per year). Counting changes brought dynamic firms to the forefront, and reduced the significance of the coasting firms. The model found by stepwise regression with the delta variables generated a far better  $R^2$  and adjusted  $R^2$ , and found far more statistically significant results. If a researcher has an opportunity to collect longitudinal data, they should consider changes to the values over time, rather than simply combining all of the data together.

## **6.3 Linking research results with the literature**

This research attempts to add clarity to the question asked by Gulati et al. (2009): “What types of partners are most desirable for increasing the gains from a partnering experience?”

This research finds that an increase in the number of relationships with large firm positively affects a young company's growth in revenue, and that the number of relationships with financial firms negatively affected a young company's growth in revenue. The financial relationships are contrary to the literature of Lee et al. (2001) – who found that this was possibly the only statistically significant relationship that could be correlated with Korean startup firm growth.

Baum et al. (2000) found that relationships with associations was negatively correlated with firm success in the area of patents and firm growth – and this was not found to be a statistically significant variable, either individually, or by the model developed through exploratory stepwise regression.

A key proposition of this research was based on work by Ferrier (2001), in which he finds that the number and diversity of competitive actions improves a firms' results. This research posited that this concept could be applied to strategic relationships – but was not able to find a statistically significant correlation between relationship volume times diversity and firm revenue growth rate.

## **7. Conclusions, Limitations and Suggestions for Future Research**

### **7.1 Conclusions**

The objective of this research was to use historical versions of websites to explore the correlation between relationship types and young firms subsequent growth in revenue.

My research used stepwise regression to find the most statistically significant variables that were correlated with young company growth. The independent variables explored included factors sought to represent the number and diversity of relationships established by young IT firms. I found that changes in the number of relationships with large firms were positively correlated with growth. Changes in the number of relationships with financial firms were negatively correlated with firm growth. This is contrary to the literature. I also found that large numbers of diverse relationships were negatively correlated with firm growth.

My study is based on research in areas of:

- relationships, networks and ecosystems
- factors affecting new venture growth

I summarized the literature in these two streams, and presented a table outlining the commonalities between the new venture growth stream and the network stream.

I developed and followed a methodology to examine and categorize relationship information for a firm using historical versions of the firms' website.

## **7.2. Limitations**

This research is limited by the following issues:

There are no databases of young Canadian IT firms. The Branham 300 lists were used, however these lists contain only a small subset of the complete young Canadian IT firm population.

There is a limited understanding or research in the area of young firms. The majority of research studies either mature firms, or startups.

Revenue data came from Branham surveys. Their source of revenue data is either from estimates that they make, or come from the observed companies (private or public). It is assumed that this data is accurate, but this cannot be guaranteed.

Relationships presented in public are only a subset of the actual relationships that a firm might use and benefit from. This is understood, but it is hoped that by gathering the publicly viewable relationships of firms, I might gain an understanding of the observed firm, and that I can compare this information with similar information made available from other observed firms.

The scope of the study is Canadian IT startups founded between 1993 and 2005. The average age of the firm for which I have the first revenue point is four years old. It would be interesting to gather data for a larger set of companies, including companies in other countries.

More information could be gained by surveying the firms to get a more complete understanding of the relationships that they maintain.

### **7.3. Future Research**

The model found via stepwise regression should be tested with another set of young firms, possibly a set of firms based in the US.

Case studies that examined financial relationships, large partner relationships, and relationships as a whole, would give a more complete picture of how these relationships change over time and provide a better understanding of how these changes are impacting firm growth. It is difficult to impossible to determine the significance of an individual relationship with the information that was gathered for this research.

It would also be interesting to examine the correlation between young firms relationships and other performance metrics other than growth in revenue in their first few years.

## References

Baghai, M., Coley, S., & White, D. 1999. **The alchemy of growth: Practical insights for building the enduring enterprise.** Reading, MA: Perseus Books.

Bantel, K.A., & Jackson, S.E. 1989. Top management and innovations in banking: does the composition of the top team make a difference? **Strategic Management Journal**, 10(S1): 107-124.

Barringer, B.R., Jones, F.F., & Neubaum, D.O. 2005. A quantitative content analysis of the characteristics of rapid-growth firms and their founders. **Journal of Business Venturing**, 20(5): 663-687.

Baum, J., Calabrese, T., & Silverman, B. 2000. Don't go it alone: Alliance network composition and startups' performance in Canadian biotechnology. **Strategic Management Journal**, 21(2): 267-294.

Bhide, A. 2000. **The origin and evolution of new businesses.** New York: Oxford University Press.

Branham Group Inc., 2010. Branham 300. <<http://www.branham300.com/>> viewed 27 June, 2010.

Chrisman, James J., Bauerschmidt, Alan, & Hofer, Charles W. 1998. The determinants of new venture performance: An extended model. **Entrepreneurship: Theory & Practice**, 23(1): 5-29.

Colombo, M.G., & Grilli, L. 2005. Founders' human capital and the growth of new technology-based firms: A competence-based view. **Research Policy**, 34(6): 795-816.

Coviello, N., & Munro, H. 1997. Network relationships and the internationalisation process of small software firms. **International Business Review**, 6(4): 361.

Feeser, Henry R., & Willard, Gary E. 1990. Founding strategy and performance: A comparison of high and low growth high tech firms. **Strategic Management Journal**, 11(2): 87-98.

