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BOOTSTRAP FINANCING:
CASE STUDIES OF TEN
TECHNOLOGY-BASED INNOVATIVE VENTURES,
TALES FROM THE BEST

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1 Introduction

1.1 Introduction to the Problem and the Broad Research Question

Although one of the youngest paradigms in the management sciences, entrepreneurship as a process of identifying new business possibilities and exploiting them in new ventures for economic gain is far from novel; indeed, it is one of the oldest activities known to humans.

Bootstrap financing, or the creative acquisition of resources by a business, is as old as any other form of entrepreneurship, and considering its effectiveness this should come as no surprise. In fact, ten of the most successful innovative technology companies of the twentieth century have all, at some point, used bootstrap methods. For example, Bill Gates and Paul Allen, the founders of Microsoft Corporation, saved money on a development system by writing their BASIC language for MIT's Altair computer on Harvard University computers (Wallace and Erickson, 1993); likewise, Steve Wozniak and Steve Jobs, the founders of Apple Inc., used Jobs' bedroom as their office at the beginning of the company's life and moved the operation to the family garage only when the bedroom became too crowded (Butcher, 1988); order takers at Michael Dell's Dell Inc. started out by writing orders by hand and pinning them up on a clothesline (Dell and Fredman, 2006, p.18); and Mike Lazaridis borrowed \$15,000 from his parents to start Research In Motion Ltd., the company that created the BlackBerry (McQueen, 2010, p.43).

Ever since recognizing the importance of bootstrap financing, entrepreneurs have been eager to learn more about it. There is no shortage of articles and books on the various techniques of bootstrap financing in the popular business press. In the United States, for example, periodicals such as *Accountancy*, *Black Enterprise*, *Entrepreneur*, *INC.*, and *Nations' Business*—and on this side of the border: *Canadian Business*, *CMA* magazine, and *Profit in Canada*—have all printed articles covering individual businesses' experiences with bootstrapping options. Similarly, bookstores and libraries—as evidenced by a variety of books with such titles as *Bootstrapping your business* and *Bootstrapping*—have devoted ample shelf space to bootstrapping techniques. And yet, despite its popularity, bootstrap financing has not been fully recognized by the academic community

as a viable and important business practice (Neeley, 2004a). A 2014 web search on the terms *bootstrap financing*, *bootstrapping techniques*- and *entrepreneurship* in all major article databases for business at the University of Toronto Library generated only a few dozen peer-reviewed articles. Howard Van Auken (2005, p.94), one of the pioneers in bootstrap financing research, remarks: “Although bootstrap financing commonly is used and is an important source of capital, few studies have investigated its use by small firms”. Similarly, Winborg and Landström (2001, p.235) suggest that: “Bootstrapping is a phenomenon which deserves more attention in future research on small business finance”. The vast majority of research focuses instead on the supply of formal sources of finance in the areas of equity finance (McNally, 1995), debt finance, (Fabowale et al., 1995) and venture capital (Lahm and Little, 2005). That venture capital should occupy such large space in academic research—as demonstrated by many articles and special issues devoted to venture capital in the top tier journals such as *Journal of Business Venturing*, *Entrepreneurship: Theory and Practice* and *Journal of Small Business Management* (Lam, 2010)—is baffling considering how little it features in small business creation. According to the US Global Entrepreneurship Monitor report (GEM, 2003, p.31): “Venture capital is so rare that, at most, only a hundred or so companies have venture capital in hand at their birth, in contrast to the million that have informal investment”.

The aim of this dissertation is to contribute to the under-researched area of bootstrap financing, using multi-case study methods of some bootstrapping techniques employed by founders of ten successful companies. The data used in this research are derived from founders’ biographies or autobiographies. The ten companies are: Hewlett-Packard Company, Digital Equipment Corporation, Apple Inc., Microsoft Corporation, Dell Inc., Amazon.com Inc., BlackBerry Limited, eBay Inc., Google Inc., and Facebook Inc. Of these, nine reside in the US, while one, BlackBerry Limited, resides in Canada.

The broader research question that I will address in this dissertation is the following: How do *high-impact entrepreneurs* finance the early stages of their entrepreneurial ventures, and what motivates their methods of selections? What is the process dynamics involved in start-ups of successful technological firms, and how do institutional contexts affect their success?

1.2 Motivation

Starting in the 1970s, economic activity has moved away from large firms to smaller ones for several reasons. Audretsch and Thurik (1998) claim that knowledge-based economies (economies which are directly based on the production, distribution, and use of knowledge and information), globalization, and technological advancements are the main causes of the move from large to smaller businesses. Perez (2012, p.7) argues that “the possibilities for innovation and entrepreneurship are now open for individuals and small companies wherever they may be located”. Business transactions across borders are much easier in a globalized and deregulated world and one where computers and telecommunications free business from the restriction of geographic location and previous firm structure. The commercial acceptance of the Internet is creating a new platform for electronic commerce and for delivery of new products and services (Lev, 2001, Stewart, 2001). Acs (1992) argues that uncertainty reflected in significant growth slowdowns, volatility of exchange rates, and intensified fragmentation—due to growing consumer demand for differentiated products—also contributes to the increased share of small businesses in the economy.

That small firms drive the economy and are a vital element in economic development (OECD, 1998) becomes evident when one looks at job creation. In 2012, small businesses in Canada employed 69.7 percent of the total labour force in the private sector, and from 2002 through 2012, they accounted for 78% of jobs created in the private sector (Industry Canada, 2013). Similarly, in the United States, between 2002 and 2010, small firms created 64% of new private sector jobs and made up more than half of non-farm private gross domestic product (Kobe, 2012). Small firms are at least as innovative as larger ones on a per-employee basis and generally have innovative advantage in high-technology industries. Their patents are not only more numerous—small businesses develop more patents per employee than larger businesses, with the smallest firms (those with fewer than 25 employees) producing the greatest number of patents per employee—but they are also more significant measured by the pipeline impacts. Lastly, the patents of small firms outperform those of the larger firms in a number of categories including growth, citation impact, and originality (Breitzman and Hicks, 2008).

But employment and economic contribution are not the only factors affecting a country's prosperity; at least equally important is it for citizens to have a sense of fulfillment, accomplishment, and inner satisfaction. In the United States, the Gallup-Healthways Well-Being Index surveys individuals in various occupations along six categories of questions to determine their overall well-being. On the top of the list, with highest reported well-being, are business owners, followed by employees with professional designations, and executives/managers. Similarly, Statistics Canada generates the Community Survey that measures the life satisfaction of Canadian citizens. In Canada self-employed people are more likely to report being "very satisfied" than employees (Institute for Competitiveness & Prosperity and Certified General Accountants of Ontario, 2012).

When discussing how entrepreneurship effects economic growth, Acs (2006) distinguishes between *necessity entrepreneurship* and *opportunity entrepreneurship*. In the former category are entrepreneurs who entered business because they did not have a better choice (they might have inherited the business, or lost their job and could not find a new one). For opportunity entrepreneurs, by contrast, the decision is a reflection of an active choice; in other words, they start a new enterprise based on the consideration that an unexploited or underexploited business opportunity exists. According to Acs and Varga (2005), necessity entrepreneurship has no effect on economic development (positive or negative) while opportunity entrepreneurship has a significant positive effect in that it enables economic growth.

The importance of entrepreneurship—i.e., its contribution to society—cannot be overstated. Most technical knowledge is ultimately made tangible in products and services, and it is through entrepreneurship that society converts technical information into those very products and services. In this process numerous jobs are created, and numerous innovations brought to light (Ács and Szerb, 2011). Of all the different sources of changes in a capitalist society, no other force is more significant in driving the change process than the innovations in products and processes driven by entrepreneurs, as identified by Schumpeter (1934) in his earlier work. The change occurs regardless of whether entrepreneurs succeed or not (if they succeed, they are rewarded; if they fail, they or others around them will learn from the experience). But entrepreneurship is also a mechanism through which inefficiencies in an economy are identified and addressed (Kirzner, 1973),

which attests to the power of entrepreneurship to bring about change on a societal level. Lastly, entrepreneurship reinforces economic freedom and ultimately leads to political freedom (Ács and Szerb, 2011).

The transition from managerial to entrepreneurial capitalism and the “information technology revolution” was an important factor in the economic success of the late 1990s in the U.S. (Wennekers and Thurik, 1999, Audretsch and Keilbach, 2004, Baumol et al., 2007, Acs and Szerb, 2007). The entrepreneurial economic structure provided opportunities for risk-taking entrepreneurs, who created innovative companies, which in turn were responsible for the breakthrough technologies. Rapidly growing entrepreneurial companies create much of the entrepreneurial activity that shapes productivity growth (Hart, 2003, Holtz-Eakin and Rosen, 2004, Acs and Szerb, 2007).

Growth and innovation, however, are often constrained within small firms by lack of liquidity, even when technical opportunity is present (Acs, 1992). Financing the seed, start-up, and early stage capital needs of a fast growing company is challenging. In innovative, technology-based new ventures, intangible assets, such as entrepreneur’s knowledge and passion, often outweigh the tangibles and frequently end up “walk[ing] out the door at the end of the day” (Stewart, 2001). These ventures have little or no history; instead, their competitive advantage lies in their intangible assets as they pertain to innovation, human resources, or organizational ability (Lev, 2001). Considering the amount of high risk and competition involved, a sizeable number of innovative, technology-based start-ups have difficulties obtaining long-term external financing (Freear et al., 1995b). Rather than being funded by equity and/or debt, the bulk of the financing at the early stages of growth is provided by informal sources, which are colourfully called the four F’s: founders, family members, friends, and foolhardy investors—the last one being angel investors, who may have personal or professional interest in the founder (Brophy, 1997, Szerb et al., 2007). These informal investments, together with the small business owners’ abilities to “use methods to meet the need for resources without relying on long-term external finance,” (Winborg and Landström, 2001, p.238) are the key aspects of bootstrap financing, which according to Amar Bhide (1992) is “not raising money, but having the wits and hustle to do without it”.

Most founders rely on bootstrap financing to provide the necessary resources to start their companies. Freear et al. (1995a) and Harrison et al. (2004) found that 95 percent of ventures in their samples had been financed using some kind of bootstrapping method. And 80 percent of the entrepreneurs Bhide (1992) interviewed in his research resorted to similar methods. Although these studies were conducted in the United States, the statistics in Canada are very much alike: most of the small and medium sized enterprises were financed with the help of some form of bootstrapping method (the initial capital coming mostly from the founder's personal savings). See Table 1.1, on page 12.

Table 1.1: Where Do Entrepreneurs Obtain Initial Capital for their New Business?

Sources	Percentage of Initial Capital
Personal savings of owner(s)	66%
Personal credit cards of owner(s)	32%
Commercial loans and lines of credit	29%
Personal lines of credit of owner(s)	23%
Personal loans of owner(s)	19%
Trade credit from suppliers	18%
Leasing	12%
Loans from friends and relatives of owner(s)	12%
Commercial credit cards	8%
Government loans and grants	5%
Other sources	5%
Loans from employees	3%
Loans and investments from other individuals	1%

Source: – (Industry Canada, 2013, p.40)

In opposition to the mainstream academic research in small business finance, which, as seen, emphasizes the importance of venture capital in the foundation of new firms, a nascent dissenting school of thought emerged focusing on the variety of alternative forms of financing for entrepreneurial firms, including bootstrap financing. The arguments that

emerged in these studies point to the need for more research in bootstrap financing in the high technology frameworks (Willoughby, 2008).

Organization of the Study

This study is presented in five chapters. Chapter 1 introduces the problem, the broad research question, the motivation for the study, and its background (including the definition of terms). Chapter 2 presents a review of the relevant literature organized by key topic areas. Chapter 3 describes the research methodology used in this study. Chapter 4 reviews the collected data, and analyzes the findings. Lastly, Chapter 5 presents the conclusions, contributions, and recommendations.

Historical Background

The word *entrepreneurship* has a long history. Originally a French word, *entrepreneur* appeared for the first time in the 1437 *Dictionnaire de la langue française* (“celui qui entreprend quelque chose”), and is used in reference most commonly to a person who is active and achieves something (Landström, 2005). Medieval French authors used the word to denote someone who is rough and ready to risk his own life and fortune. Similarly, in 1755, *A Dictionary of the English Language* used the following definition of entrepreneur: “Adventurer, he that seeks occasion of hazard, he that puts himself in the hand of chance”. Although for a long time no linguistic equivalent existed in English, the word that came closest to the French definition of entrepreneur was *undertaker*, which referred to a person who undertook a certain task. In later years, the meaning was narrowed to refer to someone engaged in projects involving risk where the profit was uncertain. In his *Inquiry into the Nature and Causes of the Wealth of Nations*, Adam Smith (1776) writes about “the undertaker of a great manufacture”. By the end of the 18th century, the word *undertaker* (to mean entrepreneur) had become outdated, in the process came to refer to someone who arranges and manages funerals, and was ultimately replaced by the term *capitalist* (Landström, 2005).

Entrepreneurship as a concept first appeared in the work of the Irish-French economist Richard Cantillon (1680s -1734) in his *Essai sur la Nature du Commerce en Général*

(*Essay on the Nature of Trade in General*). He identified three classes of economic agents: landowners, entrepreneurs, and employees (Landström, 2005). The categorization of entrepreneurial theories can be summarized into three major intellectual traditions, the roots of each can be found in Cantillon's work. However, although having a common origin, all of these traditions point to a different aspect of entrepreneurship. The German tradition of von Thünen, Schumpeter, and Baumol (commonly referred to as Schumpeterian tradition) for example, views the entrepreneur as a creator of instability and creative destruction. The neo-classical tradition of Marshall, Knight, and Schultz, on the other hand, emphasizes the role of entrepreneur in leading markets to equilibrium through their entrepreneurial activities. Lastly, in the Austrian school of Menger, von Mises and Kirtzner, the entrepreneur is somebody who combines resources to fulfill currently unsatisfied needs or improves market inefficiencies or deficiencies (Wennekers and Thurik, 1999).

In the economic history literature, the entrepreneur fulfilled many functions, of which at least thirteen different roles are found (Wennekers and Thurik, 1999, p.31):

1. The person who assumes the risk associated with uncertainty.
2. The supplier of financial capital.
3. An innovator.
4. A decision-maker.
5. An industrial leader.
6. A manager or a superintendent.
7. An organizer and coordinator of economic resources.
8. The owner of enterprise.
9. An employer of factors of production.
10. A contractor.
11. An arbitrageur.
12. An allocator of resources among alternative uses.
13. The person who realizes a start-up of a new business.

Merriam-Webster (2014) dictionary defines the verb *bootstrap* as “to promote or develop by initiative and effort with little or no assistance”. The concept is often attributed to

Rudolf Erich Raspe's story *The Surprising Adventures of Baron Münchhausen*, where the adventurer pulls himself out of a quagmire by his pigtail (Raspe et al., 1859). The term was already in use by 1922, when the Irish author, James Joyce wrote the following: "There were others who had forced their way to the top from the lowest rung by the aid of their bootstraps" in his book entitled *Ulysses* (Joyce, 1922, p.541).

1.3 Small Business and Entrepreneurship as a Scholarly Domain

Starting a business a century ago looked very different from starting one today. The market conditions, rules and regulations, and the financial and managerial environments changed significantly over time. Furthermore, different environments require different sets of skills, and the rewards too are different depending on the circumstances. Because of these ever-changing conditions, defining the central concepts within entrepreneurship and small business research has proved difficult. In fact, László Szerb (2003) argues that a historically changing nature of the entrepreneur and the entrepreneurial process contributes to the myriad of definitions. This reflects the fact that entrepreneurship is not only a complicated and ambiguous phenomenon but also multi-dimensional. Some of the better-known definitions of entrepreneurship are shown in Table 1.2, on page 15.

Table 1.2: Definitions of Entrepreneurship

Source	Definition
Drucker (1985)	An act of innovation that involves endowing existing resources with new wealth-producing capacity.
Stevenson and Gumpert (1985)	A process by which individuals pursue and exploit opportunities irrespective of the resources they currently control.
Gartner (1988)	The creation of organizations, the process by which new organizations come into existence.
Timmons (1990)	A way of thinking, reasoning, and acting that is opportunity-driven, holistic in approach, and leadership-balanced.

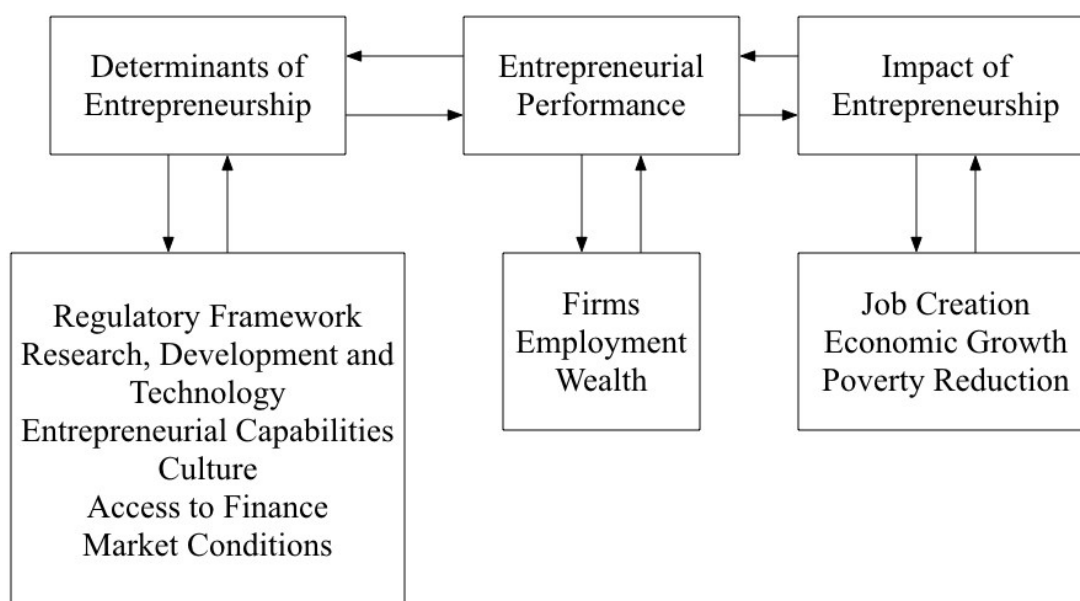
Source	Definition
Wennekers and Thurik (1999, p.46-47)	The manifest ability and willingness of individuals, on their own, or in teams, within an outside existing organization to: - perceive and create new economic opportunities (new products, new production methods, new organizational schemes and new product-market combinations) - introduce their ideas in the market, in the face of uncertainty and other obstacles, by making decisions on location, form and the use of resources and institutions.
Shane and Venkataraman (2000, p.218)	The scholarly examination of how, by whom, and with what effects opportunities to create future goods and services are discovered, evaluated, and exploited. Consequently, the field involves the study of sources of opportunities; the processes of discovery, evaluation, and exploitation of opportunities; and the set of individuals who discover, evaluate, and exploit them.
Ács and Szerb (2011, p.5)	A dynamic interaction of entrepreneurial attitudes, entrepreneurial activities, and entrepreneurial aspiration that vary across stages of economic development.

Source: – (Landström, 2005, p.11-16)

Elements that influence entrepreneurship are called the determinants of entrepreneurial activities. These determinants can vary considerably among countries, and create the overall business environment in which small business owners operate. When the determinants of entrepreneurship are advantageous in a country, then entrepreneurship thrives and has constructive impacts on the whole economy (Fisher and Reuber, 2010). See Figure 1.1, on page 17.

Entrepreneurship is not an occupation in a precise sense of the word, and entrepreneurs are not a well-defined occupational class. According to Gartner (1988, p.64): “The entrepreneur is not a fixed state of existence, rather entrepreneurship is a role individuals undertake to create organizations”.