Ferrier, Walter. 2001. Navigating the competitive landscape: The drivers and consequences of competitive aggressiveness. **Academy of Management Journal**, 44(4): 858-877.

Florin, J., Lubatkin, M., & Schulze, W. 2003. A social capital model of high-growth ventures. **The Academy of Management Journal**, 46(3): 374-384.

Gans, J.S., & Stern, S. 2003. The Product Market and the Market for "Ideas": Commercialization Strategies for Technology Entrepreneurs. **Research Policy**, 32(2): 333-350.

Gould, D.M., & Gruben, W.C. 1996. The role of intellectual property rights in economic growth. **Journal of Development Economics**, 48(2): 323-350.

Gulati, R. 1999. Network location and learning: the influence of network resources and firm capabilities on alliance formation. **Strategic Management Journal**, 20(5): 397-420.

Gulati, R., & Higgins, M.C. 2003. Which ties matter when? The contingent effects of interorganizational partnerships on IPO success. **Strategic Management Journal**, 24(2): 127-144.

Gulati, R., Nohria, N., & Zaheer, A. 2006. Strategic Networks. **Strategic Management Journal**, 21(3): 203-215.

Gulati, R., Lavie, D., & Singh, H. 2009. The nature of partnering experience and the gains from alliances. **Strategic Management Journal**, 30(11): 1213-1233.

Hagedoorn, J. 1990. Organizational modes of inter-firm co-operation and technology transfer. **Technovation**, 10(1): 17-30.

Hagedoorn, J. 1993. Understanding the rationale of strategic technology partnering: interorganizational modes of cooperation and sectoral differences. **Strategic Management Journal**, 14(5): 371-385.

Hays, W.L. 1994. **Statistics, Fifth edition**. Belmont, CA: Wadsworth.

Howell, B.A. 2006. Proving web history: How to use the Internet archive. **Journal of Internet Law**, 9(8): 3-9.

Hughes, R. 2011. NASDAQ-100 (NDX) Report.

<<https://indexes.nasdaqomx.com/pdf/PDFReport.ashx?IndexSymbol=NDX>> viewed 9 March, 2011.

Internet Archive. n.d. <<http://www.archive.org/>> viewed June 2010 – February 2011.

Kleindorfer, P.R., Wind, Y., & Gunther, R.E. 2009. **The Network Challenge: Strategy, Profit, and Risk in an Interlinked World**. Upper Saddle River, NJ: Wharton School Publishing.

Kogut, B. 2000. The network as knowledge: generative rules and the emergence of structure. **Strategic Management Journal**, 21(3): 405-425.

Larson, A. 1991. Partner networks: Leveraging external ties to improve entrepreneurial performance. **Journal of Business Venturing**, 6(3): 173.

Lechner, C., & Dowling, M. 2003. Firm networks: External relationships as sources for the growth and competitiveness of entrepreneurial firms. **Entrepreneurship & Regional Development**, 15(1): 1.

Lee, C., Lee, K., & Pennings, J. 2001. Internal capabilities, external networks, and performance: a study on technology-based ventures. **Strategic Management Journal**, 22(6): 615-640.

Lindsey, L. 2008. Blurring firm boundaries: The role of venture capital in strategic alliances. **The Journal of Finance**, 63(3): 1137-1168.

Markman, Gideon D., & Gartner, William B. 2002. The effects of hyper growth on firm profitability. **Journal of Private Equity**, 5(4): 58.

McClelland, G.H., & Judd C.M. 1993. Statistical difficulties of detecting interactions and moderator effects. **Psychological bulletin**, 114(2): 376.

Moore, James F. 2006. Business ecosystems and the view from the firm. **Antitrust Bulletin**, 51(1): 31-75.

Olson, Philip D., & Bokor, Donald W. 1995. Strategy process-content interaction: Effects on growth performance in small, startup firms. **Journal of Small Business Management**, 33(1): 34-44.

Rothaermel, F.T. 2001. Incumbent's advantage through exploiting complementary assets via interfirm cooperation. **Strategic Management Journal**, 22(6): 687-699.

Sandberg, W.R., & Hofer, C.W. 1987. Improving new venture performance: The role of strategy, industry structure, and the entrepreneur. **Journal of Business Venturing**, 2(1): 5-28.

Stinchcombe, A.L. 2000. **Social structure and organizations**. Bingley, UK: Emerald Group Publishing Limited.

Street, C.T., & Cameron, A.F. 2007. External Relationships and the Small Business: A Review of Small Business Alliance and Network Research. **Journal of Small Business Management**, 45(2): 239-266.

Stuart, T.E., Hoang, H., & Hybels, R.C. 1999. Interorganizational endorsements and the performance of entrepreneurial ventures. **Administrative Science Quarterly**, 44(2): 315-349.

Wernerfelt, B. 1984. A Resource-Based View of the Firm. **Strategic Management Journal**, 5(2): 171-180.

Veronin, M.A. 2002. Where are they now? A case study of health-related Web site attrition. **Journal of Medical Internet Research**, 4(2).

Yli-Renko, H., Autio, E., & Sapienza, H.J. 2001. Social capital, knowledge acquisition, and knowledge exploitation in young technology-based firms. **Strategic Management Journal**, 22(6): 587-613.

## **Appendix A: Relationship Categorization Methodology**

In the two year period prior to revenue data being found on the list, all historical press releases were examined, as well as snapshots of the firms' website (using archive.org). This information was examined to determine what, if any, relationships existed in a particular period.

The relationships were categorized based on a categorization scheme that was developed based on existing research and information gathered from examining the first ten firms.

The following sections describe the criteria for the relationship, and list sample headlines and text from actual press releases found. Headlines are in italics. Key phrases that indicate the relationship are underlined. Body text is provided if the headline was not clear.

The following relationship categories were measured using the following criteria:

### **Customer Relationship**

A customer relationship involved the observed firm and a customer of the firm. Sample headlines in which the relationship was clear:

*Axia to create training modules for new monitoring systems on Aurora maritime patrol aircraft*

*Deal closes on North America's largest ag-exclusive ad agency*

*Axia and Scottish University for Industry sign three-year enterprise contract worth \$1.2 million*

*Fidus contributes to newest MOSAID tester*

Sample headlines in which the headline was unclear, with body of article which provided clarity:

*Fidus partners with Multinational Electronics Company*

“Fidus Systems this week completed a large contract...By engaging Fidus, our customer brings”

*non-linear creations takes the next steps to global domination* - (Press release contains information about three customers and one new top management team member):

“non-linear creations has already tasted victory in its Toronto campaign, signing work with E\*Trade Canada, McManus Elliott and Accutel.”

## **Top Management Team Relationship**

A top management team relationship was measured for each new team member that joined the organization, either as an executive, manager, or director. Only incoming team members were counted. Outgoing team members were not counted. Sample headlines include:

*Fidus names 3 new managers following contract wins*

*Ottawa's Fidus Opens Silicon Valley Office*

*"...Fidus has engaged a full-time sales representative in San Jose..."*

*Seasoned IT executive joins Axia leadership team*

*Award-winning creative director joins Parallel*

*Senior leadership roles filled in Netricom and in Axia sales and marketing team.*

## **Financial Relationships**

Financial relationships were counted for each financial organization that a firm worked with for financing, in which the financing firm either provided direction or equity. A relationship was also counted for each major financial market transaction. The following are some sample headlines:

*Equity Square AG Becomes a Major Shareholder of Syscan*

*Syscan announces move to CDNX*

*Syscan enters into agency agreement for special warrant financing (Brant Securities)*

*Syscan enters into private placements (AXYN Corp)*

## **Merger/Acquisition Relationships**

Merger and acquisition relationships were counted once for each firm that the observed firm either acquired or merged with. The following are sample headlines:

*Axia's agricultural marketing groups and AdFarm to form marketing powerhouse*

*Axia acquires LifeSkills International Ltd. (UK) and Citizen Connect Ltd.*

*Axia purchases Fieldstone Marketing and Communications*

## **Associations/Standards bodies/Meeting a standard**

If a firm announced that a product met a particular standard, or if a firm joined an association or standards body, all of these indicated that a firm was working with peers on a common platform. An association relationship was also determined if the partner's name included "association" (CIAP, CISPA, FIRPA, SIIA), or was a regional association (Chamber of commerce, OCRI). Press releases that fell into this category:

*RuggedSwitch Meets NEMA TS2*

*RuggedSwitch Offers IEEE 1613*

*Blast Radius enters XML authoring market as XML adoption takes off*

*IT Interactive Services Inc. Becomes a Member of LISTnet*

## **Large Partner Relationship**

To be considered a large partner relationship, the observed firm must have had a relationship with another firm with the following three criteria:

1. Observed firm identified a relationship with a firm which had over \$1B revenue.
2. The relationship was not a customer relationship.
3. The relationship was not a supplier relationship - in which the observed firm is a value added retailer or system integrator reselling Oracle or Microsoft products for example.

Sample headlines include:

*Axia and Bombardier Aerospace Defence Services sign strategic teaming agreement (relationship with Bombardier to sell product to DND)*

*Axia nets national award for Cisco - Microsoft partnership on Supernet*

*Axia partners with Microsoft Canada to Build House of Tools E-commerce site*

*Platespin accepted into IBM Server Tools Network*

*Platespin Supplies Enterprise-Class Infrastructure Management Software in Support of Compaq's Adaptive Infrastructure Vision*

## **Close Partner Relationship**

A close partner relation was a partnership between two firms that were more equal in size. The observed firm had to be partnering with a firm that did not meet the large partner relationship. It had to meet the following three criteria:

1. Relationship is identified as a *partnership*.
2. Relationship is not a Larger Partner relationship.
3. Relationship is not a Customer relationship.

The following are sample close partner relationship headlines:

*BreconRidge and AFORE Solutions Announce Strategic Partnership*

*Scene7 and Blast Radius team up to provide rich media Internet solutions*

*Blast Radius joins ATG Partner Program*

*Creaform announces a mid-year bundled promotion for Rapidform and the Handyscan 3D scanner*

*Creaform...signs an OEM agreement with Z Corporation to provide the Handyscan technology under the Z Scanner 700 trademark...*

## **Integration Relationship**

An integration relationship was one that met the following two criteria:

1. The press release indicated that a product or service was being integrated with another firms' product or service.
2. The other firm was not a large partner.

*Creaform launches scanning module for CATIA v5*

*Cogsdale develops interface to ETIs CableBridge Triad*

## Distributor Relationship

Distributors aid the observed firms by helping to distribute their products to a specific market -- either a geographic market or a vertical market. Firms had a distributor relationship if the partner firm was explicitly listed as a *distributor* or *reseller* of the observed firms product.