Figure 1.1: Enablers or Inhibitors of the Entrepreneurial Activity



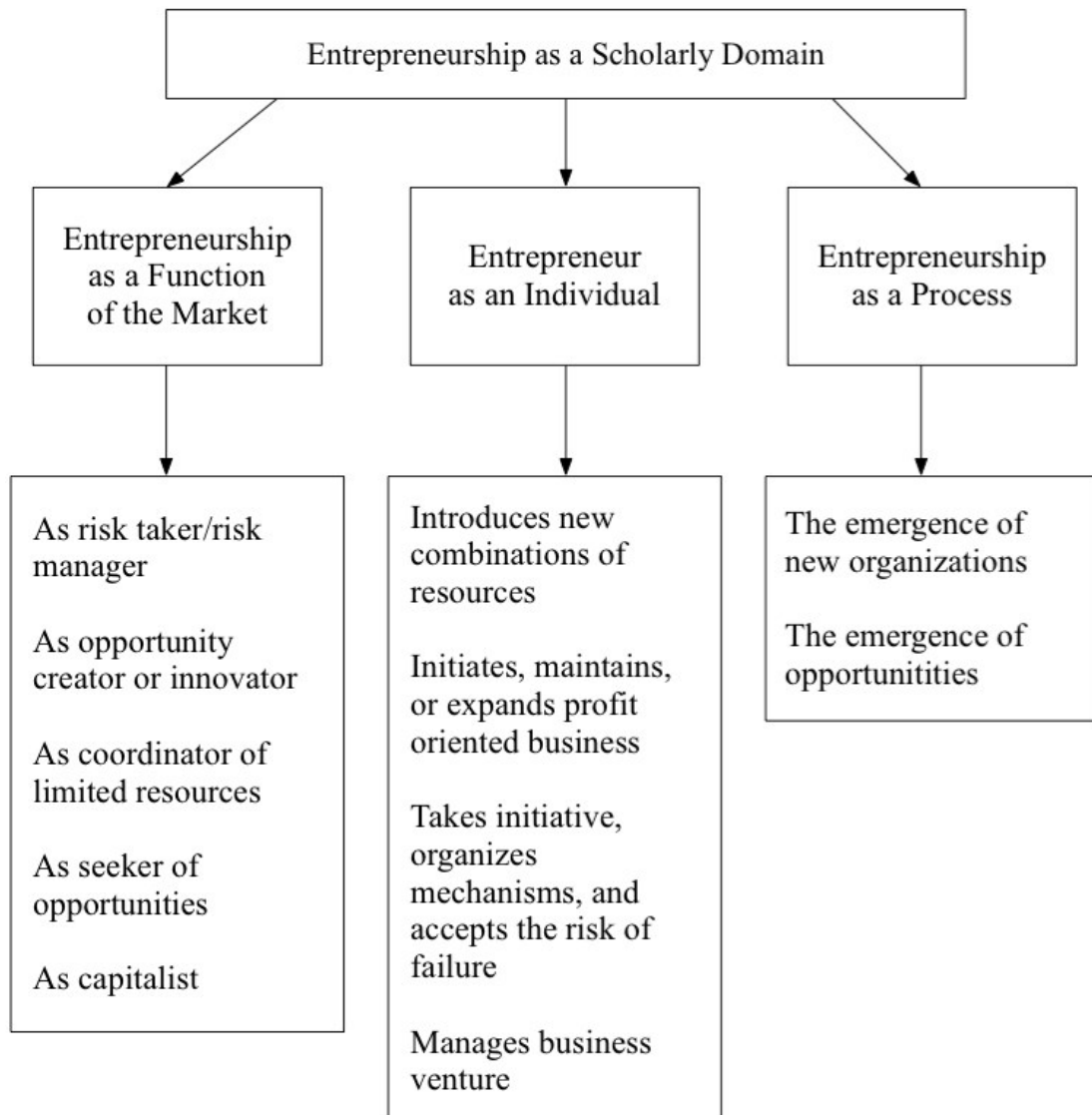
Source: – (Ahmad and Hoffman, 2007, p. 6-17)

Although researchers have struggled defining entrepreneurship, three of its central approaches are readily identifiable: entrepreneurship as a function of the market; entrepreneurship as a process, and the entrepreneur as an individual (see Figure 1.2, on page 18).

All three of these approaches emphasize the relationship between entrepreneurship and innovation, opportunity creation, and/or the organization of economic ventures (Schumpeter, 1934, Kirzner, 1973, Casson, 1982, Baumol, 1993). The clearest example of an entrepreneurial act is the creation of a new firm that offers products and services not previously available.

An important element of the entrepreneurial process is the concept of entrepreneurial motivation. A vital aspect of the motivational models is the role of entrepreneurial goals in motivating business founders to sustain their pursuits of entrepreneurial activities (Kuratko et al., 1997). Existing motivational theories can be divided into drive theory and incentive theory. The drive theory suggests that there is an internal stimulus (such as hunger or fear) that creates tension, and the individual seeks to reduce the tension created by it. The incentive theories emphasize the motivational pull. Achievement motivation (Ach) pulls an entrepreneur towards an end point, which is some kind of goal.

Figure 1.2: Entrepreneurship as a Scholarly Domain



Source: – (Landström, 2005, p.13-20)

Several studies have demonstrated that entrepreneurial performance can be significantly predicted by multidimensional factors of Ach (Carsrud and Brännback, 2011). Motivation can be either intrinsic or extrinsic. Intrinsic motivation refers to a personal interest in the entrepreneurial task as seen in studies on multidimensional Ach. Internally, entrepreneurs maybe motivated to succeed and accomplish a goal such as recognition, challenge, excitement, and accomplishment. Extrinsic motivation refers to an external reward that follows certain behaviour. Externally, entrepreneurs may be motivated to obtain wealth and status. Intrinsic and extrinsic motivations are not mutually exclusive; an individual can be motivated by both to perform an entrepreneurial act (Carsrud and Brännback, 2011).

In his seminal book, *Les misères du patronat...: le monde des petites et moyennes entreprises industrielles et de leurs patrons*, Michel Amiot (1991) addresses the process dynamics of entrepreneurship and entrepreneurial motivation. Having interviewed 70 French small-business owners about their experiences of starting a company Amiot found that despite all the challenges, and difficulties the entrepreneurs encountered along the way—especially sacrificing both time (with family or self) and financial stability in exchange for financial uncertainty—ultimately they were satisfied about their work, and in fact enjoyed it. The chapter entitled *Le désir de fortune et le désir d'oeuvre* (Amiot, 1991, p. 207-222) discusses small-business owners' motivation. Although driven by such external motivators as wealth and status, Amiot argues, the owners were also motivated by a desire to create something new and worthwhile. He concludes that entrepreneurs of small-medium enterprises loved their job at least as much as the financial rewards, or even more. Creating, therefore, is an important factor of motivation.

The small-business owner is a social person who wants to make fortune and have good life outside of his work but who would also like to do so while working on his craft, producing and selling. While creating his enterprise, he invests himself and his money (savings, assets), immersing himself in his craft, becoming prisoner of his enterprise as his capital is now in the company. Yet there is no contradiction between wanting to make one's fortune and being low on personal money – making money doing a profession that he likes (Amiot, 1991, p.220).

Amiot uses the expression *desire to create an oeuvre* to describe, what Carsud and Brannback (2011) call *achievement motivation*. In this dissertation I will use the expression *oeuvre*, to describe the factors of intrinsic motivational goals that drive an entrepreneur.

In general, businesses are classified based on the number of employees. Most entrepreneurial firms start out as small businesses, which, as exemplified by the variety of definitions, is also an imprecise term. Industry Canada, for example, defines a small business as one with fewer than 100 employees; the US Small Business Administration (SBA) classifies a small business as a firm with fewer than 500 employees; and the Organisation for Economic Co-operation and Development (OECD) defines small firms as those with fewer than 50 employees and micro-enterprises as those with fewer than 10

employees (Institute for Competitiveness & Prosperity and Certified General Accountants of Ontario, 2012).

Small businesses vary greatly. All businesses begin as start-ups and, depending on how entrepreneurial they are, will either expand or not. Small firms have ongoing stable operations that do not grow, mostly because the owners prefer to operate a small, steady business, or because the business cannot be successfully scaled up, despite the owner's vision. The owners of truly entrepreneurial firms, on the other hand, have special talents and skills that enable them to develop innovative products and services or business processes and thus achieve competitive advantage that fuels their business growth (Institute for Competitiveness & Prosperity and Certified General Accountants of Ontario, 2012).

In their study of informal investors, William Bygrave and Paul Reynolds (2005) describe founders on an entrepreneurial spectrum. At one end of their spectrum is a lone self-employed person in an impoverished area, where he makes a meagre living from a micro-business. And on the opposite end is a team of high-tech superstars in a high-tech center with a high-potential opportunity, entrepreneurs whose creations change the way we live, work, and play. Bygrave and Reynold (2005, p.40) posit that "Superstars launch their businesses with financing from professional venture capital, strategic partners, and business angels, as well as the four F's".

The distinction between a small business and an entrepreneurial firm matters because each contributes differently to economic growth. Given that they make up a large part of our economy, small businesses are an important element in our daily lives. They provide important support to the larger firms and are the mainstays of our economy. Entrepreneurial firms, on the other hand, stimulate competitive intensity and as such are sources of economic growth. A major difference between the two groups is that entrepreneurs plan and manage to grow, while small business owners do not. Some successful entrepreneurial firms experience a period of above-average growth at the early stages of their life cycle. Industry Canada defines "high growth" firms as firms with annual growth of 20 percent or more over a three-year period. This number (20 percent) refers to either the sales or the number of employees, provided that the firm employs 10 or

more workers at the beginning of the three-year period. High-growth firms that are less than five years old are called “gazelles,” and they are the most dynamic sector of the economy. In the United States there is no formal definition of high-growth gazelles, and the term gazelle is used loosely by various academics. Some entrepreneurial firms will grow even further and become medium-sized, and some become much larger and may even achieve global leadership (Institute for Competitiveness & Prosperity and Certified General Accountants of Ontario, 2012). In this dissertation I have chosen to focus on founders who created truly entrepreneurial firms that have started out as gazelles, have gone through all the phases of growth, and finally have become global industry leaders.

High-growth firms represent about 1 percent of small firms in Canada, and only 2 to 3 percent of small firms in the United States (Acs et al., 2008, Fisher and Reuber, 2010). However, despite their narrow scope, high-growth firms account for a huge proportion of employment growth in the Canadian economy. Statistics Canada researchers Garnett Picot and Richard Dupuy (1996) found that 5 percent of small high-growth firms accounted for a staggering 43 percent of job creation in Canada. Similarly, according to Zoltan Acs, William Parsons, and Spencer Tracy (2008), almost all jobs in the United States were created by a small number of high-growth firms.

Although there is a difference between small firm and entrepreneurial firm, for the purposes of this dissertation I will use the terms *entrepreneur*, *founder*, and *small-business owner* interchangeably (the same with the terms *small business* and *entrepreneurial firm*).

For a long time, policy-makers and scholars have grappled with issues of economic growth. Questions such as: “Why is the world more prosperous today than it was 50 years ago?” or “Why do some countries grow faster than others?” have never ceased to intrigue economists.

In the last century, scholars developed three major waves of growth theories that could help provide some answers. The first of these waves—associated with the work of Harrod (1948) and Domar (1947)—explained economic growth rate in terms of the level of saving and productivity of capital. The second wave, developed by Solow (1956), called the neo-classical model, attributed accumulation of factors of production, capital, and labour as

well as exogenous technological change that prods economic productivity to growth. Solow's model treated technology as a continuous ever-expanding set of knowledge that became evident over time. Although the neo-classical growth theories were more successful in explaining the realities of economic growth, they were deficient in that they did not try to explain what caused technology to improve over time.

Previous theories' omissions and deficiencies led to the development of yet another wave of growth theories. In his seminal work, *Increasing return and Economic Growth*, Paul Romer (1986) posits that technology is not an exogenous factor at all; in other words, technological developments do not, as Solow (1956) would have us believe, "just happen". Instead, they are endogenous in that they are created by organizations and influenced by governments. Knowledge and technology are characterized by increasing returns, and these increasing returns drive the process of growth (Romer, 1990, Romer, 1994). The endogenous growth theory assumes that we can gradually improve our living standard by improving our knowledge of how to produce more and better goods and services with an ever smaller amount of physical resources (Grossman and Helpman, 1994). Further research gave support to the finding that those innovative firms that create new knowledge drive prosperity (Acs, 1992, Romer, 1998, Cortright, 2001, Institute for Competitiveness & Prosperity and Certified General Accountants of Ontario, 2012).

In contrast to traditional factors of production, knowledge has a considerable impact on economic growth, because of its propensity to spill over for use by third-party firms. In Paul Rommer's (1994) growth model knowledge is endogenous, but the diffusion of knowledge is considered exogenous. In their influential work, Zoltan Acs, David Audretsch, Pontus Braunerhjelm, and Bo Carlsson (Acs et al., 2012) suggest that the spillover of knowledge may not be as routine as has been assumed in the endogenous growth models, but that a mechanism may be needed to facilitate it. One such mechanism is the startup of new firms.

1.4 Innovation and the Knowledge-Based View of the Firm

The essential outcome of entrepreneurship is innovation, or its transformation into a new product, that can be sold to a sizeable market (Schumpeter, 1934, Baumol, 1993, Ács and Szerb, 2011).

There are almost as many different definitions for *innovation* as there are researchers studying it. Anahita Baregheh, Jennifer Rowley, and Sally Sambrook (2009, p.1328) compiled 60 definitions from various disciplinary literatures as shown in the following:

- *Business and management*: 18 definitions from 1966 to 2007.
- *Economics*: nine definitions from 1934 to 2004.
- *Organizational studies*: six definitions from 1953 to 2008.
- *Innovation and entrepreneurship*: nine definitions from 1953 to 2007.
- *Technology science and engineering*: 13 definitions from 1969 to 2005.

Of the above mentioned definitions the earliest is from the discipline of economics by Joseph Schumpeter, who proposed two major patterns of innovation activities. The first one, labelled by Nelson and Winter (1982) and Kamien and Schwartz (1982) as Schumpeter Mark I, is described in *The Theory of Economic Development* (Schumpeter, 1934). In this work Schumpeter focuses on the typical European economics structure of the late nineteenth century, which is typified by many small firms. According to his earlier view new entrepreneurs enter an industry with new ideas, new products and new processes. They create new companies which challenge established firms and thus continuously upset the current way of production, organization, and distribution and remove the rent connected with the previous innovation (Malerba and Orsenigo, 1995).

The second pattern, identified as Schumpeter Mark II, is proposed in *Capitalism, Socialism and Democracy* (Schumpeter, 1947). In this later work, based on the characteristics of American industry of the first half of the twentieth century, Schumpeter examines the importance of the industrial R&D laboratory for the technological innovation and the key role of the large firm. According to this analysis, large firms institutionalize the innovation process with the formation of R&D laboratories stuffed with technical expertise. With their

accumulated stock of knowledge in specific technological areas—their superior knowledge in R&D projects, production, distribution, and financial sources—large firms establish an entry barrier to entry to new entrepreneurs and small firms (Malerba and Orsenigo, 1995).

The two patterns of the Schumpeterian innovation could also be characterized as *widening* and *deepening*. The *widening* pattern of innovative activities is related to a continuously growing innovative base which is expanded by the entry of new innovators. The new innovators erode the competitive and technological advantage of the established firms in the industry. And the *deepening* pattern is related to the supremacy of a few large firms which are constantly innovating through the accumulation of technological and innovative capabilities (Malerba and Orsenigo, 1995).

In addition to the various disciplines, organizations came up with their own definitions of innovation. For example, widely used in research are definitions by the OECD Oslo Manual (OECD/Statistical Office of the European Communities, 2005) and the Frascati Manual (OECD, 2002). In Canada the definition by The Conference Board of Canada (2013) is cited frequently. The Conference Board of Canada definition is very similar to, but broader than, the Oslo Manual definition of business innovation in that it does not require the implementation on innovation.

The Conference Board of Canada distinguishes for major types of business innovation: radical change to product and services, radical change to processes, incremental improvements to products and services, and incremental improvements to processes. See Table 1.3, on page 25.

Table 1.3: Four Types of Innovation

	Radical Change	Incremental Improvement
Products and Services	<p>Radical or breakthrough changes result in new or fundamentally changed products and services that can radically alter what companies sell, and generate major gains in revenue and profit.</p> <p>Examples</p> <p>Products: Automobile, penicillin, Polaroid camera, laptop computer, Windows operating system, ATM, and iPad.</p> <p>Services: Dentistry (provided by a certified professional), the Internet, IBM’s one-stop tech service model, and online shopping.</p>	<p>Incremental improvements add to or sustain the value of products and services.</p> <p>Examples</p> <p>Products: Windows 7, Apple’s second generation iPad, and niche food products (such as 10 kinds of tomato sauce).</p> <p>Services: Online registration systems for post-secondary education courses, the spa as a one-stop source of beauty care, and same-day dry cleaning</p>
Processes	<p>Radical or breakthrough changes result in new or fundamentally changed business and management processes and practices. The changes can significantly improve how firms operate, as well as productivity and profit.</p> <p>Examples</p> <p>Assembly-line automobile production; Lean Manufacturing, a process for greatly reducing waste; and Six Sigma, a process for radically reducing error rates.</p>	<p>Incremental improvements enhance the efficiency and effectiveness of existing business and management process and practices</p> <p>Examples</p> <p>Adding technology to replace people in part of the production cycle, reducing water usage in food production, “de-layering” management levels to bring decision-makers closer to operations and customers, and reducing the number or steps in manufacturing processes.</p>

Source: — (The Conference Board of Canada, 2013, p.8)

To answer why so many interpretations exist, we do not need to look far. As with entrepreneurship, the technical and socio-political environment of innovation has changed drastically in the last 100 years. What is considered an innovation today might have been unimaginable century ago (think of worlds that separate such inventions as the typewriter and, say, Facebook or YouTube.) Some of the most salient definitions of innovation are compiled in Table 1.4 on, page 26.

Table 1.4: Definitions of Innovation

Source	Definition
Schumpeter (1934)	<ol style="list-style-type: none"> 1. The introduction of new goods. 2. The introduction of new methods of production. 3. The opening of new markets. 4. The conquest of new sources of supply of raw materials or half-manufactured goods. 5. The carrying out of a new organization of any industry.
Dewart and Dutton (1986, p.1422)	An idea, practice or material artifact perceived to be new by the relevant unit of adoption, even though it may be an imitation or recombination of old ideas.
Drucker (1993, p.173)	The application of knowledge to produce new knowledge.
Damapour and Gopalakrishnan (1998, p.3).	Both a process and a product or service; the generation process results in innovation as an outcome for the generating organization, while the adoption process delineates how that outcome assimilates in the adopting organization.
Ahuja and Lampert (2001, p.523)	The commercialization of invention, which is the development of new ideas.
Mytelka and Smith (2002, p.1472)	Novelty in capabilities and knowledge that makes up technology.
Meyer (2004, p.10)	New and novel technology or processes.
Oslo Manual (2005) (OECD/Statistical Office of the European Communities, p.46)	The implementation of a new or significantly improved product (good or service), a process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations.
The Conference Board of Canada (2013, p.6)	A process through which economic or social value is extracted from knowledge – through the creation, diffusion and transformation of ideas – to produce new or improved products, services, or processes.

In addition to the definitions of innovation there are six attributes of innovations that are identified in the literature (Baregheh et al., 2009, p.1331-1332):

1. *Nature of innovation* refers to the form of innovation as in something new or improved.

2. *Type of innovation* refers to the kind of innovation as in the type of output or the result of innovation (e.g. a product or a service).
3. *Stages of innovation* refer to all the steps taken during an innovation process, which usually start from idea generation and end with commercialization.
4. *Social context* refers to any social entity, system, or group of people involved in the innovation process or environmental factors affecting it.
5. *Means of innovation* refers to the necessary resources (e.g. technical, creative, financial) that need to be in place for innovation.
6. *Aim of innovation* is the overall result that the organizations want to achieve through innovation.

The academic and practitioner communities have been increasingly realizing the importance of innovation in economic growth. However,

The main stream accounts of innovation deal predominantly with technological (product or process) innovation, neglecting the role and impacts of organizational innovation or socio-cultural changes as well as the social, cultural, psychological acceptance of new working practices and adaptation to them (Makó et al., 2012, p.117).

Lam (2005) argues that the relationship between organization and innovation is multifaceted, and constantly changing. Although much has been written about this relationship, there exists no theoretical framework that attempts to identify or define organizational innovation. It is in part because of these underdeveloped theoretical and methodological foundations that the role organization innovation plays in economic development has not attracted more attention (Lam, 2005, Makó et al., 2012).

Lam (2005) defines *innovation* as a capacity to respond to changes in the external environment, and *organizational innovation* as the creation or adoption of an idea or behavior new to the organization. The literature on organizational innovation can be classified into three different strands. The first, organizational design theories focus largely on the link between structural forms and the ability for an organization to innovate. They are incorporated into the literature on technological innovation. The theories of organizational cognition and learning, the second strand, study the micro-level process of how organizations develop new ideas for problem solving. This aspect of research helps

us understand how organizations create and exploit new knowledge necessary for innovative activities. Finally, the third and last strand of research focuses on organizational change and adaptation and the creation of new organizational form (Lam, 2005).