## Supplier Relationship

A supplier relationship is one in which the observed firm is supplied with equipment or technology by another firm. Using a supplier would allow a firm to focus on a core offering, which would further allow the observed firm to reach a market more quickly by using existing technology in an innovative way to meet a new market need. A supplier relationship had to meet the one of these two criteria:

1. Observed firm is a value-added reseller/system integrator OR
2. The observed firm incorporates the other firms technology into its product.

Examples included the observed firm, Pareto, including technology from Digital River (which makes digital rights management software). Other sample headlines:

... announced four Canadian reseller agreements with ... Stoneworks Technology  
OmniRIM to participate in GBS Reseller Partner Program to Provide Customized  
Label Solutions

## Zebra Technologies Announces Strategic Agreement with OmniRIM Solutions

“...Zebra will integrate its industry-leading bar code technology...”

# Appendix B: Sample Detailed Spreadsheet for a Single Firm (Cryptologic)

	Finance	Customer	Distributor	Supplier	Standard	Small Partner	Large Partner	Integration	Merge	TMT
<b>TOTALS</b>	2	1	0	0	0	2	0	0	1	5
<b>Y 1</b>	1	1	0	0	0	0	0	0	1	3
<b>Y 2</b>	1	0	0	0	0	0	0	0	0	2
<b>Delta</b>	0	1	0	0	0	0	0	0	1	1
<b>1998</b>										
CRYPTOLOGIC REALIZES PROFIT ON SALE OF INTERNET MAGAZINE (HipInteractive)										
October 12, 1999										
Cryptologic Inc. announces agreement with Wi Fam Hill										
August 26, 1999										
Cryptologic files Nasdaq listing application and Registration Statement on Form 40-F										
August 20, 1999										
Cryptologic Inc. reports of Starnet search warrants										
July 22, 1999										
Cryptologic announces second quarter results 54% increase in revenues, 48% increase in income										
May 11, 1999										
Cryptologic issues normal course issuer bid										
April 22, 1999										
Cryptologic announces 34% revenue growth and 35% earnings growth in first quarter results										
April 15, 1999										
Cryptologic announces Nasdaq application										
March 25, 1999										
Cryptologic announces the launch of two websites										
March 23, 1999										
Cryptologic announces several changes to executive team										
March 8, 1999										
Cryptologic announces addition to board of directors										
February 17, 1999										
Cryptologic announces 84% revenue growth & 60% earnings growth for 1998 (174% after unusual items)										
February 10, 1999										
Cryptologic announces fourth quarter revenue growth										
February 9, 1999										
Cryptologic Inc. announces financial information to be reported in U.S. dollars										
January 6, 1999										
Cryptologic Inc. announces acquisition of Gamesmania Internet Magazine										
WEB										
<b>1998</b>										
December 21, 1998										
Cryptologic Inc. makes strategic investment										
December 5, 1998										
Cryptologic announces full recovery of a \$3.5 million write-down										
October 27, 1998										
Cryptologic announces third quarter results										
October 21, 1998										
Cryptologic reports failure of proposed U.S. Internet gaming legislation										
October 6, 1998										
Cryptologic announces release of new gaming software										
September 29, 1998										
Cryptologic announces the commencement of TSE trading										
September 11, 1998										
Cryptologic announces listing approval from Toronto Stock Exchange										
August 27, 1998										
Cryptologic reports on financial matters										
July 24, 1998										
Cryptologic reports on proposed legislation										
July 22, 1998										
Cryptologic announces second quarter results										
July 8, 1998										
Cryptologic announces two new additions to management team										
April 27, 1998										
Cryptologic announces first quarter results growth in revenue growth in earnings										
March 5, 1998										
Cryptologic announces strong financial results in its first full year of operations										
February 3, 1998										
Cryptologic shareholders approve Class A Warrant amendment and stock split										