Using US and European examples, Makó et al. (2012) stress that a country's productivity growth advantage is not only a consequence of higher standards of technological innovation, but the result of new organizational and management methods of governance.

New business models, innovative supply methods, etc. play a key role in the introduction of technological innovation to new markets and supporting entrepreneurship. Innovations referred to as non-technological (social-institutional) represent the missing link that hinders European companies in their exploitation of opportunities offered by new technologies (Makó et al., 2012 p.117).

For the purposes of this dissertation, I will use the Conference Board of Canada's definition of innovation, and the Oslo Manual's definition of an innovative firm. The former defines innovation as a "process through which economic or social value is extracted from knowledge—through the creating, diffusing, and transforming ideas—to produce new or improved products, services, or processes" (The Conference Board of Canada, 2013, p.6), while the Oslo Manual defines an innovative firm as "one that has implemented an innovation during the period under review" (OECD/Statistical Office of the European Communities, p.47).

A theory of the firm, according to Nicholai J. Foss (1996, p.470), is "a theory that addresses the issues of the existence, the boundaries, and the internal organization of the multi-person firm". Relatedly, the resource-based view of the firm argues that the identification, generation, accumulation, combination, and deployment of firm-specific resources and capabilities are critical to comprehending the performance of a firm (Barney, 1991, Foss, 1993, Loasby, 1994, Foss, 1996). According to this theory, an organization is "a unique bundle of idiosyncratic resources and capabilities where the primary task of management is to maximize value through the optimal deployment of existing resources and capabilities, while developing the firm's resource base for the future" (Grant, 1996, p.110). Within the collection of all the new ventures, resources vary in quantity and

quality. While some organizations possess only insignificant resources, others possess superior ones. According to the resource-based view, those resources which are grander than others, are more likely to be the source of competitive advantage (Barney, 1991). And knowledge being a generic resource can to some extent deliver a competitive advantage if it is utilized strategically (Barney, 1991). “The value creation process in a company and the competitive position are critically influenced by corporate resource allocation and proper valuation of investment alternatives” (Rózsa, 2003, p.1). An organization that has superior resources can either produce goods or services more economically, or it can include elements that allow it to command superior prices, which of course leads to competitive advantage (Peteraf, 1993). Successful utilization of bootstrap financing techniques can endow a new firm with potentially important resources, cash, and cost savings (Perry et al., 2011).

As an extension of the resource-based view, knowledge-based theory of the firm regards firms as heterogeneous, knowledge-bearing entities, and “focuses upon knowledge as the most strategically important firm resources” (Grant, 1996, p.110). It argues that:

The essential thing about the firm is its function as a repository of distinct productive (technological and organizational) knowledge, and as an entity firms can learn and grow on basis of this knowledge. Such knowledge stocks are associated with differential efficiencies, and are accumulated in a path dependent way (Foss, 1996, p.470).

Whether the knowledge-based view is a theory per se or not—there has been some disagreement in the academia—all scholars agree that in a knowledge-based economy, innovation and the factors and the processes that enable or enhance production of valuable ideas are central to organization studies (Ahuja and Lampert, 2001).

Lundvall (1992) posits that “knowledge is the most important resource and learning is the most important process”, and argues that in the current period of knowledge-based economy it is misleading to refer to one knowledge base, but rather separate knowledge pools each with limited access.

The knowledge-base is fragmented and may best be illustrated as number of semi-public community pools with shared access regionally, professionally or through networking. Limited access means that some are excluded from

even approaching these pools while others with access may lack the necessary tools to tap into them (Lundvall, 2006, p.6).

Despite its importance, there is little consensus as to how to define knowledge, or how the various kinds of knowledge influence economic growth. “Researchers classify knowledge into four groups: data, information, knowledge, and wisdom. Data are the raw material, or the building blocks of information; knowledge makes meaning from information; and wisdom is needed to use knowledge” (Lundvall, 2006, p.7). Lundvall and Johnson (1994) divide knowledge into four categories as well: know-what, know-why, know-how and know-who, as shown in Table 1.5 on page 30.

Table 1.5: Knowledge Categories

Know-what	Knowledge about fact/ information
Know-why	Knowledge about principles and laws of motion in nature, in the human mind and in society
Know-how	Knowledge about skills/ ability to do something
Know-who	Knowledge about who knows what / who knows what to do

Source: — (Lundvall, 2006, p.9-11)

Lundvall (2006) argues that these distinctions have an important implications both for innovation policy and for management of innovation. Since most knowledge is neither private nor is it exactly private goods, but a community resource, creating new links between separate knowledge pools, or allowing experts an access to different pools to interact are essential elements in the innovation oriented knowledge policy.

1.5 Angel Investors and Venture Capitalists

Early-stage equity financing plays a critical role in the entrepreneurial economy (Freear and Wetzel, 1990, Sohl, 1999). There are two major sources of private equity capital for small business ventures: angel investors (or angels, for short) and venture capital funds. The former represent the oldest and largest source of seed and equity capital for the high-

growth venture (Harrison and Mason, 2000, Sohl, 2003). Angels invest before formal venture capitalists, and fund about 100 times as many seed-stage high-technology companies as venture capitalists (Preston, 2007). Angel investments account for 70% of capital for new ventures (Morrisette, 2007).

The forerunners of modern day angel investors and venture capitalists go back to the late 19th century, when wealthy American families began to invest in potentially high-return, high-technology undertakings. When the young Alexander Graham Bell required money in 1874 to finish his early experiments on the telephone, Boston attorney Gardiner Green Hubbard and Salem leather merchant Thomas Sanders lent a hand, and later supplied the capital to start Bell Telephone Co. in Boston (Gompers, 1994).

However, the market for risk capital remained largely chaotic and disintegrated through the late 19th and early 20th century. In the 1930s and 1940s, members of the Rockefeller, Bessemer, and Whitney families employed professional managers to look for investments in promising young companies (Gompers, 1994).

The first modern venture capital firm was created in 1946, when MIT president Karl Compton, Massachusetts Investor Trust chairman Merrill Griswold, Federal Reserve Bank of Boston president Ralph Flanders, and Harvard Business School professor General George Doriot started American Research and Development (ARD) (Gompers, 1994). ARD was to finance commercial applications of technologies that were developed during World War II, and tried attracting money from non-family sources, primarily from institutional investors. Doriot, the heart and soul of ARD, was later called the “father of venture capital” (Ante, 2008).

As the following examples show, definitions of angel investing (and angel investor) are diverse. According to a wider interpretation of the term, angel investors are any informal private investors (Brophy, 1997, Harrison et al., 2004, Szerb et al., 2007). Other interpretations, however, are narrower. Mason and Harrison (1999) for example, define angel investors as private individuals who provide financing directly to companies in which they have *no family connection*. And Shane (2009) defines an angel investor as a

person who provides capital to a private business, owned and operated by someone else who is not a friend or part of family.

Because angel investments are private (i.e., not provided by public transaction), statistical information is sparse and inconclusive. Researchers, therefore, rely more on estimates, which are derived from small samples or are extrapolated from related data. It is estimated that in the US alone 220,000 to 400,000 people are involved in angel investing every year. The number of deals per year is estimated at anywhere between 50,000 and 140,000, and the amount of investment between \$18 billion and \$108 billion. Half of the angel investments are in seed-stage companies, usually before the company has earned any revenue at all (Morrissette, 2007).

When looking at the characteristics of angel investors, a pattern appears. Angels fund projects that venture capitalists would consider too small, or too new—or, at times, not new enough; in other words, their risk tolerance is high. A typical angel investor is male, aged between 46 and 55, and with a college degree, and has net worth exceeding \$1 million. At some point in life, he had a successful business. In addition to funds—average investment ranges anywhere between \$50,000 and \$150,000—he can also provide human or social capital, manifested in informal networks. Lastly, he generally invests in firms that are within 50 miles from his home, and for no longer than five years (Sohl and Hill, 2007, Morrissette, 2007, Szerb et al., 2007, Degennaro, 2010).

In the US, accredited angel investors have most recently started forming groups and networks, where research is shared and capital investment pooled. Although only contributing to about 2% of angel investment, angel investor groups are on the rise. The members of these groups are well-off; they often have entrepreneurial experience, and incline to invest in fledgling companies; and they invest their own funds. By contrast, venture capitalists—professional investors who specialize in funding innovative enterprises—tend to invest in more mature companies; their capital funds are managed by professional investment managers, who often have no entrepreneurial experience; and, unlike angel investor groups', their money is contributed by institutional investors (Degennaro, 2010).

In 2010, there were 462 active venture capital firms in the United States, which were managing \$176.7 billion committed capital (National Venture Capital Association, 2011). Venture capitalists are long-term investors; they play an active role with all of their investments and work with entrepreneurial management teams to develop companies and sit on the board. Most venture capital firms raise their funds from institutional investors, such as pension funds, insurance companies, endowment funds, foundations, corporations, high-net-worth individuals, foreign investors, and other venture capitalists (National Venture Capital Association, 2011). Venture capitalists specialize either in particular stages of financing (such as early- or late stages of financing), industries, or geographic locations (Bygrave, 1987). Some venture capitalists, however, prefer not to invest in new ventures due to the high risk associated with them. Instead, they prefer to work with ventures in which the entrepreneurs have already made a significant financial and time commitment (Schilit and Chandran, 1993). For example, of the 2,497 companies that received venture financing in the US in 2010, only 285 of them had received seed capital (PriceWaterhouseCoopers/National Venture Capital Association, 2010).

Venture capital firms are private partnerships or closely held corporations funded by general partner(s) and investors, or limited partners. These partnerships are fixed-life investments, and usually do not last longer than ten years. Each fund is financed by commitments of capital from the limited partners. Once the partnership has reached its target size, it is closed to further investments. After that, however, a venture capital firm may decide to raise another fund a few years later; in fact, it is not uncommon to see a successful firm raise six or seven funds consecutively over the span of ten to fifteen years (Bygrave and Timmons, 1992).

Depending on its focus and strategy, the venture capital firm will seek to exit the investment in the portfolio company within three to seven years of the initial investment, typically by way of an initial public offering (IPO), a merger, or an acquisition of the company by its founder or another company (Timmons, 1994).

It is commonly believed that a business partnership between an entrepreneur and a venture capitalist is a ticket to success. However, venture capital is not easy to raise, and the likelihood of being funded by a venture capital firm is slim because venture capitalists

invest only in a fraction of the deals that come to their attention (Tyebjee and Bruno, 1984). According to the National Venture Capital Association (2014), for instance, less than one percent of all business plans that venture capitalists receive will get funding. Take, for example, Arthur Rock, the lead investor in Apple Computer, Fairchild Semiconductor, and one of the most successful venture capitalists in history. Of hundreds of business plans that reach his office daily, he will look at only one, and at the end may invest in only one or two business propositions in a year (Rock, 1987).

William Bygrave and Paul Reynolds conclude by remarking that: “Money from informal investors and founders is the lifeblood of entrepreneurship. It is fair to state that entrepreneurship in general would still thrive without any formal venture capital, but it would wither away if money from the four F’s dried up” (Bygrave and Reynolds, 2005, p.42).

1.6 The Definition of Bootstrap Financing

Because innovative technology-based new ventures lack tangible assets, their future income stream is difficult to predict; consequently, their valuation presents significant uncertainty and subjectivity (Bélyácz and Kovács, 2010), which often deter potential financiers. Financiers, who rely on the valuation of ventures to determine the amount of finance that they would provide, tend to shy away from intangible-asset based new companies. It is therefore not surprising that a substantial number of innovative, technology-based start-ups struggle with long-term external financing (Freear et al., 1995b), and are resorting to bootstrapping techniques (Van Auken, 2005).

Ever since Amar Bhide (1992, p.110) coined the term *bootstrap financing*—he referred to it as the “financing of ventures with modest personal funds”—numerous studies have attempted to refine and redefine the construct, as shown in Table 1.6 on page 35.

Table 1.6: Definitions of Bootstrap Financing

Source	Definition
Bhide (1992, p.110)	Financing of ventures with modest personal funds.
Fear et al. (1995a, p. 395)	Highly creative ways of acquiring the use of resources without borrowing money or raising equity financing from traditional sources.
Van Auken and Neeley (1996, p.224)	Capital acquired from sources other than traditional providers.
Van Osnabrugge (2000, p.24)	The highly creative acquisition and use of resources without raising equity from traditional sources or bank.
Winborg and Landström (2001, p.238)	The use of methods to meet the need for resources without relying on long-term external finance.
Harrison et al. (2004, p.308)	Imaginative and parsimonious strategies for marshaling and gaining control of resources.
Neeley (2004b, p.105)	Financial methods to satisfy a ventures' financial and resource needs without long-term commitments or external obligations.
Ebben and Johnson (2006, p.853)	A collection of methods used to minimize the amount of outside debt and equity financing needed from banks and investors.
Grichnik et al. (2014)	An alternative resource management approach characterized as avoiding market-based resource transaction.

Harrison et al. (2004, p.308), for example, define bootstrap financing as “imaginative and parsimonious strategies for marshaling and gaining control of resources”. This definition comes close to the heart of bootstrapping, since it conveys two important aspects of bootstrapping: the entrepreneurs’ initiative and their imagination. In addition, it encompasses the two most salient forms of bootstrapping: acquiring financing from non-conventional sources, and ways of minimizing the need for financing (Smith, 2009).

Neeley (2004a) defined bootstrapping finance as set of methods used to meet a venture’s resource needs while avoiding financial transactions. Neeley (2004b) also compiled the most extensive classifications of bootstrap finance categories and techniques, shown in in Table 1.7 on page 36.

Table 1.7: Bootstrapping Categories and Sources

Category	Sources
Owner's Resources	Savings accounts Sales of securities and properties Forgone salary Salary from "other" job Residence for business use
Owner's Borrowing	Installment or signature loans Lines of credit Credit cards Micro-lending programs Franchise lending Collateral loan Mortgages Home equity loans Insurance cash value Retirement account funds Online credit search matching services
Relationship Resources	Cash contributions (<i>investment from family/friends</i>) Property or equipment purchases Donated labor Below-market salary
Barter	Service or Goods Exchanges or Trades Organized Service or Goods Exchanges
Quasi-Equity	Partnerships Angels, individuals or groups Adventure capital Incubators' interests Credit enhancements
Cooperation Resources	Equipment or facilities (software) sharing Joint ownership Coordinated purchases Customer-sharing alliances Franchise supported advising and services
Customer or Client Financing	Prepaid licences Advance payments Customer-funded research and development Letters of credit "Invest-omers"
Cash or Asset Management	Trade Credit Delayed payments Deferred taxes Overdraft Privileges Account transfers Skip loans

Category	Sources
	Accelerated receipts Short-term investments Inventory Minimization Used-equipment Theft Control
Leases	Close-ended leases Open-ended leases Sale leasebacks Venture leasing
Outsourcing	Professional services Temporary employees Manufacturing co-ops Flexible networks
Subsidies and Incentives	Direct and indirect local, state or federal funds University resources Indirect corporate funds
Foundation Grants	Direct grants Flow-through arrangements

Source: – Bootstrap finance (Neeley, 2004b, p.106)

It is the first compilation that includes quasi-equity, examples of which are angel investors as individuals or groups, or adventure capitalists.

Gricknick, Brinckmann, Singh, and Manigart (2014) reconciled the multitude of prior bootstrapping definitions by referring to bootstrapping as “an alternative resource management approach directed at avoiding market-based resource transaction” (Grichnik et al., 2014, p.311).

2 Literature Review

2.1 Capital Market Imperfections

According to a large number of entrepreneurs, the raising of funds is the most difficult part of starting a new venture (Blanchflower and Oswald, 1998). The financial gap (i.e. the difference between money available and money needed) that separates financial seekers from financial providers is significant (Szerb et al., 2007). This is especially true for small businesses, because they have no collaterals (or credit or earning history), and are therefore considered “high risk” (Ang, 1992).

In the 1920s, two seminal papers were published in the economic literature that gave rise to the economic study of risk and uncertainty: the first, *Risk, Uncertainty and Profit*, written by Knight in 1921, and the second *Treatise on Probability*, by Keynes in 1922 (Bélyácz, 2011b). Both of these papers deal with the issues associated with identifying and quantifying uncertainty and risk, which are important factors in the finance provider’s decision making. The higher the uncertainty and the risk associated with a venture, the more difficult it is to obtain external financing (Bélyácz, 2011a).

The optimal capital structure of companies—subject of many studies—goes back to Modigliani and Miller (1958), who posited that a capital structure (equity, debt or hybrid securities), which minimizes the firm’s overall cost of capital, increases the value of a company.

According to many studies (Petty and Bygrave, 1993, Storey, 1994, Berger and Udell, 1998) on capital structure, the primary factor affecting the financial gap is a phenomenon known as *information asymmetry*, which occurs when one party in the transaction, either the finance seeker or finance provider, has superior knowledge that is not shared by the other party. This causes imbalance in the market power among participants, and may ultimately lead to market failure in form of moral hazard or adverse selection. Moral hazard occurs when one party with additional information has both the capacity and the motivation to shift costs onto other parties. Moral hazard and agency conflict arise when

an entrepreneur takes advantage of investors by not disclosing information about the company, and by obtaining capital and using it for his or her own gain instead of for the venture. Through equity financing, entrepreneurs can engage in activities that profit them disproportionately because the costs of the activities are diversified amongst shareholders. And through debt financing, an entrepreneur has incentives to take on risky projects because in case of liquidation, the creditors bear the majority of the costs (Shane and Toby, 2002).

Adverse selection, on the other hand, takes place in lending activities when the lenders are unable to distinguish between customers, and thus cannot set the price or rate differently according to risk. In addition to moral hazards and adverse selection, the most often discussed market failure affecting new ventures with little collateral or revenue history is the principal-agent problem, which occurs when one person or entity (the “agent”) is able to make decision for another person or entity or make decisions that impact another person or entity (the “principal”). The dilemma exists because sometimes the agent is motivated to act in his own best interests rather than those of the principal (Institute for Competitiveness & Prosperity and Certified General Accountants of Ontario, 2012).

Although small business owners generally know their business well, often they end up not communicating the required information. They are unwilling to disclose their knowledge about their opportunities and/or their approaches to exploit them, lest other people should pursue the same goal, and consequently damage their interest. Owners of new, innovative companies are not as transparent as financing providers would like them to be, and may be disinclined to provide data on patents, core competences, and trade secrets. This imbalance often leads to a high degree of uncertainty for the investor, which results in higher costs for the financing transaction (Arrow, 1974). The lack of transparency between finance seeker and finance provider also precludes risk assessment, which leads to financiers’ not being able to set the prices accordingly for high or low risk (Akerlof, 1970).

In addition, subsequent assessment costs are not proportionate to the size of the funds the financier provides, which renders the relative cost beyond the reach to most entrepreneurs. The likelihood of a low-risk venture willing to incur the exorbitant costs is low, which leaves only the high-risk firms in the market. Financiers thus encounter the problem of

adverse selection which means that financiers select high-risk firms, and banks use credit rationing to constrain lending (Stiglitz and Weiss, 1981, Amit et al., 1990). In addition to higher financing costs, small businesses face costs to identify potential financiers and to undertake bonding activities (Winborg and Landström, 2001). Bonding costs arise because of the financing providers' requirements for information and guarantees of non-opportunistic behaviour to avoid agency conflict (Jensen and Meckling, 1976).

Literature on small business finance suggests that new ventures finance themselves largely in line with the *pecking order hypothesis* (Myers, 1984, Myers and Majluf, 1984), which postulates that smaller firms tend to prefer internal- to usually very costly external financing to maintain the maximum level of autonomy, and to reduce the costs (Manigart and Struyf, 1997). In case that external financing *is* needed, firms would apply for a loan first and then raise equity.

The same conclusion is reached by the *signaling theory* (Spence, 1973), according to which internal finances are positively acknowledged by the external market. If the founder is willing to finance the venture, it means that he or she has a great confidence in the future of the company. An increase in the equity capital would be a negative signal, in which case borrowing would be a better approach. This would indicate that the entrepreneur is not willing to share the future profitability of the company generated by the investment.

These capital market imperfections affect innovative, small, technology-based firms even more harshly because their accomplishments are linked to difficult-to-measure assets derived from scientific knowledge and intellectual property. As seen, small firms often lack tangible assets, which could be used as collateral, especially at the early stages of their life cycle; their products have little or no brand recognition, and are therefore subject to possible non-marketability. What is more, their future success is linked to difficult-to-value growth potential derived from intangible assets (Brierly, 2001). Although small, technology-based new ventures frequently end up providing profitable financial returns, the initial level of high-risk often deters the potential investor (Bélyácz, 2007). These examples of capital market imperfection may affect both the quantity and price of equity and debt finance provided to small ventures. The external financing market, if available, is thus a relatively expensive way of fulfilling entrepreneurs' needs for resources. A large

majority of start-up ventures are therefore established without conventional debt or equity funding (Cassar, 2004, Mason and Harrison, 1999).

2.2 The Birth of the Concept of Bootstrap Financing

The following sections explore the peer-reviewed literature dealing with how entrepreneurs support their ventures through bootstrap financing. This review entails searches in all the major article databases for business and management at the University of Toronto Library.

In their studies of capital acquisitions of 96 small businesses in Iowa, Van Auken and Carter (1989) identified personal savings, the cash value of life insurance, home equity loans, and the sale of personal assets as sources of equity, and friends and relatives as a source of debt. See Table 2.1 on page 41.

Table 2.1: Alternative Sources of Initial Equity and Debt Capital

Sources of Equity
Personal savings
Life insurance (cash value)
Home equity loan
Issuance of stock
Limited partnership
Sale of personal asset
Third party investment
Other
Sources of Debt
Friends/relatives
Lending institutions
SBA guaranteed
Issuance of bond
Finance company
Government grant
Other

Source: – (Van Auken and Carter, 1989, p.4)

Similarly, according to Thorne (1989), entrepreneurs use seven techniques to acquire resources: borrowing from suppliers and service providers, deals with customers, free or low-cost labour, special deals for space, non-equity funds, and special relationships. See Figure 2.1, page 42.

Figure 2.1: Techniques Often Used to Acquire Substantial Resources / Alternate or Supplemental Financing

1. Borrowing from suppliers and service providers; late payment, either negotiated or forced on supplier.
2. Dealing with customers: early payment, prepayment by customers, progress payments, and prompt payments.
3. “Free” or low-cost labour: deals for future payments for labour; payment in stock; using family, friends, and others willing to work for low wages; subcontracted work; employment of retirees or moonlighters.
4. Special deals for space.
5. Non-equity funds from federal, state and local agencies.
6. Special relationships; loans, advances, or use of equipment from potential vendors of key components; partnerships with established companies; programs with universities.
7. Other sources of income, such as consulting or providing other services while a product is being developed.

Source: – (Thorne, 1989, p.8-9)

However, it was not before Amar Bhidé’s (1992) influential article that the term *bootstrap financing* was ever used. (Van Auken and Carter (1989) used the term *alternative sources* and Thorne (1989) used the term *alternative financing*).

Bhidé (1992) interviewed 100 company founders about how they overcame the daunting obstacles that confront start-ups. The founders had been selected from the list of the Inc. magazine’s “500”, which includes the 500 fastest growing companies in the US. His results showed that bootstrapping is an important strategy for successful entrepreneurs to launch a venture.

In an empirical study, Freear et al. (1995a) investigated the importance of bootstrap financing in the computer software industry, and defined it as “highly creative ways of acquiring the use of resources without borrowing money or raising equity financing from traditional sources” (p.395). Their survey divides bootstrapping into two categories: financing for product development and financing for business development. They identify 12 product development and 19 business development bootstrapping techniques, which respondents evaluated along a five-point scale, (see Table 2.2 on page 43).

Table 2.2: Bootstrapping Techniques

Product Development
Special deals for access to hardware
Pre-paid licences, royalties or advances from customers
Development of products at nights and weekends
Research grants
Customer funded R&D
Commercializing university-based research
Commercializing public domain software
Porting fees to transfer software form one platform to another
Free or subsidized access to hardware
Commercializing an existing shareware product
Turning a consulting project into a commercial product
Using public domain development tools
Business Development
Delaying payments
Bartering arrangements
Personal credit cards & home equity/mortgage loans
Discounted advance payments from customers
Below market or very low rent space
Deals with professional service providers at below competitive rates
Leasing vs. purchasing assets
Purchasing used vs. new equipment
Working out of home
Gifts or interest-free loans from relatives

Product Development
Unpaid family member working as an assistant
Loan Guarantee Scheme loan guarantees
Severance and parachute payments
Personal savings
Reduced compensation
Forgone or delayed compensation
Special terms with customers, including discounted advances, prepayments and larger than normal deposits
Outsourcing key parts of the business
Shareware revenue stream

Source: – (Freear et al., 1995a, p.31)

The research found that software entrepreneurs actively employ bootstrapping and business alliances as part of their strategies for growth and survival.

Van Auken and Neeley (1996) further refined the definition of bootstrap financing to include those sources of capital used after exhausting personal savings, other than personal capital or loans from banks. Their research indicated that there is a significant difference between the percentage of sole proprietorship versus other firms and construction/manufacturing versus other types of firms using bootstrap financing as compared to traditional sources of financing when bootstrapping comprised at least 60% of the total start-up capital. Whether a firm was located in a smaller community (less than 10,000 people), or a larger one (more than 10,000) had no significant effect on the usage of bootstrapping.

Harrison and Mason (1997) replicated Freear et al.'s study (1995a) in Northern Ireland, and found that 95 percent of their sample used some bootstrapping techniques. Furthermore, their findings revealed that bootstrapping is more common for business development than for product development, and that smaller firms are more likely to resort to the practice than larger ones. In 2004, they extended their study to a comparison of bootstrapping and venture development in three regions: Northern Ireland, South England, and the state of Massachusetts (Harrison et al., 2004). They found that bootstrapping

techniques were most commonly used in Massachusetts (followed by South England and then Northern Ireland).

In *Financial Bootstrapping in Small Businesses: Examining Small Business Manager's Resource Acquisition Behaviors*, Winborg and Landström (2001, p.238) define bootstrap financing as the “use of methods to meet the need for resources without relying on long-term external finance”. In their questionnaire, which was based on a study by Freear et al. (1995a), they were able to identify 32 bootstrapping methods (see Table 2.3 on page 45).

Table 2.3: Bootstrapping Methods

Use of Bootstrapping Measures for Capital Minimization
Buying used equipment instead of new
Using routines to speed up invoicing
Borrowing equipment from other businesses for shorter periods
Using interest on overdue payment from customers
Hiring temporary personnel instead of employing permanent personnel
Using routines to minimize capital invested in stock
Coordinating purchases with other businesses
Leasing equipment instead of buying
Ceasing business relations with late-paying customers
Offering same conditions to all customers
Practicing barter instead of buying/selling goods
Offering discounts to customers who pay cash
Buying on consignment from supplier(s)
Sharing premises with others
Employing relatives and/or friends at non-market salary
Delaying payment of value-added tax
Running the business at home
Sharing equipment with other businesses
Sharing employees with other businesses
Use of Bootstrapping Measures to Meet Need for Capital
Seeking out best conditions possible with supplier(s)
Withholding manager's salary for shorter/longer periods
Delaying payment to supplier/s

Use of Bootstrapping Measures for Capital Minimization
Obtaining payment in advance from customers
Using a private credit card for business expenses
Obtaining capital via manager's assignments in other businesses
Obtaining loans from relatives/friends
Choosing customers who pay quickly
Obtaining subsidy from County Administrative Board
Obtaining subsidy from County Labour Board
Obtaining subsidy from Swedish National board for Industry and Technical Development
Raising capital from a factoring company
Obtaining subsidy from the Foundation Innovationscentrum

Source: – (Winborg and Landström, 2001, p.251)

These were then separated into two categories: those used for capital minimization, and those intended to meet the need for capital. Using cluster analysis, they then identified six clusters of bootstrappers: delaying bootstrappers, relationship-oriented bootstrappers, subsidy bootstrappers, minimizing bootstrappers, non-bootstrappers, and private owner-financed bootstrappers.

Using the Freear et al.'s (1995a) factors, Van Auken (2004), too, studied bootstrap financing among 44 small technology-based firms in the US Midwest. His results, however, indicated that in general the owners did not view bootstrapping as an important source of capital. The use of bootstrapping techniques were positively correlated to the risk of the firm, and inversely correlated to the size of the firm's market and whether the owner had looked for capital in the previous year. A year later, Auken (2005) extended the study to bootstrap financing among technology-based versus non-technology-based firms using the Winborg and Landström's (2001) factors. Unlike the owners of non technology-based firms, the owners of technology-based ventures thought that methods that improved cash inflows were more important than methods that slowed cash disbursement.

Neeley (Neeley, 2004a, p.4) defined bootstrapping finance "as a set of methods used to meet a venture's resource needs while avoiding financial transactions". Her compilation of bootstrap finance techniques consists of the following categories: owner's resources,

owner's borrowing, relationship resources, barter, quasi-equity, cooperations resources, customer or client financing, cash or asset management, leases, outsourcing, subsidies and incentives, and foundation grants. These categories consist of a total of 65 sources. It is the first compilation that explicitly includes quasi-equity, such as angel investors (individuals or groups) and adventure capitalists. See Table 1.7 on page 36.

Carter and Van Auken (2005) built on the work by Winborg and Landström (2001) to determine whether similarities in approaches to bootstrap financing in Sweden could be generalized to Iowa. Their study examined the influences of owners' perceptions of constraints, opportunities, and risks in the environment on their choice of bootstrap financing techniques. They found perceived risk to be positively correlated to the use of delaying payments, minimizing investments, private owner financing, and sharing resources. Perceived ability constraints, on the other hand, were negatively correlated to private owner financing.

Given how recent bootstrap financing research is, early scholars have focused predominantly on defining the concept and establishing its relevance. Most papers draw on the work of Freear et al., or Winborg and Landström (2001). Winborg and Landström's research is unusual in more than one respect: unlike the typically small-scaled bootstrap studies, with sample sizes ranging between 32 and 100 participants, their research sample is large (they studied 263 Swedish firms); and their research was conducted outside of the US (other non-US based studies include research by Harrison and Mason (1997), and Harrison et al. (2004).

2.3 Empirical Evidences of Bootstrap Financing

This section discusses the empirical evidences of bootstrap financing as presented by peer-reviewed publications from 2003 to present.

Carter et al.'s (2003) studied systematically female business owners and their equity financing strategies. The study examines the influence of human and social capital on the likelihood of seeking equity funding, access to funding sources, bootstrapping techniques, and development of financial strategies. According to their findings, graduate education is

the only type of human capital that significantly increases the odds of using external equity financing. Although social capital had no direct effect on increasing the likelihood of using equity it positively influenced the use of bootstrapping techniques. Similarly, network diversity was positively correlated with the use of personal sources (personal savings, family and friends, etc.). Employment of professional advisors, by contrast, was negatively correlated with personal sources of financing.

In a sample of 88 women-led US high-growth, high-technology start-ups, Brush et al. (2006) expanded on Carter et al.'s study (2003) by examining how female entrepreneurs use bootstrap financing across different stages of venture development. The results showed that companies that have not achieved sales were more likely to emphasize bootstrapping techniques to reduce labour costs; those companies that have achieved sales, on the other hand, were more likely to minimize cost of operation.

Influenced by Winborg and Landström's (2001) study, Ebben and Johnson (2006) sampled 146 firms in the Midwestern US. Their results indicate that bootstrapping methods varied depending on the developmental stage of the small firm: the older the firm, the higher is the number of customer-related bootstrapping techniques, and by extension, the lower is the number of joint-utilization and owner-related bootstrapping techniques (as well as the use of delaying payments).

Other researchers drew on work by Winborg and Landström. Ebben (2009), for example, used their 25 techniques when surveying 186 manufacturing firms in the US. He found that small-firm bootstrapping methods were correlated with the firms' financial conditions (the data for the firms' financial conditions were obtained from the Kauffman database). Furthermore, highly levered, illiquid, and underperforming firms chose to use owner-related-, joint-utilization-, and payment-delaying bootstrapping methods.

Similarly, Neeley and Van Auken (2009) used a questionnaire based on the Winborg and Landström study (2001) to analyze the influence of education, age, and gender on financing methods of 247 business owners in Illinois. The analysis identified significant differences between owners in terms of their personal characteristics and the bootstrapping approaches they used. In a later study, Neely and Van Auken (2010) examined the effect

of gender on bootstrapping methods. After analyzing 247 firms in Illinois (32 owned by women; 215 by men), the researchers found bootstrap finance methods to be similar among female-owned and male-owned small firms. However, they did find that their choices were affected differently by their age and education and their firms' change in sales and overdraft privileges.

Willoughby (2008) includes revenue and other non-traditional sources of funds under the umbrella of "unorthodox" bootstrap financing. Having used a sample of 184 bioscience technology firms (93 from New York State and 91 from Utah), he found that unorthodox bootstrap financing was the dominant method of financing in that industry.

Winborg (2009) identifies seven motives for seeking bootstrap financing: cost reduction, managing without long-term external finance, lack of capital, risk reduction, gaining freedom of action, saving time, and enjoyment in helping others. Having conducted his research with 91 Swedish business founders, Winborg examined the relative importance of the different motives in using financial bootstrapping in new businesses. He found that cost reduction was the most important motive, followed by lack of capital. Enjoyment of helping others and saving time were in the third and fourth place. He found that the relative experience of the founders in terms of number of earlier start-ups is the most significant influence for using bootstrapping.

Smith (2009) sheds light on how technology-based start-ups fund innovation through studying the biographies of three well-known UK-based entrepreneurs using the Thorne (1989) factors. The case studies confirm the importance of personal networks in bootstrap financing innovation.

Having sampled 606 small firms in the US, Bosse and Arnold (2010) used the Real Options framework to forecast small firms' bootstrapping behaviour with respect to trade discount. Their findings suggest that the greater is the cash flow generated by taking the discount for early payment, the more entrepreneurs are likely to take advantage of it. The length of time until the trade credit must be paid in full has the opposite effect on the use of early payment discount.

Lam (2010) conducted a longitudinal, multi-stage fieldwork study in Hong Kong and Shanghai to understand bootstrap financing from an enactment perspective. A total of 17 companies, and 59 informants (including 33 business owners) participated in the multi-stage fieldwork over a period of two and a half years. The paper highlights the active role entrepreneurs take in managing both the demand for and the supply of entrepreneurial finance to narrow the dynamic funding gap.

Jones and Jayawarna (2010) linked social networks and bootstrapping activities to the performance of firms during the early stages of operation. Based on a sample of 211 entrepreneurs, their longitudinal study used structural equation modelling, and differentiated between the roles of strong ties, weak ties, and brokerage in accessing three different types of bootstrapped resources: payment related-, owner related-, and joint utilisation techniques. The results indicate that those entrepreneurs who make use of their network ties to bootstrap additional resources will enhance the performance of their business. Having strong ties allows companies to acquire resources from family and close friends and exploit joint utilization bootstrapping techniques. Weak ties, on the other hand, are positively correlated with payment-related bootstrapping methods. Brokerage, using intermediaries to access new contacts, is positively linked to both payment-related and joint-utilisation techniques, thus enhancing the firm's performance.

Yilmazer and Schrank (2010) integrated relevant literature and the Sustainable Family Business Model regarding interchange of financial resources between family and business by examining two sources of literature: literature on the intermingling of business and household resources from the family firm, and that on the financial bootstrapping studies from the small business finance. The study discusses the risk that owner bootstrapping and intermingling may place on the household and the business.

Perry, Chandler, Yao, and Wolff (2011) studied 431 nascent entrepreneurial ventures. They compared externally-oriented versus internally-oriented bootstrapping techniques and compared cash-increasing and cost-decreasing techniques with respect to becoming operational. According to their findings, when bootstrapping increased cash and decreased cost of a new venture, externally-oriented bootstrapping techniques were a positive

predictor of subsequent positive cash flows. Internally-oriented techniques, on the other hand, were not correlated with subsequent cash flows.

Vanacker, Manigart, Meuleman, and Sels (2011) investigated the relationship between bootstrapping strategies and subsequent venture growth using a longitudinal database comprising data from both questionnaires and financial accounts of 21 new ventures. What they found was that new ventures that use more owners' funds, employ more interim personnel, encourage customers to pay quickly, and apply for more subsidy programs, demonstrate higher growth over time.

Patel, Fiet, and Sohl (2011) used a sample of high-technology firms to test the non-linear relationship between bootstrapping and venture growth and the moderating effects of alliances. They found that bootstrapping has an inverted-U relationship with venture growth; however alliance diversity enhanced the positive effects of bootstrapping while mitigating its negative effects on venture growth.

Bruno Dallago (2011) analysed the situation of small- and medium-sized enterprises (SME) in Hungary. After reviewing and accessing the main features of the then recently implemented policy strategies, he concluded that the lack of financing is not an important obstacle to the creation of small firms, as at the early stages they rely on informal sources. Although Dallago does not use the term bootstrap financing, he argues that leasing, which is considered a bootstrapping method, is the most successful among financial instruments—its use has increased threefold between 2000 and 2005, reaching 5.4% of GDP—and that factoring- and business angels—again bootstrapping methods—are underdeveloped.

Jayawarna, Woodhams, and Jones (2012) used a sample of 211 nascent entrepreneurs in early stages of business start-up to examine gender differences with respect to different forms of bootstrapping behaviour. Their study demonstrates a significant difference with regards to different forms of bootstrapping behaviour. Features of capital markets, and business and personal characteristics that limit female business owners from accessing sources of traditional finance, also impede their access to the most effective forms of bootstrapping behaviour.

Using the bootstrapping techniques identified by Winborg and Landström (2001), Neeley and Van Auken (2012) examined 245 small business owners in Illinois. What they found was a correlation between entrepreneurs' use of bootstrap financing and the use of short- and long-term debt: firms that have long-term or short-term debt have greater usage of bootstrap sources. However, future access to long-term debt was indirectly related with bootstrap financing.

Malmström (2014) examined bootstrapping behaviour in small ventures based on a survey of 91 entrepreneurs and interviews with 10 entrepreneurs. Having developed a taxonomy of strategic bootstrapping behaviour, he outlined three bootstrap financing strategies for resource mobilization in small ventures: *quick fix*, *proactive* and *efficient* bootstrappers (see Table 2.4 on page 53).

Quick-fix bootstrappers emphasize temporary access to resources and prefer internally-oriented activities; proactive bootstrappers focus on operational resource issues; lastly, efficient bootstrappers prefer activities that are externally and vertically oriented, up or down in the value creation chain.

Grichnik, Brickmann, Singh, and Manigart (2014) view bootstrapping as an alternative resource management approach directed at avoiding market-based resource transactions. Their study found that nascent entrepreneurs with greater levels of human capitals in different areas, managerial experience, and higher levels of education engage in bootstrapping to a greater extent. Nascent entrepreneurs draw more on their weak tie network for bootstrapping activities than on their strong tie network. An environment that is perceived as hostile or has insufficient access to external financial capital leads to a higher propensity to engage in bootstrapping activities.