# Appendix C: Summary Tables and Variable Values for Firms (n=80)

FirstRevYear	Founded	OBS T	OBS T (OBS)	OBS	Age	Annual Growth	ADJ Annual Growth	Industry	Region	Finance	Customer	Distributor / Supplier	Standard	Small Partner	Large Partner	Integrate	Merger	TMT	TOTAL DIVERSITY	VTIMESP			
2006	RuggedCom	2001	47979	10940	2	1.73	1.67	Hardware	GTA	0	26	33	0	12	0	0	0	3	71	0.85	48.08		
2000	Aria NetMedia Corporation	1996	95870	72606	2	1.15	1.7*	Service	(Calgary)	1	7	0	0	0	9	3	0	5	1	26	0.75	19.62	
2007	GuestLogix	2002	18781	6430	2	1.86	2.29	Software	GTA	0	2	0	0	4	2	0	0	0	0	8	0.63	5.00	
2004	BreconRidge	2001	283901	176882	2	3	.27	1.19	Hardware	Ottawa	1	50	0	60	0	0	0	1	1	113	0.2	59.99	
2007	Creafarm	2002	24000	17500	2	1.17	1.44	Hardware	Quebec	0	2	0	0	0	4	0	0	0	0	20	0.46	0.20	
2001	Cogsdale Corp	1997	6110	745	2	4	2.88	4.65	Software	PEI	0	0	0	0	0	3	0	0	0	3	0.00	0.00	
2001	Alacng Inc	1999	2100	1200	2	2	1.32	2.1	Software	Ottawa	0	0	0	0	0	3	1	0	0	4	0.38	1.50	
2003	Texada Software	2000	3386	3486	2	3	0.98	0.79	Software	Queph	1	1	2	2	2	1	0	1	0	1*	0.78	10.88	
2003	Sofium Capital Inc	1999	6300	872	2	4	2.82	2.11	XSP	Ottawa	4	6	0	0	0	1	0	0	0	18	0.72	13.00	
2006	Gon eKnows.com	1999	8400	975	2	8	1.19	1.09	XSP	NS	0	0	0	0	2	0	0	0	0	2	0.00	0.00	
2008	Manner	2003	10782	4500	2	3	1.55	1.49	Service	NB	0	1	0	0	0	4	0	0	0	1	6	0.50	3.00
2003	Blast Radius Inc	1997	43000	25000	2	6	1.31	1.05	Service	Vancouver	0	14	0	5	0	2	12	0	8	38	0.73	28.62	
2002	Navantis	1988	11000	10200	2	4	1.04	1.06	Service	GTA	0	7	0	1	0	2	3	0	0	13	0.63	8.15	
2002	Spyre Solutions	2000	7500	1320	2	2	*.32	1.34	Service	GTA	0	0	0	0	0	2	0	0	2	4	0.40	2.00	
2007	ParetoLogic	2004	42600	16000	2	3	1.63	2.01	Software	Montr	0	3	18	5	6	5	0	0	4	4*	0.63	26.00	
2000	Microcell Telecommunications Inc.	1998	500000	449154	2	1	1.15	1.74	Telecom	Montreal	1	1	7	4	0	4	0	0	1	18	0.57	10.22	
2002	Elloqua	2000	4800	1656	2	2	1.70	1.73	Software	GTA	0	2	12	2	0	2	6	0	0	24	0.58	14.00	
2007	uptime software	2002	7100	4350	2	3	1.28	1.57	Software	GTA	0	0	0	0	0	17	0	0	0	17	0.00	0.00	
2003	Mendex Software	1999	5185	261	2	4	4.46	3.58	XSP	Vancouver	1	0	2	2	1	3	2	0	3	14	0.78	10.88	
2006	4Point	2003	16150	12280	2	3	*.15	1.10	Service	Ottawa	0	32	0	0	0	2	0	0	0	34	0.11	3.76	
2001	Trisotech	1998	2894	3378	2	5	0.93	1.60	Service	Montreal	0	60	0	0	0	0	0	0	0	60	0.00	0.00	
2007	HighVal Systems	2003	21000	12000	2	4	*.32	1.63	Service	GTA	0	1	0	11	0	0	9	0	0	2	0.51	11.33	
2007	MetroBridge Networks	2004	4251	3878	2	3	1.06	1.32	Telecom	Vancouver	6	0	0	11	1	0	0	0	1	24	0.68	18.33	
2004	Stoneworks Technologies	2001	17882	11500	2	3	1.25	1.16	Service	Ottawa	0	0	0	14	0	2	2	0	0	18	0.37	6.67	
2006	TeraGo Networks	2001	31869	19917	2	3	1.25	1.20	Telecom	GTA	10	96	1	0	33	0	0	1	0	141*	0.48	67.19	
2007	TechSpCom	2003	14548	8200	2	4	1.33	1.64	Service	Montreal	0	4	0	4	7	0	2	0	0	1	18	0.65	11.67
2007	Immersive Media	2004	6144	3306	2	3	*.36	1.68	Hardware	Calgary	3	1	2	0	1	5	3	0	1	0	16	0.78	12.50
2001	TrekLogic Technologies Inc	1997	15500	2771	2	4	2.37	3.84	Service	Ottawa	0	0	0	0	0	2	0	0	0	2	0.00	0.00	
2004	OmnRIM Solutions	2000	4103	2512	2	4	1.28	1.19	Software	Vancouver	0	8	0	17	4	5	0	0	0	1	35	0.68	23.71
2002	VerigoMedia Inc	1996	4000	3012	2	6	1.15	1.17	Software	Montreal	1	6	0	0	0	8	3	1	0	2	21	0.70	14.76
2006	Visual Defence	2000	16000	19863	2	8	0.90	0.96	Hardware	GTA	3	11	0	14	7	19	6	0	4	1	82	0.80	49.51
2004	Isave Technology Consulting (ISTCL)	2000	5800	5000	2	1	*.06	0.80	Service	GTA	0	16	0	0	0	1	0	0	0	17	0.11	1.88	
2002	Cero Systems Inc.	1997	3987	2044	2	3	1.40	1.42	Service	GTA	0	1	0	15	0	1	0	0	0	17	0.21	3.66	
2003	Combat Networks	2001	6500	2834	2	2	1.51	1.22	Service	Ottawa	0	0	0	1	0	0	0	0	0	4	0.00	0.00	
2001	Maximizer Software	1996	15150	16800	2	6	0.97	1.57	Software	Vancouver	4	7	0	0	0	2	1	0	1	6	2	0.76	15.90
2004	WebTech Wireless Inc	1999	16344	9584	2	5	1.58	1.47	Hardware	Vancouver	1	7	14	8	0	2	0	0	0	32	0.47	15.19	
2000	Whitcap Canada Inc.	1997	1450	1800	2	3	0.90	1.36	Service	GTA	0	2	2	4	0	0	1	0	0	1	10	0.8	5.80
2004	PlateSpin Ltd.	2003	16854	1440	2	1	.32	3.10	Software	GTA	12	0	0	0	0	0	0	0	0	2	0.49	10.29	
2001	Boomerang Tracking Inc	1995	20703	12029	2	6	*.31	2.14	Service	Montreal	1	4	2	0	0	1	2	0	0	2	12	0.79	9.50
2001	Clarity Systems Ltd	1996	12400	9198	2	3	*.16	1.88	Software	Toronto	0	6	0	4	0	0	4	0	0	14	0.65	9.14	

	CHAIN	NET	CLOSE	DFinance	DCust	DDist	DSupplier	DStandard	DSmall Partner	DLarge Partner	DIntegr	DMerge	DTMT	DTOTAL	DCHAIN	DNET	DCLOSE
RuggedCom	33	12	0	0	26	33	0	0	0	0	0	0	3	-4	33	0	0
Axia NetMedia Corporation	0	3	9	1	1	0	0	0	1	1	0	3	1	2	0	1	1
QuestLogic	0	2	0	0	0	0	0	0	2	0	0	0	0	2	0	0	2
BreconRidge	60	0	0	1	50	0	0	0	0	0	0	1	1	53	0	0	0
Craform	14	0	4	0	2	14	0	0	2	0	0	0	0	18	14	0	2
Cogsdale Corp	0	3	0	0	0	0	0	0	0	3	0	0	0	3	0	3	0
Alacris Inc	0	1	3	0	0	0	0	0	3	1	0	0	0	4	0	1	3
Texada Software	4	3	4	1	1	2	2	2	2	0	1	0	1	-4	-4	1	0
Sofium Capital Inc.	0	0	2	2	0	0	0	0	1	0	0	1	2	0	0	0	1
Gen eKnows.com	0	0	2	0	0	0	0	0	2	0	0	0	0	2	0	0	2
Manner	0	0	2	0	1	0	0	0	0	0	0	0	1	2	0	0	0
Blast Radius Inc	5	2	2	0	0	0	3	0	0	0	0	0	4	7	9	0	0
Navantis	1	3	2	0	-5	0	1	0	2	1	0	0	0	9	1	1	2
Spyre Solutions	0	2	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0
ParetoLogic	23	6	5	0	1	18	5	4	1	0	0	0	0	29	23	4	-1
Microcell	11	0	4	1	1	3	2	0	4	0	0	0	1	2	1	0	4
Telecommunications Inc																	
Eloqua	14	6	2	0	2	0	2	0	2	0	0	0	0	6	2	0	2
uptime software	0	17	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0
Mendax Software	0	3	3	1	0	0	2	1	1	2	0	0	3	10	2	3	1
4Point	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trisotech	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HighVail Systems	11	9	0	0	1	0	1	0	0	1	0	0	0	1	1	1	0
MetroBridge Networks	11	1	0	0	-3	0	11	1	0	0	0	0	1	8	11	1	0
Stoneworks Technologies	14	2	2	0	0	0	14	0	2	2	0	0	0	18	14	2	2
TeraGo Networks	1	33	0	0	-1	1	0	1	0	0	0	1	0	5	1	1	0
TechSolCom	4	9	0	0	-4	0	0	1	0	0	0	0	1	-4	0	1	0
Immersive Media	2	4	5	1	1	2	0	1	-3	1	0	1	0	0	2	0	-3
TrekLogic Technologies Inc	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OmnIRIM Solutions	17	4	5	0	8	0	1	0	5	0	0	0	1	15	1	0	5
VertigoXmedia Inc	3	3	0	1	2	0	0	0	0	1	1	0	0	1	0	1	-1
Visual Defence	14	13	16	1	3	0	14	1	2	0	0	4	1	-8	14	1	2
Iserec Technology Consulting (ISTCL)	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0
Qpro Systems Inc.	15	0	1	0	1	0	1	0	1	0	0	0	0	3	1	0	1
Combat Networks	1	0	0	0	0	0	1	0	0	0	0	0	0	-1	1	0	0
Maximizer Software	0	1	2	0	5	0	0	0	2	1	0	1	2	11	0	1	2
WebTech Wireless Inc.	22	0	2	1	5	0	2	0	2	0	0	0	0	10	2	0	2
Whitcap Canada Inc	0	1	0	0	2	2	4	0	0	1	0	0	1	10	6	1	0
PlateSpin Ltd.	0	9	0	2	0	0	0	0	0	9	0	0	0	11	0	-9	0
Boomerang Tracking Inc.	2	2	1	1	0	-2	0	0	1	2	0	0	2	2	2	2	1
Clarity Systems Ltd	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