Table 2.4: Key Discriminatory Factors of the Entrepreneurial Strategy Profiles

Constitutive Elements	Quick Fix	Proactive	Efficient
Resourcing route	Dominated by used, reduced, forgone, or delayed personal compensation and savings as a resourcing route	Dominated by using friendship and social ties as a resourcing route	Dominated by used reduced, forgone, or delayed payments as a resourcing route
Approach to resourcing	Making use of internal resources to improve cash flow	Securing access to operational resources via the social network at minimal cost	Exploiting business relationships along the value chain to improve cash flow
Scope orientation	Internal orientation	Social orientation	Market orientation
Structures of activities	Seeks to build and operate internal structures to address a resource need	Seeks to build and operate social structures to address resource needs	Seeks to build and operate external structures to address resource needs
Timing	Fragmented, often episodic and reactive in nature	Preplanned, often proactive in nature	Fragmented, often episodic and reactive in nature
Scale	Small to moderate scale	Small to large scale	Small to large scale
Underlying logic	The entrepreneur's personal financial status	The social exchange structures and familiarity with subsidy support	The routines of the exploited external business actors
Limitations of the resourcing route	Reduced risk of losing control	Lower costs and need for capital	Lack of financial capital
Motivation dominated by	Desire for autonomy, freedom of action, and privacy Pride of being self-sufficient and a drive to get by The growth of the business to the point where it can yield a very much higher future revenue stream and capital gain, a 'jam tomorrow' philosophy	Trust in social relations Gaining legitimacy through social position The use of social obligations allows for a 'jam today' philosophy and do not necessitate the entrepreneur to put his or her own money at risk	Desire to save time and cope with financial distress Efficiency focus to reduce costs The opportunistic use of contractual credibility allows for a 'jam today' philosophy and do not necessitate the entrepreneur to put his or her own money at risk
Exploitation of	Personal and private contracts – reliance on using private means	Social contract – reliance using social obligations	Market contracts – reliance on negotiation and opportunistic actions
In exchange for	The sacrifice of immediate personal financial returns	Social obligations and returning favors	The sacrifice of business contracts up/down the value chain
Cost in terms of	Postponed compensation and put personal investment opportunities at risk	Returning favors that social relations may require	Credibility at external business factors
Implications of pursuing the strategy	Limitation in their ability to address larger financial needs or aspiration of growth Low requirements on openness and resource sharing May restrict opportunities for collaborative development on a wider scale Appear to support growth opportunities well	The development of social structures through the network is a prerequisite for this resourcing route High requirements on openness and resource sharing Appear to support growth opportunities to a great extent	Exploitation of existing business relationships may be a potential to bridge situations of financial distress but may jeopardize these relationships, which ultimately may hurt profitability Illegitimate activities may inhibit the ability to raise financial resources from traditional sources due to potential notifications of late payments at authorities Appear to support growth opportunities to some extent

Source: – (Malmström, 2014, p.37)

All the findings indicate that financial bootstrapping in the early stages of small businesses is a widely used technique. Although bootstrapping, as seen, encompasses a wide variety of techniques, firms rely mainly on just a few methods. Except for Lahm and Little (2005), Smith (2009), Lam (2010), and Malmström (2014), researchers used mostly questionnaires, a large number of which were based on Winborg and Landström's study (2001). The studies—most of them cross-sectional—sampled anywhere between 88 and 606 participants. A few research papers for example: Smith (2009), Jones and Jayawarna (2010), Lam (2010), Vanacker et al. (2011), and Jayawarna et al. (2012)—are longitudinal studies. Smith (2009), Vanacker et al. (2011), Dallago (2011), Jayawarna et al. (2012), Malmström (2014), and Grichnik et al.'s (2014) studies were conducted in Europe, and Lam's (2010) was conducted in China.

2.4 Bootstrap Financing of Technology-Based Firms

The number of sources of capital available to a firm depends on its risk profile. The higher the risk profile of a firm, the fewer potential sources of capital the firm will attract. Not surprisingly, financiers are reluctant to fund high-risk firms because they are concerned about the company's ability to generate enough income to repay the investment. Because of their long product development time, unproven markets, limited asset base with hard-to-value intangibles, and intellectual property rights, technology-based firms are almost always considered "high risk." What owners of small, technology-based firms have in creativity and technological know-how, they often lack in business acumen; in other words, their experience in raising capital is, at best, limited (Van Auken, 2005), which only raises their risk profile.

Bootstrapping thus provides an opportunity for a technology-based firm to grow without incurring more debt, which would result in additional drain on the cash flow and working capital, or worse yet loss of control, which is widely perceived as a consequence of selling equity in the business (Harrison et al., 2004). Having control of a business is a key issue for innovators, who do not want to see their rights to their intellectual property dilute or disappear (Smith, 2009). Not only is bootstrap financing easily obtained, but it is convenient and non-bureaucratic, since it does not require a formal business plan or

collateral (Van Auken, 2004). Because of the high risk associated with technology-based, innovative firms, they are confronted with a restricted access to traditional capital, they are an ideal model to use in studying bootstrap financing. It is not surprising that more than 35 percent of the studies in the literature review on bootstrap financing focus on technology-based businesses. See Table 2.5 on page 55.

Table 2.5: Research on Bootstrap Financing of Technology-Based Firms

Reference	No. of Firms	Location of Firms	Firms' Sector	Research Methodology
Bhide (1992)	100	US/20 cities in 12	Mostly technology firms	Interviews
Freear et al. (1995a)	77	US/Massachusetts	Software companies	Questionnaire
Harrison and Mason (1997)	40	UK/Northern Ireland	Independent software firms	Questionnaire replication of the study (Freear et al.)
Van Auken (2004)	44	US/Midwestern states	Technology-based firms	Questionnaire
Harrison et al. (2004)	40 32 113	UK/Northern Ireland UK/South East England US/Massachusetts	Independent software firms	Questionnaire – extension of the study (Freear et al.)
Van Auken (2005)	44 44	US/single state US/single state	Technology-based firms vs. non-technology-based firms	Questionnaire using Winborg factors
Brush et al. (2006)	88	US/Silicon Valley US/Washington DC US/Boston, US/Chicago, US/New York	IT sector firms	Questionnaire – phone interview
Willoughby (2008)	93 91	US/New York State US/Utah	Bioscience technology firms	Questionnaire – phone interview, – printed interview sheet
Smith (2009)	3	UK	Lotus Oxford Instruments Dyson	Case Study – based on 3 biographies
Patel, Fiet and Sohl (2011)	106	US	Software companies	Questionnaire

The salient findings of the studies include the following points:

1. Bootstrap financing techniques are widely used as an important tool for venture development (Bhide, 1992, Freear et al., 1995a, Harrison and Mason, 1997, Harrison et al., 2004, Smith, 2009). The exception to this is research conducted by Van Auken, who, in his study of 44 technology-based small-firm owners, found bootstrap methods not to be that important (Van Auken, 2005).
2. Cultivating relationships with customers and suppliers is an important bootstrapping technique in product development, while personal resources, personal credits, and personal sacrifices figure more substantially in bootstrapping practices for business development (Freear et al., 1995a).
3. Owners of technology-based firms believe that bootstrap financing methods that lead to improving cash inflow are more important than methods that slow disbursement. The opposite is true for owners of non-technology-based firms (Van Auken, 2005).
4. Small and large technology-based firms differ in their bootstrapping strategies. The former use bootstrapping techniques more often for business development than for product development; the latter, on the other hand, are more dependent on customer-and-supplier relationships to provide access to required resources (Harrison and Mason, 1997, Harrison et al., 2004) .
5. Bootstrap financing is positively correlated with the risk profile of a firm, but it is negatively correlated with the size of a firm's market and whether the owner sought capital during the past year (Van Auken, 2004).
6. There are significant variations in the level and pattern of bootstrap financing among technology-based small firms depending on the location of the firm (Harrison et al., 2004).
7. In the bioscience industry, if bootstrap financing includes growth from earnings, then it is the dominant form of financing. Start-up firms in the bioscience sector rely less heavily than other firms on bootstrapping for their finance. Nevertheless, they benefit financially more from bootstrap strategy than other firms (Willoughby, 2008).
8. Female entrepreneurs leading high-tech ventures that seek growth rely on a variety of bootstrapping activities, which vary by business stage and increase even with

the receipt of equity funding. Companies that have not yet entered the sales phase are more likely to use bootstrapping to reduce labour, while companies with greater sales minimize cost of operation (Brush et al., 2006).

9. Social capital provides an important access to bootstrap finance in technology-based innovative companies (Smith, 2009).
10. Bootstrap financing has an inverted-U relationship with venture growth in high-technology firms, however alliance diversity enhances the positive affects of bootstrapping while mitigating its negative effects on venture growth (Patel et al., 2011).

Case studies are rarely used in bootstrap financing research. Out of more than thirty research papers that I reviewed, only two featured case studies: Winborg and Landström's (1997) study of Lars Anderson and his technology-based venture, and Smith's (2009) analysis of three English innovative companies (Lotus, Oxford Instruments and Dyson).

According to the literature reviews of bootstrap financing, at the early stages of growth, technology-based small firms rely heavily on bootstrapping techniques (Freear et al., 1995a, Winborg and Landström, 2001, Neeley, 2004b).

This dissertation further builds on the existing literature, in that it examines the use of the *bootstrapping* categories and sources identified by Neeley (2004b) in the funding process selected by founder(s) of companies that have become industry leaders in the field of high-technology.

3 Methodology

3.1 Multi-Case Study: a Tool to Understand the Process Dynamics of Bootstrapping

Qualitative research focuses on understanding how people interpret their experiences, how they construct their worlds, and what meanings they attribute to their experiences. Decades before qualitative research became accepted in academia, anthropologists and sociologists were studying people's lives in their natural settings, conducting interviews, and observing local customs and traditions. Chicago sociologists in the 1920s and 1930s emphasized “the intersection of social context and biography” that lies at “the root of contemporary descriptions of qualitative research as holistic” (Bogdan and Biklen, 2007, p.9).

In the second half of the twentieth century, two academic works were published that changed the course of qualitative research and, what is more, legitimized it: *Discovery of Grounded Theory: Strategies for Qualitative Research* (Glaser and Strauss, 1967), and *Toward a Methodology of Naturalistic Inquiry in Education Evaluation* (Guba, 1978). Whereas Glaser and Strauss made a case for building theory from inductively analyzing social phenomena, Guba introduced the concept of *naturalistic* study.

Most definitions of qualitative studies reflect the complexity of the methods used. Among the many definitions, Van Maanen’s is one of the most comprehensive. He defines qualitative research as:

An umbrella term covering an array of interpretive techniques which seek to describe, decode, translate, and otherwise come to terms with the meaning, not the frequency, of certain more or less naturally occurring phenomena in the social world (Maanen, 1979, p.520).

Because of the subjective nature of entrepreneurial constructs, in this dissertation I have decided to rely more on qualitative research. Entrepreneurship is about eventuality,

creation, pioneering, newness, and initiatives (Aldrich and Martinez, 2001, McKenzie, 2007), all of which lend themselves to qualitative research studies.

Case study, along with critical narrative analysis, phenomenology, ethnography, and grounded theory, is a significant qualitative research strategy. However, case study differs from other research strategies in that it conducts an in-depth analysis of a bounded system. (Merriam, 2009). Yin (2009, p.13) describes case study as an empirical inquiry that “investigates a contemporary phenomenon within its real life context, especially when the boundaries between phenomenon and context are not clearly evident”. According to Yin (2009), case study is the ideal strategy when how-or-why questions are being proposed, when the researcher has little control over the events, and when the focus is on contemporary occurrence within some real-life environment. Stake (2005) posits that much can be learned from a particular case. Readers can learn vicariously from an encounter with the case through the researcher’s narrative description. “The colorful description in the case study can create an image: a vivid portrait of excellent teaching, for example—can become a prototype that can be used in the education of teachers or for the appraisal of teaching” (Eisner, 1991, p.199). Further, Erickson (1986) and Merriam (2009, p.51) argues “that since general lies in the particular, what we learn in a particular case can be transferred to similar situations. It is the reader, not the researcher, who determines what can apply to his or her context”.

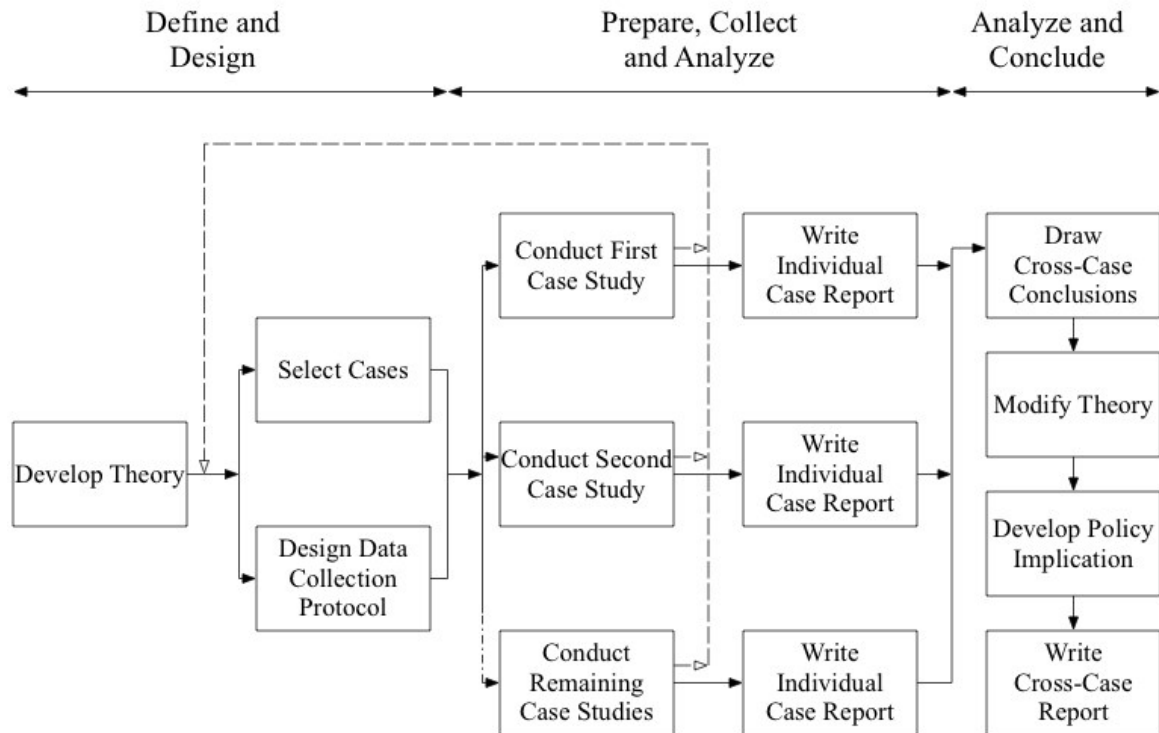
When data from several cases are collected and analyzed, they are referred to as collective-case, multi-case, or multi-site studies. In such studies, a number of cases are studied to investigate a phenomenon, population, or general condition (Stake, 1995). Stake explains:

In multi-case study research, the single case is of interest because it belongs to a convincing particular collection of cases. The individual cases share a common characteristic or condition. The cases in the collection are somehow categorically bound together. They may be members of a group or examples of a phenomenon. (Stake, 2006, p.5)

The more cases are included in a study, the greater is the variation across them. In a multi-case study there are two stages of analysis, those within the case analysis and those in cross-case analysis. For within-case analysis, each case is treated as a comprehensive case itself. Once the analysis of each case is completed, a cross-case analysis is conducted,

where commonalities and differences across cases (cross-case analysis) are examined, as seen in Figure 3.1, on page 60.

Figure 3.1: Case Study Methodology–COSMOS Corporation



Source: – Yin (2009, p.57)

When researchers uncover a significant finding from a single experiment, they need to replicate the study multiple times to see whether conclusions or estimates can be drawn from the data. Only through the process of replication can the original experiment be considered robust (Yin, 2009, p.54). For the purposes of this inquiry, I will be treating multiple cases as multiple experiments. Similarly, the replication logic used in this dissertation follows the one used in multiple experiments. Each case is carefully selected so that it predicts similar results, a literal replication. Conducting research on ten case studies within a multiple case design is therefore analogous to conducting ten experiments on related topics.

In order to understand the process dynamics of bootstrap financing I will analyze the context in which bootstrapping techniques are used. Since context changes over time, I opted for a longitudinal research design. One way to design a longitudinal research is

through case study methodology, which is particularly effective in showing how the context influences the decision making process and provides an opportunity for a comprehensive in-depth examination of the funding process (Smith, 2009). To make the study more robust and compelling, I investigated the bootstrap financing practices of ten highly successful start-ups.

Having worked with founders of new ventures, I have learned that entrepreneurs generally enjoy sharing their experiences. Jack and Anderson (1999), for example, at Aberdeen University, found that “visiting entrepreneurs” enjoyed talking to students about their ventures. The wide-ranging variety of documentary material covering business people and their ventures further attests to entrepreneurs’ willingness to share their stories of success. It is this documentary material—autobiography, biographies, business histories—that forms the bulk of my research sources.

Although the particular details of a specific case may vary, my hope is that my research, as a multi-case study, will build abstractions across cases (Merriam, 2009) and a general explanation that fits the individual cases (Yin, 2009).

3.2 Case Selection and Data Mining From Documents: Autobiographies and Biographies

The multi-case study method does not follow specific data-collection methods, but focuses on holistic description and explanation (Merriam, 2009). When choosing the cases, it was important to me to provide balance and variety, rather than select the cases based on typicality and representativeness. Opportunity to learn is of primary significance (Stake, 1995).

To select the cases, I used the purposeful sampling method, thus further extending the experimental approach. Patton (2002) argues that “the logic and power of purposeful sampling lies in selecting *information-rich* cases for study in depth”, which are cases “from which one can learn a great deal about issues of central importance to the purpose of the inquiry” (p.230). LeCompte et al. (1993), however, prefer the term criterion-based

selection, in which the researcher “creates a list of the attributes essential to the study” and then “proceeds to find or locate a unit matching the list” (LeCompte et al., 1993, p.70).

Denzin defines biographical method “as the studied use and collection of life documents, which describe turning point moments in individuals’ life” (Denzin, 1989, p.7). Autobiography is an account of life based on personal memories (written in first person), while a biography is a reconstruction prepared from facts based on readings or interviews (Sexty and Sexty, 1992), and therefore provides a detailed description of somebody else's life. Although traditionally rare in management science, the use of biographies as a major data source for case studies has been on the rise (Roberts, 2002). In management research, biographies and autobiographies are not only on a par with in-depth interviews (Jones and Conway, 2004); indeed, they often are the primary source of data (Bryman and Teevan, 2005). The data obtained in documents can be used in the same way as data from interviews or observations (Merriam, 2009), and entire studies can be based on personal documents. For example, Abramson’s (1992) case study of Russian-Jewish emigration relies exclusively on his grandfather’s diaries, and an earlier study of Polish immigrants' life based on personal letters written between immigrants and relatives in Europe (Thomas and Znaniecki, 1927).

Despite some of the limitations of the biographical method (the information is at times incomplete, inaccurate, or inauthentic), biographies and autobiographies are an important source of data in management research, because they place individuals within a network of personal, historical, and social events that, combined, make up that individual’s life story.

After conducting a purposeful, criterion-based sampling, I turned my focus on ten entrepreneurs, all of whom meet the following sampling criteria:

1. The entrepreneur has at one point funded a technology-based high-growth innovative venture.
2. On the path to becoming an industry leader, the entrepreneur’s venture traversed all stages of development.
3. The entrepreneur’s life story has been recorded in the form of a biography, which has been published by a reputable publisher (see Table 3.1 on page 63).

Table 3.1: Case-Study Biographies/Autobiographies

Name of Venture	Founder(s)	Title of Book	Author(s)	Type	Date Published	Publisher
Hewlett-Packard Company	Bill Hewlett Dave Packard	The HP Way: How Bill Hewlett and I Built Our Company	David Packard, David Kirby, Karen Lewis	Autobiography	1995	Harper Business
Digital Equipment Corporation	Ken Olsen Harlan Anderson	The Ultimate Entrepreneur: The Story of Ken Olsen and Digital Equipment Corporation	Glenn Rifkin, George Harrar	Biography	1988	Contemporary Books
Apple Inc.	Steve Wozniak, Steve Jobs and Ronald Wayne	Steve Jobs	Walter Isaacson	Biography	2011	Simon & Schuster
Microsoft Corporation	Bill Gates Paul Allen	Hard Drive: Bill Gates and the Making of the Microsoft Empire	James Wallace, Jim Erikson	Biography	1993	HarperCollins Publishers
Dell Inc.	Michael Dell	Direct from Dell: Strategies That Revolutionized an Industry	Michael Dell, Catherine Fredman	Autobiography	2006	Collins Business Essentials
Amazon.com	Jeffrey Bezos	One Click: Jeff Bezos and the Rise of Amazon.com	Richard L. Brandt	Biography	2011	Portfolio/ Penguin
Research In Motion Ltd.	Douglas Fregin Mike Lazaridis	Blackberry: The Inside Story of Research In Motion	Rod McQueen	Biography	2010	Key Porter Books
eBay Inc.	Pierre Omidyar	The Perfect Store: Inside eBay	Adam Cohen	Biography	2012	Little, Brown and Company
Google Inc.	Larry Page Sergey Brin	The Google Story	David A. Vise, Mark Malseed	Biography	2008	Delacorte Press
Facebook Inc.	Mark Zuckerberg Chris Hughes Dustin Moskovitz Eduardo Saverin	The Facebook Effect: The Inside Story of the Company That is Connecting the World	David Kirkpatrick	Biography	2010	Simon & Schuster Paperbacks

The data were analyzed according to the recommendation for qualitative data analysis that have been described by Merriam (2009) and Roberts (2002). This required continuous reading and rereading of material (rather than coding). The data were then analyzed for commonalities as well as inconsistencies within the context of the research questions (Amatucci and Sohl, 2004).