FirstRevYear		Founded	OBS T	OBS T (OBS)	OBS	Age	Annual Growth	ADJ Annual Growth	Industry	Region	Finance	Customer	Distributor	Supplier	Standard	Small Partner	Large Partner	Integrate	Merger	TMT	TOTAL DIVERSITY	VTIMES		
2002	CTSolutions	1995	3431	2800	2	7	1.11	1.13	VAR	Kingston	0	0	0	32	0	6	0	0	0	0	38	0.27	10.11	
2008	Fidus	2001	8800	5400	2	5	1.28	1.23	Service	O-tawa	0	15	0	2	3	1	3	0	0	0	30	0.68	19.83	
2007	Modworx	2004	3043	2862	2	3	1.17	1.45	Software	Toronto	11	85	0	0	0	2	0	0	1	1	90	0.11	9.64	
2000	Nonlinear	1995	1500	3400	2	5	0.66	1.01	Service	Ottawa	0	8	0	0	0	0	0	0	0	0	1	0	0.20	1.78
2000	T4G	1995	12500	10412	2	5	1.10	1.68	Service	Toronto	0	24	0	30	0	0	2	0	0	0	58	0.53	29.57	
2002	Sycon	1998	2026	3798	2	6	0.73	0.74	Hardware	Quebec	4	5	4	6	0	3	1	0	0	10	34	0.78	26.59	
2000	Sonus	1995	16400	14500	2	6	1.06	1.6	Service	O-tawa	0	3	0	0	1	5	10	0	0	4	23	0.68	5.67	
2002	Citypress	1999	3120	561	2	4	2.32	2.36	XSP	BC	3	13	1	11	0	2	0	0	0	3	33	0.69	22.65	
2000	Ecruiter/Workstream	1998	23159	1752	2	4	3.64	5.52	Software	Ottawa	1	31	0	0	1	3	0	0	1	1	38	0.33	2.37	
2000	SXG	1993	30983	26666	2	7	1.21	1.84	Software	Toronto	0	9	0	0	1	1	0	0	0	11	22	0.58	12.73	
2001	Whitehill	1997	10385	7900	2	4	1.15	1.88	Software	NB	0	4	1	0	10	11	1	5	0	0	33	0.61	20.66	
2002	Infoterra	1998	1500	500	2	4	1.73	1.78	Software	O-tawa	0	3	1	1	0	0	3	0	0	0	8	0.68	5.25	
2000	Medagnt	1996	27300	12000	2	4	1.51	2.20	Software	Quebec	3	0	0	0	0	0	0	0	0	0	3	0.00	0.00	
2002	Cinnabar	1996	11000	4100	2	6	1.84	1.67	Service	Ottawa	0	0	0	0	1	1	0	0	0	5	7	0.45	3.14	
2006	Dragonwave	2000	40404	19421	2	6	1.44	1.39	Hardware	O-tawa	0	9	3	0	0	1	0	0	0	0	13	0.46	6.00	
2001	Necho	1998	7342	5100	2	5	1.20	1.85	Software	GTA	0	13	5	4	0	0	19	0	0	2	44	0.68	29.14	
2005	Nightingale	2002	14077	1884	2	3	2.73	2.52	Software	GTA	0	1	0	2	0	0	2	0	1	0	6	0.72	4.33	
2001	Wyedom	1990	4206	8478	2	2	0.71	1.15	Software	GTA	2	3	0	2	12	2	7	2	2	3	35	0.67	23.37	
2003	Verbx	1999	3142	4000	2	4	0.89	0.71	Software	BC	3	0	1	0	0	1	0	1	0	1	7	0.69	4.68	
2000	InfotechCanada	1998	3000	1000	2	4	1.73	2.63	Service	NF	0	0	0	0	0	3	3	0	0	0	6	0.50	3.00	
2002	RedKnee	1999	33200	20000	2	3	1.29	1.31	Software	GTA	0	2	0	1	4	2	6	0	0	0	15	0.62	7.73	
2000	Cryptologic	1995	64008	66887	2	6	0.98	1.48	Software	GTA	2	1	0	0	0	2	0	0	1	5	11	0.71	7.62	
2001	Educoms	1994	8000	2500	2	7	1.00	3.08	Software	Ottawa	0	0	1	0	0	2	2	0	0	0	5	0.64	3.20	
2005	Talentech	1999	8670	4800	2	6	1.34	1.24	Software	BC	0	3	5	0	1	7	2	3	0	1	22	0.70	15.45	
2007	Metrobridge	2004	4201	3678	2	3	1.08	1.32	Telecom	BC	2	3	0	0	1	0	1	0	1	0	2	0	0.74	8.67
2005	Nstair	2000	16149	9104	2	5	1.33	1.23	Software	Quebec	1	9	1	2	0	7	2	2	3	2	29	0.78	22.48	
2000	Burntsand	1995	58000	75254	2	5	0.88	1.33	Service	GTA	5	20	0	29	0	0	3	0	4	8	69	0.72	49.36	
2000	Cyberplex	1994	8410	50000	2	6	0.41	0.82	Service	GTA	3	10	0	0	0	3	1	0	1	1	19	0.68	12.63	
2007	Precisionerp	2005	5630	3307	2	2	1.30	1.61	Service	Ottawa	0	0	0	0	0	0	8	0	0	0	8	0.00	0.00	
2006	Mantagroup	2003	6250	2221	2	3	1.68	1.62	Service	GTA	0	1	2	2	2	2	0	0	0	1	12	0.63	7.50	
2006	Sandvine	2001	51034	29802	2	5	1.31	1.26	Hardware	KW	1	18	18	7	0	0	0	2	0	4	50	0.61	30.60	
2002	Govern Software	1997	2700	2400	2	5	1.06	1.08	Software	Quebec	0	9	16	0	0	1	8	1	0	0	36	0.67	23.43	
2003	CriticalControl	1997	19039	2500	2	6	2.76	2.22	Software	Quebec	6	1	0	1	0	0	2	0	0	6	22	0.76	16.62	
2001	AGYI	1998	41000	5870	2	5	2.62	4.26	Service	Montreal	1	0	0	0	0	0	1	0	0	0	2	0.50	1.00	
2004	Ivedha	2001	5550	1846	2	3	1.69	1.38	Service	GTA	0	0	0	0	0	2	0	0	0	0	2	0.00	0.00	
2001	Wellpoint	1997	3900	2824	2	4	1.16	1.91	Software	Calgary	1	0	0	0	0	1	0	0	0	0	2	0.50	1.00	
2004	Dext	2001	8010	1757	4	3	1.46	1.37	Other	GTA	0	0	0	1	1	0	3	0	0	0	5	0.32	1.60	
2007	Flexity	2004	96000	40000	2	3	1.55	1.91	Service	GTA	0	0	0	0	8	0	7	0	0	0	15	0.00	0.00	
2002	AurIQ	1997	20000	5897	2	5	1.34	1.68	XSP	GTA	1	3	1	1	0	0	6	0	2	0	14	0.72	10.14	
2003	Camilon	2000	3000	421	2	3	2.67	2.49	Software	GTA	3	0	0	0	1	0	0	0	0	3	7	0.61	4.28	