4 **Analysis: The Cases of the Technology-Based Firms**

4.1 **Hewlett-Packard Company**

Company Background

When in 1938 Bill Hewlett and David Packard started using the one-car garage of Packard's home on Addison Avenue in Palo Alto as the workshop of their newly founded company, they could not have imagined that one day their garage would become the epicentre of America's high-technology sector, today commonly referred to as Silicon Valley.

David Packard and Bill Hewlett had met at Stanford University in 1930. Their interests and passions for electronics led both of them to courses in radio engineering. They were encouraged by their professor to combine forces, but because of the Great Depression had to postpone their entrepreneurial plans. After a brief stint at General Electric, Packard reunited with his friend in 1938, and together they started working on their venture. Their beginnings were humble; they would do a job here and a job there, all on a part-time basis. In 1939, after tossing a coin to determine whose name would be first in the company name, they signed a simple partnership agreement, and the Hewlett-Packard Company (HP) was born.

While completing his master's degree at the Massachusetts Institute of Technology (MIT), Hewlett had designed an audio oscillator, which represented the first practical and low-cost method of generating high-quality audio frequencies needed in communications, geophysics, medicine, and defence work. The oscillator became the company's first product, and when executives at Disney Studios heard of the new technology, they ordered eight units to help in the production of the sound equipment of their innovative movie *Fantasia*. For the young entrepreneurs, this was a significant accomplishment. By 1940, their sales totalled \$34,000; the company employed one more person, and their product line included 8 products.

During World War II, Hewlett and Packard had little contact with each other. After the attack on Pearl Harbour, Hewlett was called to active duty, and spent the duration of the war as an officer in the Army Signal Corps, while Packard continued managing HP. Innovation coupled with effective cost control were significant building blocks of HP's success. Although production continued to be the company's main emphasis, product development was as important. By 1943, HP entered the microwave field of technology with signal generators and a radar-jamming device. Since most of HP's product was bought by the military and by defence contractors, the company grew rapidly during the war, by the end of which HP became the acknowledged leader in signal generator technology. In 1947, to take advantage of tax rules and provide more continuity, HP became incorporated. At that time, the company's sales of \$679,000 were generated by 111 employees. In the 1950s, stimulated by yet another war (this time in Korea), the company continued growing and finally in 1957 it went public. According to Packard, the company entered the stock market to provide stock options to employees, but also to acquire other companies through stock exchange. By the end of 1958, HP sales reached staggering \$30 million; the company employed 1,778 employees, and their product line included 373 products (Packard et al., 1995).

Financing the Early Stages of Growth

Bill Hewlett and David Packard decided at the birth of their partnership not to borrow money. Packard's father was appointed as a bankruptcy referee for the state of Colorado in the 1930s, where he witnessed the devastating effects of the Great Depression on businesses and people's lives. These incidents formed his son's attitude towards debt for the rest of his life. Packard notes:

The banks simply foreclosed on firms that mortgaged their assets and these firms were left with nothing. Those firms that did not borrow had a difficult time, but they ended up with their assets intact and survived during the depression years that followed. From this experience I decided our company should not incur any long-term debt. For this reason Bill and I determined we would operate the company on a pay-as-you-go basis, financing our growth primarily out of earnings rather than by borrowing money. We know self-financing was possible because General Radio, a company we admired, had been in business several years, has been successful, and had never sought outside financing. Our feeling was that if they could do it, we could do it. And we have—for more than a half century.

I know that in some industries, particularly those requiring large capital investments, the pay-as-you go approach just isn't feasible. I also know that it has become popular throughout industry to meet capital needs by leveraging profits with equity financing and long-term borrowing. The advocates of this approach say you can make your profits go further by leveraging them. That may be, but at HP our firm policy to pay as we go and not to incur substantial debt (Packard et al., 1995, p.84-85).

However, Packard also noticed that "Self-financing requires constant vigilance and self-discipline" (Packard et al., 1995, p.87).

In fact, Packard's conviction was so strong that he mentions it one more time in his autobiography, and again when he talks about the company's performance during war times. At that time the federal government wanted to prevent companies from making excessive gains from their war effort by limiting companies' profits to 12% of equity, which was overseen by the local Renegotiation Board. David Packard summarizes his meeting with members of the board:

Bill and I had decided we were going to reinvest our profits and not resort to long-term borrowing. I felt strongly about this issue, and we found we were clearly able to finance 100 percent growth per year by reinvesting our profits. After some discussion with the members of the board, they seemed to be impressed with what we were doing but said they had a limit of 12 percent of profit they could allow on equity. I pointed out that our business had been doubling every year and that it would continue to do so for several years. I also told them that I had kept my salary at a lower level than it should have been because I did not think it was fair for my salary to be higher than Bills' army salary. Moreover, I pointed out that we had controlled our costs to the extent that the government could not get better products from anyone else at a lower price. For these reasons I could not accept 12 percent on equity. They said I would have to take my case to Washington. I did so and worked out an agreement with the government that gave our company virtually everything we asked for (Packard et al., 1995, p.58).

With such strong principles, the founders of HP had no choice but to bootstrap finance their venture. At the early stages of the company's growth they would take compensation way below market value; they would control costs; and even forgo salaries. And to finance growth, they reinvested their profits.

In spite of the financially prudent management of the company, cash flow would sometimes present a problem. When in the early 1940s the payment for a unit that Hewlett and Packard had built for the ITT Company got delayed, and they could not meet their payroll requirements, the frugal entrepreneurs realized the importance of short-term working capital. Instead of accepting The Bank of America’s loan of \$500, for which they would have to sign over their accounts receivable, Hewlett and Packard approached their little local bank. The manager, who knew Packard from Stanford University, lent them \$500 based on a note that Packard signed (Packard et al., 1995, p.51). Packard would rather obtain a personal loan than have the company incur even a small amount of debt. Kick-started from Hewlett’s savings of \$538 in 1939, HP rose to become a multibillion dollar industry leader with 317,500 employees and \$112.3 billion revenue (Hewlett Packard Company, 2013).

Bootstrapping Examples

Bootstrapping techniques used during the early stages of operations at Hewlett-Packard are numerous. These examples are divided into categories identified by Neeley (2004b) and are summarized in Table 4.1 on page 68.

Table 4.1: Bootstrapping Examples at Hewlett-Packard Company

Categories Neeley (2004b)	Sources / Techniques	Examples
Owner’s Resources	Savings Accounts	Hewlett contributed \$538 of his savings to start HP.
	Forgone Salary	The Packard’s lived on Lucy Packard’s salary for the first few years.
	Salary from “Other” Job	Bill Hewlett worked for a doctor to develop medical equipment. Packard worked on the Varian Project at Litton Engineering Laboratories.
	Residence for Business Use	HP used Packard’s garage as a workshop.
Owner’s Borrowing	Lines of Credit	Packard took a personal line of credit at Palo Alto National Bank to finance HP.
Relationship Resources	Donated Labour	Lucy Packard donated a lot of her time for HP keeping the books, assisting, and interviewing prospective employees.

Categories Neeley (2004b)	Sources / Techniques	Examples
Cooperation Resources	Equipment or Facilities (or Software) Sharing	HP used Charlie Litton's shop.
		When Litton's shop burned down, they used HP shops during the night, until they could rebuild their own plant.
Cash and Asset Management	Accelerated Receipts	When HP needed cash Packard called his friend, Harold Buttner at ITT, and asked him to pay as soon as possible.
	Used Equipment	David Packard bought a used Sears, Roebuck drill press at GE.
Outsourcing	Professional Services	Al Spear made the cabinets for the oscilloscopes and Ernie Shiller did the sheet metal work.

Institutional Context

At the beginning of the 20th century many of the pioneers in the field of radio engineering were situated in the Palo Alto area. Early wireless work by Stanford graduate Cyril F. Elwell was organized into the Federal Telegraph Company; Lee De Forest invented the vacuum tube in Palo Alto in 1908; and Fritz Kolster developed the radio direction finder in the 1920s. In the early 1902s numerous Bay Area firms relocated to Chicago, which had become the center of the radio industry. Many, however, stayed and, encouraged by Frederick Terman—Stanford's dean of the School of Engineering—founded their own companies in what would later become Silicon Valley. In fact, Terman was so instrumental in contributing to Bay Area's economic growth that he is often called "the father of Silicon Valley" (Ante, 2008).

Through Terman, Packard got a job with Russ Varian, a young Stanford inventor who with his brother Sig, was behind the invention of the klystron tube, the technology that made radar and particle accelerators possible. Terman also introduced David Packard to Charlie Litton, the founder of Litton Systems. And at Charlie Litton's shop Packard met Alex Poniatoff, the founder of Ampex Corporation (Packard et al., 1995). The network, that grew out of and around Stanford University nurtured Hewlett's and Packard's entrepreneurial ambition.

Background and Motivation of Founders

Hewlett and Packard became friends in Prof. Terman's classes in radio engineering at Stanford University. That they would both attend Terman's classes was inevitable. After all, both shared a passion for electronics (at the time called "radio") and a natural curiosity for science. When younger, both Hewlett and Packard would conduct experiments at home to find out just how things worked, some of which involved explosives. Packard's parents were able to provide some financial support to help with their son's university tuition, but he had to work hard during the summers to earn the balance. Hewlett, on the other hand, came from a well-off family. Because he was dyslexic Hewlett was forced to file mental information in a logical form, and was therefore able to retrieve it easily from memory. This procedure proved to be particularly suited for learning math and science. After both graduated with a B.A. degree from Stanford University, Hewlett earned a Master of Science degree in electrical engineering from MIT, and Packard a master's degree in Electrical Engineering from Stanford University (Packard et al., 1995).

While students at Stanford, Hewlett and Packard decided to form a company. Packard notes:

Terman said to them: Well, as you can see, most of the successful radio firms were built by people without much education, adding that business opportunities were even greater for someone with a sound theoretical background in the field. That got us thinking, and with Terman's encouragement (four friends) Bill Hewlett, Ed Porter, Barney Oliver and I were making tentative plans to try to do something on our own after graduation (Packard et al., 1995, p.24).

Although originally founded by Hewlett and Packard, Ed Porter and Barney Oliver joined the team a few years later, and the four of them became the management team of Hewlett-Packard (Packard et al., 1995).

Bill Hewlett's and David Packard's passion for electronics, Hewlett's dedication to the scientific field and Packard's broad based personality that encompassed science and business was the foundation of the success of Hewlett-Packard Company.

4.2 Digital Equipment Corporation

Company Background

Ken Olsen was in charge of designing a small computer at MIT's Lincoln Laboratories that would ensure the Semi-Automatic Ground Environment (SAGE), a defense system for the Air Force, was viable. It was a crucial project that had to be done within 9 months, and Olsen was selected to lead the project, because he had a reputation as a "guy who gets things done" (Rifkin and Harrar, 1988, p.19). Against all odds, he and his team of 15 engineers built the Memory Test Computer in less than 9 months. IBM became the subcontractor of Lincoln Laboratories to manufacture the SAGE computers, and in 1953 Olsen was assigned to be a full time liaison to IBM. Frustrated by the amount of time and energy wasted at IBM—the levels of managers doing nothing but discussing and recommending (Rifkin and Harrar, 1988)—Olsen said one day to his boss at Lincoln Laboratories: "Norm, I can beat these guys at their own game" (Rifkin and Harrar, 1988, p.24). From that moment on, the idea for Digital Equipment Corporation was born.

Together with his fellow engineering and business partner, Harlan Anderson, he would build machines that were cheaper and easier to build and use than the expensive IBM mainframes. Maintaining parts and personnel lists or tracking research tests was a mathematically simple task not requiring the power of a multimillion dollar mainframe, they realized; a simple machine could handle all the basic jobs. They also understood the allure of the new technology: everyone wanted to have their own access to the computers and interact with them via keyboard and monitor, just like the researchers at Lincoln Laboratories. In 1957, Digital Equipment Corporation (DEC) was founded. Olsen and Anderson were not simply creating a company; they were creating an industry.

DEC developed the PDP line of computers that sustained the company's growth for 20 years. After a number of previous models, PDP-8 was introduced in 1965 at an unheard-of price of \$18,000. Eventually more than 50,000 units were sold. It was this computer that triggered the mini-computer industry, and catapulted DEC from a small company to the ranks of the major computer makers (Rifkin and Harrar, 1988). Between 1960 and 1970, DEC grew from a local computer company with 117 employees and \$1.3 million in

revenue into a global company with 5,800 workers generating \$135 million in sales. In 1990, at the peak of its growth, DEC earned more than \$14 billion in revenue and employed more than 120,000 people worldwide (Digital Equipment Corporation (DEC), 2014).

Financing the Early Stages of Growth

If they wanted to make a contribution to the society and turn their idea into products that people could use, Ken Olsen and Harlan Anderson needed a company. One day in 1957, during lunch, they threw together a crude business plan for a computer company that would build computers more cheaply and easily than IBM. They had an idea, and now they had a plan. All that was missing was money. The first company they approached was General Dynamics, which turned them down because of their lack of experience. Without connections or capital, they next visited the Small Business Administration office in Boston and, at their suggestion, contacted ARD, the only venture capital firm in Boston. Olsen and Anderson wrote a letter to General George Doriot, the head of ARD, who was intrigued by the proposal (Rifkin and Harrar, 1988). Doriot, the “father of venture capital”, was not the typical venture capitalist by today’s standards; his approach was closer to that of a modern angel investor or adventure capitalist. He believed in building companies for the long haul, not flipping them for quick profit, and often worked with a company for a decade or more before realizing any return. He nurtured his start-ups as if they were his progeny:

When you have a child, you don’t ask what return you can expect. But if a man is good and loyal and does not achieve a so-called good rate of return, I will stay with him. If I were a speculator, the question of return would apply. But I don’t consider a speculator—in my definition of the world—constructive. I am building man and companies. (Ante, 2008, p.XVII).

Although at first finding Olsen and Anderson’s ambitions immodest, Doriot did invite the entrepreneurs to present their proposal before the board. ARD’s employees took a liking to the intense young pair, and wanted them to succeed, but not without first giving them three last pieces of advice:

One was, don't use the word, "computer," said Olsen, because Fortune magazine said no one was making money in computers and no one was about to. So we took that out of our proposal. We were going to make modules first, anyway. And they said, "don't promise five percent profit". You see we looked in the library. All good companies seemed to make about five percent on sales. The staff said that if you're asking someone to give you money, you've got to promise better results than that. So we promised ten percent. The third thing they said was, "most of the board is over 80, so promise fast results". So we promised to make a profit in a year (Ante, 2008, p.12).

It was not the sophisticated business plan that convinced the board; it was the dedication and passion required to create a successful business from scratch (Ante, 2008, p.151). Of the requested \$100,000, ARD offered them \$70,000 in equity financing—for a 70 percent share in the company—and a \$30,000 loan to be given later in the year. Another \$300,000 was set aside several years later as a line of credit for when the new enterprise needed it. It was a take-it-or-leave-it deal. With no other offers on the horizon and no clue how to negotiate a better offer, Olsen and Anderson accepted the deal.

Seven hundred of DEC's one thousand shares went to ARD; Olsen and Anderson got two hundred; and the final one hundred were reserved for a manager who could help run the business. As the leader, Olsen took 12 percent of the shares, leaving Anderson with 8 percent. After seeing how frugal Olsen and Anderson were in the first days of the venture—they used bootstrapping methods every time they could—ARD did not press to hire a manager. Since the 100 shares for the manager were never issued ARD kept those shares and thus owned 77 percent of the venture. To provide some degree of financial assistance, General Doriot assigned Dorothy Rowe, an associate of ARD to serve as the company's first treasurer. Since ARD did not initially want the company to build computers, Olsen and Anderson changed the name of Digital Computer Corporation to Digital Equipment Corporation (Rifkin and Harrar, 1988, p.14).

Although Doriot would never claim credit for Digital's growing success, DEC would have never become as successful as it did without his constant and close support during its difficult early years. Doriot was Olsen's "professional life line" (Ante, 2008, p.179):

He was always there as a mentor and help. Most of his ideas he didn't present in a way you had to accept it. He presented them in a way, after it

was done; as you thought you had thought of them yourself (Ante, 2008, p.179).

Doriot always had DEC’s interest at heart. In DEC’s early years, ARD had numerous suitors. As majority owner, ARD could have easily sold the company for a quick and easy profit. Itek Corporation, Bechman Instruments, Xerox, Hewlett-Packard—they all at some point expressed interest in purchasing the company. But Doriot rejected every offer, betting that the company could prosper on its own, even though its long-term success was far from certain (Ante, 2008, p.180).

DEC went public on August 19, 1966 at a share price of \$22. Ken Olsen’s 13% stake was worth \$7 million. In nine years ARD’s \$70,000 investment skyrocketed in value by a factor of five hundred, to \$38.5 million, validating Doriot’s model of nurturing the growth of a technology-based new venture (Ante, 2008, p.196). DEC was acquired in June 1998 by Compaq, which subsequently merged with Hewlett-Packard in May 2002. Some parts of DEC, notably the compiler business and the Hudson, Massachusetts facility, were sold to Intel.

Bootstrapping Examples

The bootstrapping techniques used during the early stages of operations at DEC are numerous. These examples are divided into categories identified by Neeley (2004b) and are listed in Table 4.2 on page 74.

Table 4.2: Bootstrapping Examples at Digital Equipment Corporation

Categories Neeley (2004b)	Sources / Techniques	Examples
Relationship Resources	Donated Labour	Aulikki Olsen cleaned the office.
Quasi-Equity	Angels, Group	George Doriot the “father of venture capital” and his venture capital firm acted in many ways as a group of angels.
Cooperation Resources	Equipment or Facilities (or Software) Sharing	DEC shared a building with Arthur Discount Furniture Store.

Categories Neeley (2004b)	Sources / Techniques	Examples
Cash and Asset Management	Used Equipment	Olsen bought used office equipment.
Outsourcing	Professional Services	A local portrait photographer developed the film for the printed circuit board.

Institutional Context

When Olsen enrolled at MIT in 1947 the computer technology was still in its infancy, and MIT was at the centre of a nascent technological development that would usher in a new era. Founded in 1951 with money from the Department of Defence to concentrate on needs of the Air Force during the Cold War, MIT's Lincoln Laboratories was selected as a consultant and primary contractor for the massive Semi-Automatic Ground Environment (SAGE) project. The project basis was the Whirlwind computer, which was developed to power a cockpit flight simulator for the Navy. Soon becoming the fastest computing machine of the 1950s, Whirlwind relied on vacuum-tube circuits with short word length. An operator could sit behind the computer and interact with it. For Olsen the interactive nature of the computer was a revelation: it brought computing power to the individuals. Olsen's and Anderson's work experience at MIT Lincoln Laboratories laid the foundation of their company, DEC.

Background and Motivation of Founders and Finance Providers

Olsen enrolled at MIT to study electrical engineering after serving in the Navy during the war. While studying for his master's degree in engineering he ended up working at the school's Lincoln Lab. Although not a superb student, he was considered by many a first-class practical engineer (Rifkin and Harrar, 1988), which was probably why he was picked among 60 engineers to lead a team of computer developers. Despite his impressive record at MIT, however, he never got the praise he deserved from the business community. In the end "nobody cared" said Olsen (Ante, 2008, p.149). If he was going to get the commercial world to respect and value his ideas he needed to start a company (Ante, 2008, p.148). In the spring of 1957, he teamed up with Harlan Anderson, a friend from Lincoln Lab, to

launch a computer company. Before joining Lincoln Lab, Anderson had graduated with a Bachelor of Science degree in engineering-physics and a Master of Science in Physics from the University of Illinois. Anderson brought his desire to create and his love for engineering and computers to Lincoln Lab from the Midwest. When Olsen and Anderson were offered the equity deal from ARD, they jumped on the opportunity.

We thought we could succeed with that amount of money and we wanted to do the computer company so badly that we were willing to accept the terms”, recalls Anderson. “The excitement of creating a company was more important than the terms of the deal” (Ante, 2008, p.151).

George Doriot, the finance provider of DEC, moved to the United States in 1921 from France. He enrolled in Harvard Graduate School of Business Administration to pursue a better life in the aftermath of the Great War, and was appointed as a professor at the Harvard Business School in 1926. After becoming a U.S. citizen in 1940, he was commissioned a lieutenant colonel in the U.S. Army Quartermaster Corp a year later (Ante, 2008). As the head of research and development he applied his business acumen to war. Under his command the U.S. army found substitutes for critical raw materials, and developed dozens of innovative items such as water repellent fabrics, cold weather shoes and uniforms, insecticides, and nutritious compact food including K-rations. He oversaw the invention of Doron, the lightweight plastic armour that was named in his honour. For his achievements Doriot was promoted to the rank of Brigadier General and won the Distinguished Service Medal, the highest U.S. military medal given to non-combatant (Ante, 2008). After the war Doriot went back to Harvard and pursued another passion, public venture capital investment. As the first firm of such kind, ARD democratized entrepreneurship by focusing on technical companies and by providing intellectual leadership to the small nascent community of technology-based ventures (Ante, 2008). ARD helped funding 150 companies, none of which, however, matched the success of DEC (Rifkin and Harrar, 1988). Doriot and Olsen were both ambitious; they were motivated, however, not by money, but by a desire to create a better world through building great products and companies.

4.3 **Apple Inc.**

Company Background

When Steve Wozniak took his home-designed computer board to the Homebrew Computer Club, a local group of electronics hobbyists in Palo Alto, California, it received little recognition; after all, its microprocessor was based on the MOS 6502 chip rather than the more popular Intel 8080. He tried selling his design to various sophisticated high-tech companies in Silicon Valley, but they weren't interested either. The only option, as he saw it, was to sell the design to Call Computer, a small time-sharing business. Steve Jobs, a friend and fellow member of the Homebrew Computer Club, intervened, and convinced Wozniak that they make printed circuit boards and sell them to computer hobbyists. Ron Wayne, an Atari field engineer with considerable practical business experience, joined them, and the three of them signed their partnership agreement on April 1, 1976 in Mountain View, California. Jobs suggested that they call their business Apple.

However, the personal computer market did not exist yet. Faced with the uncertainty of Apple's future, and the fear that he would have to pay 10% of Apple's debt if the company went under, Wayne changed his mind, and left the business. At the time, this would have seemed hardly foolish. The two young entrepreneurs did not exactly inspire success; not only were they operating out of a garage, but Wozniak had dropped out of college, and Jobs had barely graduated high school. The high-technology establishment did not take them seriously either. However, after talking to the young entrepreneurs, Mike Markkula, an angel investor, saw potential in the young duo and decided to invest. Markkula underwrote a \$250,000 bank loan in exchange for 26% equity in the company, and Apple Computer, Inc. was born on January 3, 1977 (Isaacson, 2011, p.77). With some operating capital and professional guidance at their disposal, Jobs and Wozniak moved the company out of the garage and on April 17, 1977 launched the Apple II, which differed from its major rivals in that it came with color graphics and an open architecture, a 5 ¼ inch floppy disk drive, and the Disk II interface. Apple II became the platform of the first business application, the VisiCalc spreadsheet program, which transformed Apple from a hobbyist's toy into a business machine. In December 1980, less than four years after its incorporation, Apple launched its Initial Public Offering of stock to the investing public.

Financing the Early Stages of Growth

Jobs and Wozniak founded their entrepreneurial venture with their own money. To contribute to the capital needed to start their venture (\$1,300), Wozniak sold his scientific Hewlett-Packard calculator, and Jobs his Volkswagen van (Butcher, 1988, p.64). But the initial capital was not enough to run the company. When a fellow Homebrew Club member ordered fifty fully assembled computer boards, parts for which cost around \$15,000, they turned to their friends. Wozniak pursued his friend's father, Allen Baum to lend the company \$5,000 (Isaacson, 2011, p.67)—Baum lent the money without being sure he would ever get his money back (Butcher, 1988, p.74). With two thirds of the money for the parts still missing, Jobs and Wozniak convinced the supplier (Newton, of Kierulff Electronics) to help them out; the young entrepreneurs bought the parts on credit without interest and with the proviso that the order be paid within thirty days (Butcher, 1988, p.69). Already imagining the next version, Jobs and Wozniak referred to their current model as Apple I.

Although realizing that personal computers should come in a package, they also knew that producing a fully packaged Apple II would require significant capital. Having no “proper” office for their business operation but their garage, they failed to secure a loan from a bank (Isaacson, 2011, p.67). They were considering selling the rights to a larger company, but with the personal computer market still non-existent, successful tech-companies catered only to the tiny market of computer hobbyists. Consequently, seeing no commercial potential in small computers, Atari, Commodore Business Machine, and Hewlett-Packard all declined their offer. Jobs turned to Nolan Bushnell, an Atari executive for a private investment. Bushnell turned down the offer, but suggested to Jobs to approach Don Valentine, a venture capitalist and the founder of the pioneer Sequoia Capital. Bushnell gave an advice to Jobs: “The longer you can go without having to go to those guys, the better off you are” (Ante, 2008, p.235). Although not interested, Valentine suggested that they partner up with someone who understands marketing and distribution: someone who can write a business plan; in other words, someone like Mike Markkula.

Markkula visited them in Jobs's parents' garage, where Wozniak immediately started showing off his Apple II. Impressed with what he saw, Markkula proposed they write a business plan together. "If it comes out well, I will invest, and if not you've got a few weeks of my time free" (Isaacson, 2011, p.76). Markkula ended up writing most of the report, and in the end offered to guarantee a line of credit up to \$250,000 in return for an equal partnership, on condition that Wozniak quit his job at Hewlett-Packard and work full time at Apple. Each of the three partners would own 26% of the stock, and the rest of the shares would be reserved to attract future investors.

As an angel investor, Markkula played a critical role at Apple for the next two decades, and even became a father figure to Jobs, who learned from him about marketing and sales. "Mike really took me under his wing," Jobs recalled (Isaacson, 2011, p.78). In 1977, Markkula, who understood the importance of appearance, started concentrating on building the reputation and image of Apple as a stable company. He wanted prestigious venture capitalists to invest in Apple—investors who would not only bring in the necessary funds, but also improve the company's image. In 1978, the final arrangements for venture capital financing of \$517,500 were completed. Alongside Don Valentine, who finally came aboard, other highly reputable venture capitalists—Arthur Rock and the venture capital firms such as Sequoia and Venrock—decided to invest (Ante, 2008, p.236). Markkula's plan to attract the kind of investors who would get the company's attention on Wall Street paid off. In 1980, after barely four years of founding their company, the owners of Apple decided to go public. It was the most oversubscribed initial public offerings since that of Ford Motors in 1956 (Isaacson, 2011, p.102).

From humble beginnings of operating from a garage, Apple Inc. grew to a multinational global technology giant, generating worldwide revenue of \$170.9 billion and employing 80,000 people in 2013 (Apple Inc, 2013).

Bootstrapping Examples

Apple's bootstrapping techniques used during the early stages of operations at Apple are numerous. These examples are divided into categories identified by Neeley (2004b) and are summarized in Table 4.3 on page 80.

Table 4.3: Bootstrapping Examples at Apple Inc.

Categories Neeley (2004b)	Sources / Techniques	Examples
Owner's Resources	Savings Accounts	Wozniak invested \$500 by selling his scientific calculator and Jobs invested \$800 by selling his Volkswagen bus.
	Forgone Salary	The first month Apple did not make any money
	Salary from "Other" Job	Wozniak kept his day job at HP until Markkula joined the company.
	Residence for Business Use	Jobs's bedroom and later the family garage were used as workshop.
Relationship Resources	Donated Labour	Jobs's mother, sister and their friends worked for the company. Wayne, the former partner, designed the logo for free.
	Cash Contributions (Investment from Family/Friend)	The father of Jobs' friend, Allan Brown, lent \$5000 to the founders.
Quasi-Equity	Angels, Individuals	Mark Markkula, an angel investor invested \$250,000 in exchange for equity.
Cash and Asset Management	Trade Credit	Jobs convinced the manager of Cramer Electronics to sell parts to Apple on a thirty-day credit.
	Used Equipment	Jobs bought all sorts of used tools and equipment for manufacturing.
Outsourcing	Professional Services	1. Instead of hiring a secretary Apple hired an answering service. 2. J. Manock, a local consultant designed the case for Apple II. 3. Hired Regis McKenna, a publicist.
	Temporary Employees	Apple hired Elizabeth Holmes as a part-time bookkeeper.

Institutional Context

Silicon Valley and the Homebrew Computer Club were pivotal in putting Apple Inc. on its path. In the 1960s the West Coast began attracting an increasing number of tech-companies away from the East Coast. A hospitable climate and a greater acceptance of ethnic diversity gave the west an edge that was needed to draw creative talent. Higher education was instrumental in developing the area. The University of California, California Institute of Technology, and Stanford University gained a reputation for cutting-edge research in science and technology. Similarly, the private sector began to be dominated by ground breaking commercial enterprises. In the 1940s Hewlett-Packard, Varian Associates, and Ampex had led the way. In 1958, eight talented engineers left Shockley Semiconductor, and created Fairchild Semiconductors, the first tech spin-off. Ten years later, Robert Noyce and Gordon Moore left Fairchild to found Intel. In 1971, Don Hoefler, a computer journalist, referred to the area as “Silicon Valley” because of the high concentration of computer-related industries (Ante, 2008).

The Homebrew Computer Club—what McCracken (2013) would call “the crucible for an entire industry”—was an early computer hobbyist group in Silicon Valley which met from March 5, 1975 to December 1986. It was an informal group of electronic enthusiasts, entrepreneurs, and technically-minded hobbyists who would meet to openly exchange ideas, and trade parts, circuits, and information pertaining to do-it-yourself construction of computing devices. Bob March and Lee Felsenstein, the founders of Process Technology, and Adam Osborn, who created Osborn Technology, were members. The club had its own newsletter, 21 of which were published from March 15, 1975 until December 1977. Gordon French and Fred Moore founded the club and organized the first meeting in French’s garage in Menlo Park to review the first MITS Altair microprocessor. Wozniak credits that first meeting with inspiring him to design the Apple I (Wozniak and Smith, 2006).

Background and Motivation of Founders and Finance Provider

Steve Jobs was adopted at birth by Paul and Clara Jobs. Jobs's youth was riddled with frustrations over formal schooling. At Monta Loma Elementary school in Mountain View,

he was considered a difficult yet incredibly smart child. In fact, school officials recommended that he skip two grades on account of his test scores, a proposal his parents declined. Jobs later attended Cupertino Junior High and Homestead High School in Cupertino, California. At Homestead, Jobs became friends with Bill Fernandez, a neighbour who shared the same interests in electronics. Fernandez in turn introduced Jobs to his neighbour, Steve Wozniak, a computer and electronics whiz kid, also known as "Woz". Although they went to the same high school, Wozniak and Jobs did not know each other. After high school graduation Jobs enrolled in Reed College in Portland Oregon, only to drop out of it six months later. The next year and a half Jobs would spend attending creative classes such as calligraphy. After travelling in India for seven months, Jobs returned to the US and went back to work for Atari as a technician. He rekindled his friendship with Wozniak, and they began to attend meetings of the Homebrew Computer Club. Having previously decided to take a year off from the UC Berkeley, Wozniak was at the time working for Hewlett-Packard on a mainframe computer. In 1976, he developed the computer that eventually made him famous, Apple I, the parts for which—hardware, circuit board designs, operating system—he designed alone in his spare time. It was the first time in history that a character displayed on a TV screen was generated by a home computer. With the Apple I design, he wanted to impress other members of the Palo Alto based Homebrew Computer Club. Jobs and Wozniak's partnership could not have been more efficient in Wozniak's words: "Every time I'd design something great, Steve would find a way to make money for us" (Isaacson, 2011, p.62). Bushnell the founder of Atari said: "There is something indefinable in an entrepreneur. And I saw it in Steve (Jobs). He was interested not just in engineering, but also the business aspect" (Isaacson, 2011, p.55). Both Wozniak and Jobs were motivated with creating a very good product and an industry. "We participated in the biggest revolution that had ever happened" Wozniak said. "I was so happy to be part of it" (Isaacson, 2011, p.69). Jobs recounts:

I never worried about money. I grew up in a middle-class family, so I never thought I would starve. And I learned at Atari that I could be an okay engineer, so I always knew I could get by. I was voluntarily poor when I was in college and India, and I lived a pretty simple life even when I was working. So I went from fairly poor, which was wonderful, because I did not have to worry about money, to being incredibly rich, when I also didn't have to worry about money.

I watched people at Apple who made a lot of money and felt they had to live differently. Some of them bought a Rolls-Royce and various houses, each with a house manager and then someone to manage the house managers. Their wives got plastic surgery and turned into these bizarre people. This was not how I wanted to live. It's crazy. I made a promise to myself that I'm not going to let this money ruin my life (Isaacson, 2011, p.105).

Mike Markkula, the angel investor, was only thirty-three years old when he met Wozniak and Jobs. He had already retired after working at Fairchild and then at Intel, where he made millions on his stock options when the company went public. Jobs, who immediately took a liking to Markkula, thought he was interested in their company because he was passed for the top marketing job at Intel, and wanted to prove himself through a new product (Isaacson, 2011, p.76). But Markkula was motivated by creating a company. "Markkula, whose estimated net worth was more than 22 million dollars at the time, enjoyed his retirement and he did not need additional money. Yet he saw an opportunity, not just for riches, but to make an incredible mark for himself in the business world" (Butcher, 1988, p.84).

4.4 Microsoft Corporation

Company Background

When Bill Gates and his friend Paul Allen saw a picture of an Altair microcomputer on the cover of the December 1974 issue of *Popular Electronics*, they knew this was their opportunity to capitalize on their previous expertise with BASIC, a programming language. At the time, Gates was a second-year student at Harvard University, and Allen, having dropped out of Washington State University, was working for Honeywell. After approaching Ed Roberts of Micro Instrumentation and Telemetry Systems (MITS), the manufacturer of the Altair, they offered to develop BASIC a programming language for the computer. Since neither Gates nor Allen had an Altair, they bought a manual for the Intel 8080 chip used in the Altair, and wrote a program for Harvard's PDP-10 computer, creating it to resemble Altair's 8080 chip. By late February of 1975, after working 20 hour days for eight weeks, they were ready to try out their new product. Allen flew out to MITS's office in Albuquerque, New Mexico, and his successful demonstration of the program marked the beginning of the personal computer revolution. Allen came back with

a development model and, rather than using Harvard's computer to continue with the development, they bought computer time from a timesharing service in Boston. Gates left Harvard to join Allen in Albuquerque to work on the project on a full-time basis.

Micro-Soft (the hyphen in the name was soon dropped), a partnership between Gates and Allen, was born in the summer of 1975. After deciding that New Mexico was not a good location for a fast-growing software company, Gates and Allen moved Microsoft and its 11 employees to Seattle in January 1979, where they finally got their own computer system, a \$250,000 high-end DECSYSTEM 20. In early November of 1980, Microsoft and IBM signed the agreement that eventually catapulted Gates and Allen into the ranks of the richest entrepreneurs in the world. Microsoft would develop the software for IBM's first personal computer and supply the crucial disk operating system, known as DOS. In 1981, Microsoft changed from a partnership to a privately held corporation. During the next few years Microsoft transitioned from a company creating programming languages and operating systems to one selling applications to the retail market. Word, Excel, and numerous versions of Windows were created. On March 13, 1986, Microsoft's stocks were traded publicly for the first time (Wallace and Erickson, 1993).

As of 2013, Microsoft is market dominant in both the IBM PC-compatible operating system (with Microsoft Windows) and office software suite markets (with Microsoft Office). The company also produces a wide range of other software for desktops and servers, and is active in areas including Internet applications, the video game industry, the digital services market, and mobile phones. In June 2012, with the launch of the Microsoft Surface—a line of tablet computers—Microsoft for the first time entered the personal computer production market.

Financing the Early Stages of Growth

At the beginning of their partnership, Bill Gates and Paul Allen decided that they would self-finance their ventures. Although coming from a wealthy family, Gates, whose parents and grandparents had taught him to be financially conservative (Wallace and Erickson, 1993, p.91), was determined to make it on his own and not to dip into family money to help finance their new venture:

From the start Paul and I funded everything ourselves. Each of us had saved some money. Paul had been paid well at Honeywell, and some of the money I invested in our start-up came from late night poker games in the dorm. Fortunately, our company did not require much funding (Gates et al., 1996, p.19).

Microsoft, it was decided, would be built without outside financing, and there would be no unnecessary overhead or extravagant spending. The young partners moved into an inexpensive downtown apartment, and MITS provided them with computer time and office space for the first year. However, unresolved issues about the licensing agreement surfaced, and the case went to arbitration. Microsoft could not license its 8080 BASIC until the licensing dispute was resolved. What is more, the arbiter handling the case was late in his ruling. This was the only time in the history of Microsoft that the company was unable to meet its financial obligations. Their attorney waited for his payment until they won the case. Gates never had to use his family's wealth or venture capital to bankroll the company. Microsoft was bootstrapped from the beginning (Wallace and Erickson, 1993, p.136).

Not only was the company self-financed, but Microsoft's bank account grew by \$150,000 or more every couple of months. In 1978, when Microsoft got its own computer system—a quarter-million dollar, high-end DEC20—the founders used the bank savings to finance the purchase (Wallace and Erickson, 1993, p.137). In 1981, after Microsoft was reorganized from partnership into a privately held corporation, Gates sold five percent of Microsoft for a million dollars to Technology Venture Investors (TVI), a venture capital firm. Consequently, David Marquardt, a general partner in TVI, was made a director of Microsoft's new board. Microsoft did not need the venture capital per se; Gates was essentially hiring the venture capital firm's expertise in incorporation procedure (Wallace and Erickson, 1993, p.209). “We just threw that million dollars into the bank with all our other millions”—said Steve Smith, Microsoft's first business manager (Wallace and Erickson, 1993, p.210). Gates wanted to go public in order to be able to reward his staff. As a public corporation, Microsoft could now offer stock incentives to its employees. Compared to the rest of the industry, Microsoft's salaries were not high, but the company was very generous with stock options. In fact, when Microsoft went public in 1986, a number of long-time employees became millionaires (Wallace and Erickson, 1993, p.210).

The frugal approach to finances used by Microsoft’s founders paid off, and from 1975 to 2013 the company grew from a two-man shoestring operation to a global technology giant with close to 102,000 employees and more than \$77.85 billion in revenues (Microsoft Corporation, 2013).

Bootstrapping Examples

Bootstrapping techniques used during the early stages of operations at Microsoft are numerous. These examples are divided into categories identified by Neeley (2004b) are summarized in Table 4.4 on page 86.

Table 4.4: Bootstrapping Examples at Microsoft Corporation

Categories Neeley(2004b)	Sources / Techniques	Examples
Owner’s Resources	Savings Accounts	Bill Gates invested \$910, Paul Allen \$606 in Microsoft.
	Forgone Salary	Gates and Allen took salary from the company only when there were surpluses.
	Salary from “Other” Job	At the beginning Allen worked full-time at MITS.
	Residence for Business use	In Albuquerque Microsoft used Gates apartment as the office.
Relationship Resources	Below-market Salary	1. Gates employed his friends Chris Larson at below-market rate. 2. Microsoft employees were working from early in the morning until the end of day. Typically there were Microsoft employees at MITS 24 hours a day, 7 days a week.
Cooperation Resources	Equipment or Facilities (or Software) Sharing	1. Microsoft contracted timesharing a PDP-10 with the Albuquerque city school. 2. Used MITS’s computer to work on BASIC compiler.
Cash and Asset Management	Delayed Payment	When Microsoft had a licensing dispute with MITS, the arbiter handling the case was late; Microsoft’s lawyer had to wait for his payment.

Categories Neeley(2004b)	Sources / Techniques	Examples
Outsourcing	Professional Services	Microsoft hired Davidoff as an independent contractor.
	Temporary Employees	Microsoft hired college students for summer employment.
Subsidies and Incentives	University Resources	Gates and Allen used the Harvard University's PDP-10 to develop their BASIC compiler, a commercial product.

Institutional Context

Lakeside College was instrumental in developing Gates's and Allen's passion for computers. At the time of their enrollment, Lakeside College was an all-boy private school noted for its rigorous academic environment, and Seattle's most exclusive school, home to the sons of the rich and the powerful. Superficially it looked like an elitist school with high requirements. As Robert Fulghum, the art teacher at Lakeside at the time remembers:

But in fact it tended to look very, very carefully at individual students, especially ones who stuck out in any direction, and it would give those students lots and lots of privilege and rope and space to do whatever they could do, even if it was far out of the usual constraints of the school (Wallace and Erickson, 1993, p.19).

It was in Lakeside College that Allen and Gates met; there they formed a lifelong friendship, and developed the personalities required to make Microsoft an industry leader. In early 1968, Lakeside had decided to expose their students to the world of computers. The school bought an inexpensive Teletype Model 33 ASR machine that connected for a fee through a telephone line to a DEC PDP-10 machine owned by General Electric and later by Computer Center Corporation. The Lakeside Mothers Club raised \$3000 to cover the fees. Lakeside became the first school in the country with computer capabilities (Wallace and Erickson, 1993).