	CHAIN	NET	CLOSE	DFinance	DCust	DDest	DSupplier	DStandard	DSmall Partner	DLarge Partner	DIntegr	DMerge	DYMT	DTOTAL	DCHAIN	DNET	DCLOSE
OTSolutions	32	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fidus	2	6	1	0	7	0	2	3	1	1	0	0	0	2	2	4	1
Medworx	0	0	2	1	7	0	0	0	0	0	0	1	1	8	0	0	0
Nonlinear	0	0	0	0	8	0	0	0	0	0	0	0	1	9	0	0	0
T4G	70	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Syscan	10	1	3	2	1	2	-4	0	1	1	0	1	2	-6	-6	1	1
Sinus	0	1	5	0	1	0	0	1	1	0	0	0	0	1	0	1	1
Cityxpress	12	0	2	1	13	1	1	0	2	0	0	0	1	13	2	0	2
Ecruter/Workstream	0	1	3	1	11	0	0	1	3	0	0	1	1	16	0	1	3
SXC	0	1	1	0	7	0	0	1	1	0	0	0	7	16	3	1	1
Whitehill	1	11	17	0	4	1	0	0	7	1	6	0	17	1	1	1	13
Infoterra	2	3	0	0	3	1	1	0	0	3	0	0	0	8	2	3	0
Mediagrt	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
Cinnabar	0	1	1	0	0	0	0	1	1	0	0	0	3	3	0	1	1
Dragonwave	3	0	1	0	3	3	0	0	1	0	0	0	0	7	3	0	1
Necho	9	20	0	0	1	3	0	1	0	1	0	0	2	2	3	2	0
Nightingale	2	2	0	0	1	0	2	0	0	2	0	1	0	4	2	2	0
Wisdom	2	19	4	0	9	0	0	8	2	1	2	2	3	21	0	9	4
Verbx	1	0	2	3	0	1	0	0	1	0	1	0	1	7	1	0	2
InfotechCanada	0	3	3	0	0	0	0	0	3	1	0	0	0	4	0	1	3
RedKnee	1	10	2	0	2	0	1	4	2	2	0	0	0	11	1	6	2
Cryptologic	0	0	2	0	1	0	0	0	0	0	0	1	1	3	0	0	0
Educomts	1	2	2	0	0	1	0	0	2	0	0	0	0	3	1	0	2
Talentech	5	9	10	0	3	5	0	1	1	0	1	0	1	4	5	1	0
Metrobridge	0	2	0	0	1	0	0	1	0	1	0	0	2	3	0	0	0
Nstein	3	2	9	1	1	1	0	0	5	2	2	3	0	9	1	2	3
Burntsand	29	3	0	1	4	0	1	0	0	3	0	2	4	13	1	3	0
Cyberplex	0	1	3	3	0	0	0	0	1	1	0	1	1	5	0	1	1
Precisionerp	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mantagroup	4	6	0	0	1	0	0	2	0	0	0	0	1	2	0	2	0
Sandvine	25	0	2	1	2	-2	1	0	0	0	2	0	2	2	1	0	2
Govern Software	15	8	2	0	9	0	0	0	1	2	1	0	0	13	0	2	2
CriticalControl	1	2	0	2	1	0	1	0	0	2	0	0	-4	8	1	2	0
AGTI	0	1	0	1	0	0	0	0	0	1	0	0	0	2	0	1	0
Invista	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wellpoint	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	1
Dexit	1	1	0	0	0	0	1	1	0	3	0	0	0	5	1	4	0
Flexty	0	15	0	0	0	0	0	6	0	1	0	0	0	7	0	7	0
AurIQ	2	8	0	1	1	1	1	0	0	0	0	0	0	0	2	0	0
Camlien	0	1	0	1	0	0	0	1	0	0	0	0	3	0	0	1	0

## **Appendix D: Further Exploratory Considerations**

### **Control Variables**

The following control variables are also included in this study, but were dropped from results as they were found to add no value to the models:

#### **Variable 30. (Control) Firm Industry**

This was based on the primary industry as identified in the Branham survey, or based on an observation of the firm. To reduce the number of industries categorized, XSP firms were moved to the software category. The categories were: Software, Hardware, Service, VAR, Telecom.

#### **Variable 31. (Control) Firm age**

This control variable was the age of the firm at the time of the first revenue observation.

#### **Variable 32. (Control) Firm region**

This control variable was the province that the firm was headquartered in.