After graduating from Lakeside College, Gates went to Harvard University and Allen to Washington State University. While Gates spent most of his time at the Aiken Computer Center, Allen used a PDP-10 computer in the physics department, and a PDP-11 in the

university hospital. After two years at Washington State, Allen dropped out of university so that he could work as a programmer for Honeywell in Boston and be near his old friend Gates.

Background and Motivation of Founders

Bill Gates was 13 years old when he had his first encounter with computers. Shortly thereafter computer technology became an all-consuming passion for him. Seeing how obsessed their son became, Gates's parents put a ban on computer use, which lasted nearly a year (Wallace and Erickson, 1993). As a student at Lakeside School, he was never just one of the boys. Instead, his drive, intensity, attitude, and intelligence made him stand out from the crowd. Gates was considered not only the brightest kid in school, but he was also an outstanding businessman. At the age of 21 he had the business- and marketing savvy to run a very profitable company in a highly competitive environment. The rare combination of technical genius and managerial acumen was a winning combination (Wallace and Erickson, 1993). Although just as intense and competitive as Gates, Allen was more soft-spoken and approachable than Gates.

In addition to spending countless hours on programming, Allen and Gates also often talked about the future of computer technology. "We both were fascinated with the different possibilities of what you can do with computers. Bill and I always had big dream of what we could do with computers", said Allen (Wallace and Erickson, 1993, p.26). And in Gates's words: "I was the mover. I was the guy who said, Let's call the real world and try to sell something to it" (Wallace and Erickson, 1993, p.26). Although uncertain about his career plans, when still in high school Gates told his friend that he would be a millionaire by the time he was 30 years old (Wallace and Erickson, 1993, p.41).

While still attending university, both friends knew that the computer industry was about to reach a critical mass. Allen was more eager to start a company than Gates, who was worried that his family would not approve of his leaving Harvard. Concerned about her son, Mary Gates asked Samuel Stroums, a family friend, to dissuade her son from leaving university. Gates talked about the vision he and Allen shared:

The personal computer revolution is just the beginning. Eventually everyone would own a computer. Imagine the money-making possibilities, a zillion machines all running on his software (Wallace and Erickson, 1993, p.90).

Stroums decided not to discourage Gates. Bill Gates and Paul Allen wanted to be part of the computer revolution, while earning significant sums.

4.5 Dell Inc.

Company Background

When Michael Dell's parents came to visit their son, a first-year student at the University of Texas, he had barely enough time to hide the computer parts behind the shower curtain. He knew his parents disapproved of his informal business. In 1983, when he was barely eighteen years old, Dell applied for a vendor's license so he could bid on contracts with the State of Texas; this way he could win bids without having the overhead expenses associated with a brick-and-mortar computer store (Dell and Fredman, 2006, p.10). Michael Dell had decided that by eliminating the retailer he could sell directly to the consumer. At the time, IBM personal computers sold in stores for about \$3,000. After taking the computers apart, however, and rebuilding them, Dell realized the components could be purchased for a fourth of the retail price. The PCs could be sold at a handsome profit, even after Dell added memory, bigger monitors, and faster modems. Soon he was buying components in bulk to reduce the cost. There was only one drawback to this otherwise sound business decision: his room was starting to look like a mechanic's shop—hardly an appropriate setting to be dealing with attorneys and doctors who would come to the campus to drop off or pick up their computers.

In May 1984, Dell used \$1000 of his savings (Dell and Fredman, 2006, p.13) to incorporate the business as "Dell Computer Corporation", and decided to drop out of university. The \$1000 required to capitalize a company in Texas was his initial start-up investment. At first Dell bought excess inventory computers, added disk drives and memory, upgraded them, and sold them for a profit. But soon thereafter, he realized that buying chip sets, and designing his own computers around them would be even more lucrative. His company became the first in the industry to sell custom-built computers

directly to end-users, thus bypassing the intermediary, and to offer a 30-day money-back guarantee. In 1986, Dell introduced the industry's fastest performing computer, a 12 MHz, 286-based system (Dell and Fredman, 2006), and two years later, in June 1988, the company went public.

Financing the Early Stages of Growth

Remarkably, Dell's business generated income from the start, with monthly sales of upgraded PCs, kits, and add-on components ranging between \$50,000 and \$80,000. As Dell reinvested most of his substantial profit, there was no requirement for outside financing. In fact, in the four years that it took Dell's business venture to rise from its humble beginnings to becoming an industry giant, Michael Dell received outside capital only once: after leaving the university, and becoming a full-time entrepreneur, he had borrowed \$300,000 from his family (Spiceland et al., 2011, p.4). Having paid the amount back in such a short period of time, however, Dell must have considered this episode irrelevant in the history of the company, since he did not even mention it in his autobiography. In 1986, when the business was growing at a tremendous rate, Dell hired Lee Walker as president. A venture capitalist, Walker had been an executive at a couple of companies, and was the first key manager to hire. By the end of 1986, less than three years after the company's birth, Dell was generating about \$60 million in sales:

Investment bankers started calling and saying, "Why don't you go public"?
Venture capitalists were calling and saying, "Want some capital"? Other
companies showed up to see if we wanted to sell. It was clear that great
opportunities lay ahead (Dell and Fredman, 2006, p.26).

To test the waters, in 1987, Dell decided to arrange a private offering of shares for a selected group of investors. The \$21 million raised in the offering put the company on a solid footing, and a year later, in June 1988, Dell went public, raising an additional \$30 million. The market value of the company at that time reached unprecedented \$85 million.

Michael Dell's novel idea of bypassing the intermediary and selling custom-built PC's directly to customers made Dell Computers into one of the world's largest computer corporations, employing more than 100,000 people worldwide with revenues of more than \$56 billion (Dell Inc., 2013).

Bootstrapping Examples

Bootstrapping techniques used during the early stages of operations at Dell are numerous. These examples are divided into categories identified by Neeley (2004b) and are summarized in Table 4.5 on page 91.

Table 4.5: Bootstrapping Examples at Dell Inc.

Categories Neeley(2004b)	Sources / Techniques	Examples
Owner’s Resources	Savings Accounts	Michael Dell invested \$1000 to start the company.
	Residence for Business Use	Dell started his company in the university dormitory, and later moved it to his rented apartment.
Relationship Resources	Cash Contribution (Investment from Family/Friend)	Dell’s parents loaned the company \$300,000 for a very short time.
Cash and Asset Management	Inventory Minimization	Direct selling to customers involved selling the customers what they wanted at the time of ordering, and required minimum inventory.
Outsourcing	Professional Services	Dell hired Jay Bell, an engineer on contact to design the company’s first 286-based PC.

Institutional Context

The University of Texas at Austin is a state research university and the flagship institution of The University of Texas System. Founded in 1883, The University of Texas has the fifth-largest single-campus enrollment in the nation, with over 50,000 undergraduate and graduate students and over 24,000 faculty and staff. It has been labeled as one of the “Public Ivies”, a publicly funded university considered comparable in quality of education to Ivy Leagues universities. The relaxed atmosphere of the university and its openness allowed Michael Dell to carry out an informal business during his first academic year from his dormitory, Room 2713 of the Dobie Center residential building (Dell and Fredman, 2006).

Background and Motivation of Founders and Finance Providers

Although pushed by his parents to become a physician, Michael Dell showed an early interest in business. At the age of 12 he worked as a water boy at a Chinese restaurant, so that he could save money for his philatelic business. And later in high school, by selling Houston Post newspaper subscriptions, he was making more money than his high school teachers. Intrigued by computers, however, Dell purchased an early Apple computer at the age of 15 just so he could take it apart and examine how it worked. While he was selling and upgrading computers at university, he realized that his fascination with computers was more than just a hobby or a passing phase (Dell and Fredman, 2006). When his father questioned him about his plan for the future, Dell replied that he would want to compete with IBM. But he also knew that he wanted to build better computers than IBM, offer great value and service to customers by selling direct, and become number one in the industry (Dell and Fredman, 2006, p.10). After finishing the first year, without telling his parents, he dropped out of university and devoted all his time and energy to his business. As Dell remembers:

Where I came from, not going to college is not an acceptable option. Convincing my parents to allow me to leave school would have been impossible. So I just went ahead and did it, whatever the consequences, I finished my freshman year, and left. After a while, my parents forgave me. A little bit after that, I forgave them, too (Dell and Fredman, 2006, p.13).

The Dell household was focused on recognizing commercial opportunities. The dinner table conversations were revolving around which company to invest in and which stocks to sell or buy (Dell and Fredman, 2006). Dell's parents recognized that their son started a very successful venture. They knew that by lending a larger sum, they would not only help out their son, but also generate a significant return.

4.6 Amazon.com

Company Background

When Jeff Bezos decided to start his own venture, his goal was to create a hit company by leveraging his business and technology skills. It did not matter what the business was, as long as it had enormous potential. He realized that the Internet was a huge gathering place, and when people gather there was an opportunity to sell something. He began to dream of becoming the world's largest Internet retailer, and selected books as the entry product (Brandt, 2011).

Cadabra Inc., which was later renamed Amazon.com, was created in July 1994 (Brandt, 2011). The idea was simple: create a company that offers an unprecedented number of books online and one that delivers them quickly, at the cheapest price possible. The company's website was simple, fast, and intuitive, and it generated a great online experience with very little human interaction with customers (Brandt, 2011). After Amazon.com was introduced on July 16, 1995, success came fast. Already after the first week of the launch, Amazon took in over \$12,000 worth of orders. It was hard for the employees to keep up, and the company shipped only \$845 worth of books. The following week the value of orders rose to \$15,000, and they were able to ship only \$7,000 worth of books (Brandt, 2011). The customers liked Jeff Bezos's virtual book store. He was able to turn over inventory 20 times a year, compared to 2.7 times for most bookstores (Brandt, 2011, p.92). Less than two years after opening its virtual doors, Jeff Bezos took his venture public at \$18.00 per share, after which the company was valued at \$429 million.

Financing the Early Stages of Growth

Jeff Bezos started the company with his own money. Having been paid well in his previous jobs, he was able to finance the company for several months. He put in \$10,000 equity and, at the end of 1994, gave his venture an interest-free loan for \$44,000 (Brandt, 2011, p.61). When he ran out of his own money, his family helped him out, despite their son's warning not to invest unless prepared to lose the investment (Brandt, 2011). In February 2005, he raised just over \$100,000 from his father in exchange for equity. The

growth of Amazon.com was outstanding in the first year, but it was still limited by a shortage of cash. Needing to raise some money, Bezos asked his friend Nick Hanauer for help. The latter not only invested in Amazon.com himself, but also managed to get additional 19 investors. With each investor providing around \$30,000 apiece, Bezos ended up raising \$981,000 (Brandt, 2011, p.93). In 1996, General Atlantic, an investment firm, approached Bezos to offer finances to the company. Rather than jumping at the offer, Bezos called one of the top venture capitalist in Silicon Valley, John Doerr of Kleiner Perins Caufield & Byers (KPCB). An association with Doerr would certainly increase the value of his venture—and it did! KPCB offered \$8 million for 13% of the company’s stock; in return, Bezos demanded that John Doerr join the company’s board as part of the investment. Amazon did not need to rely on KPCB’s money for long; in fact, in May 14, 1997 the company went public (Brandt, 2011). Amazon survived the 1999-2001 collapse of the dot-com bubble. In 2013 it had \$74.45 billion in revenue, and more than 117,000 employees (Amazon.com, 2013).

Bootstrapping Examples

Bootstrapping techniques used during the early stages of operations at Amazon.com are numerous. These examples are divided into categories identified by Neeley (2004b) and are summarized in Table 4.6 on page 94.

Table 4.6: Bootstrapping Examples at Amazon.com

Categories Neeley (2004b)	Sources / Techniques	Examples
Owner’s Resources	Savings Accounts	Bezos invested into Amazon his earnings from his previous job.
	Forgone Salary	Bezos did not get paid at the beginning.
	Residence for Business Use	Amazon started in Bezos’s garage.
Relationship Resources	Cash Contribution (Investment from Family/Friend)	1. Bezos’s father contributed \$100,000 to Amazon. 2. Hanauer, a friend of Bezos invested in Amazon.
	Below-market Salary	MacKenzie Bezos handled the phone calls, ordering, purchasing, secretarial duties, and accounting.

Categories Neeley (2004b)	Sources / Techniques	Examples
Quasi-Equity	Angels, Group	Nick Hanauer and his network of business associates invested \$981,000 into Amazon.
Cooperation Resources	Equipment or Facilities (or Software) Sharing	<ol style="list-style-type: none"> 1. After moving out of the garage Amazon shared premises with a needle exchange program and a pawn shop. 2. Instead of buying a copier Amazon employees used the Print Mart shop a few blocks away. 3. Used open-source programs.

Institutional Context

Planning to study physics, Jeff Bezos attended Princeton University, but soon returned to his love of computers and graduated with a Bachelor of Science in Engineering in electrical engineering and computer science. Princeton University is a private Ivy League research university in Princeton, New Jersey. Founded in 1746 in Elizabeth as the College of New Jersey, Princeton was the fourth chartered institution of higher education in the American colonies. By endowment per student, Princeton is the wealthiest school in the United States. About his time at Princeton Bezos said: “I was taking all the computer classes, and actually not just learning how to hack, but learning about algorithms and some of the mathematics behind computer science, and it’s fascinating. It is really a very involving and fun subject” (Brandt, 2011, p.31).

With the help of his contacts at Princeton, Jeff Bezos joined Fitel, a computer company that linked different computers at brokerage firms, investment firms and banks over a network to allow them to trade stocks among themselves. He left only two years thereafter to work at Bankers Trust, a firm that Bezos said was “at the intersection of computers and finance” (Brandt, 2011, p.35). D. E. Shaw, the last of Bezos’s employers, created a computer automated trading system for Wall Street. David Shaw, its founder, led Bezos to the path that led him to opportunity, and in 1994 asked Bezos to look at the innovation called Internet. Recognizing the importance and future of the Internet, Bezos suggested to Shaw that they start an online book-selling business. This was a big leap for a financial services firm, and Shaw rejected the idea. In 1994, after giving his notice, Bezos started his own company.

Background and Motivation of Founders and Finance Providers

Jeff Bezos was born Jeffrey Preston Jorgensen. His mother's marriage to his father lasted a little more than a year, after which his mother remarried to a Cuban immigrant, who adopted his stepson, and Jeffrey Jorgensen became Jeff Bezos. His maternal grandparents had a 25,000-acre ranch in Texas, where the young Bezos spent his early childhood. Bezos said that his experience on the ranch helped sow the seeds of his entrepreneurial drive (Brandt, 2011, p.20). He was a smart student, and often showed intense scientific interests. He was the valedictorian in his high school, and graduated *summa cum laude* from Princeton University. Although toying with the idea of becoming an entrepreneur right after university, Bezos "ultimately decided that it would be smarter to wait and learn a little bit more about business and the way the world works" (Brandt, 2011, p.33).

Unlike other successful entrepreneurs who are passionate about their businesses, Bezos did not care that much about the nature of the enterprise; as long as the business had enormous potential, he was interested (Brandt, 2011, p. 46). He did not set out to build the world's biggest bookstore because books were his passion—although he does love books. Instead, he was simply interested in making a fortune and creating a successful company by leveraging his business and technology skills. To help him with his decision, Bezos relied on the "regret minimization" framework, which suggested that when he was eighty years old he would not regret walking away from his Wall Street job, but he might regret not participating in the Internet boom.

After exhausting his own finances, Bezos turned to his family. According to his mother, the family invested in Jeff, not in the concept; after all, they had never heard of the Internet before, but they had faith in him (Brandt, 2011, p.61). When Bezos used up the money he and his family could provide, he turned to a group of angel investors, led by his friend, Nick Hanauer, whom he had met at D. E. Shaw. Hanauer was impressed with Bezos's abilities, and when he heard that Bezos was going to start an e-commerce company, he offered to invest in it. Hanauer made good on his promise, and made the first investment that was followed by other angel investors.

4.7 Research In Motion Limited (BlackBerry Limited)

Company Background

In 1984, Mike Lazaridis and Dough Fregin established Canadian-based Research In Motion (RIM). Initially, the two young university dropouts experimented with various contract and consulting work, such as computer-controlled LED display panels and film-editing and paper-processing equipment. It was not until 1994, however, that Lazaridis, who wanted to be in the company of Motorola, Ericsson, Nokia, and Siemens, decided to move into the wireless business. This was a bold ambition for a small, unknown Canadian company, given that cellular technology was still in its infancy and required large amounts of funding for research and development. To turn the Ericsson-developed Mobitex wireless data network into a two-way paging and wireless e-mail network, RIM worked with two companies: Ericsson, and RAM Mobile Data. Pivotal in this development was the release of RIM's Inter@ctive Pager 950, called the Leapfrog, which started shipping in August 1998. About the size of a deck of cards, this device competed against Motorola's Sky-Tel two-way paging network (McQueen, 2010). In 1999, RIM launched the BlackBerry, a two-way pager; and three years later, they released the BlackBerry smartphone, which supported e-mail, mobile telephone, text messaging, Internet faxing, Web browsing, and other wireless information services. By 2010 RIM, had sold more than 75 million of its smartphones (RIM, 2010). The incorporation of encryption and S/MIME support helped BlackBerry devices gain usage by governments and businesses. Even US President Obama was photographed many times with his BlackBerry pressed to his ear. RIM soon began to introduce BlackBerry devices aimed towards the consumer market as well. The BlackBerry Pearl 8100 was the first of their phones to include multimedia features such as a camera (McQueen, 2010). In 2013, owing most of the success to its popular smartphone device, RIM changed its name to BlackBerry Limited.

Financing the Early Stages of Growth

To start the venture, Lazaridis relied on self-financing and seed money from his parents. Lazaridis knew RIM had to run lean to stay alive:

Doug and I were very frugal in those early days. We shared the lowest-cost basement apartment. We walked or biked to work. We lived on spaghetti. Occasionally, we'd have meat. Every morning when we'd go to work we'd smell the bagels in the Bagel Bin downstairs, which was driving us crazy. Eventually we were able to afford the bagels (McQueen, 2010, p.46).

Further, the \$15,000 loan that came from Lazaridis' parents was matched by an Ontario government Student Venture Loan (McQueen, 2010, p.43). For the first fifteen months of their start-up, Lazaridis and Fregin, frugal with their money, did not pay themselves any salary (McQueen, 2010, p.47). Jim Balsillie, who joined the company in 1992 and eventually became co-CEO, received a one-third interest in the company for \$125,000, the money he saved by using his severance pay from his previous employer and by increasing the mortgage on his house (McQueen, 2010, p.71). His investment was one of many sources of much needed funds to finance RIM's state-of-the-art innovation. In 1993, additional funds came from the Ontario Development Corp. and Ericsson, each organization contributing \$250,000 that eventually became a loan. In 1994, the Canadian firm COM DEV International Ltd., invested \$2 million for 25% interest in RIM, and RIM received another \$4.7 million grant from the Ontario Technology Funds (McQueen, 2010, p.128). This money helped RIM to move onto a sounder financial footing. With Lazaridis and Balsillie's perseverance paying off, Research In Motion became a major player in the industry.

Although several companies—Intel, BellSouth, Palm, US Robotics—expressed interest in acquiring RIM, the young entrepreneurs were not selling. They were, however, interested in an association with Intel Capital, the company's venture capital arm, and subsequently sold 926,667 shares to it for \$4,170,000. Within less than 12 years, RIM created a strategic alliance with two of the biggest American corporations by using Intel and BellSouth's network. However, to establish itself as an industry-leader in wireless technology, RIM needed more investment. In 1996, RIM sold special warrants to institutional investors and received investment from an investment-banking firm. After much initial bootstrapping, RIM's early developments in wireless technology were financed by various government programs along with Canadian institutional and venture capital investors through a private placement in the privately held company (McQueen, 2010). A year later, on October 28, 1997, RIM went public (McQueen, 2010, p.144).

Between 2007 and 2009 BlackBerry was the top selling smartphone brand in North America. RIM ranked No.1 on Fortune's 2009 list of fastest-growing companies, with a three-year average earnings-per-share growth of 84% and revenue growth of 77% (Hempel et al., 2009). However, lately RIM has been losing market share to its primary competitors: smartphones running Android, the Apple iPhone, and the Windows Phone.

Bootstrapping Examples

Bootstrapping techniques used during the early stages of operations at BlackBerry Limited are numerous. These examples are divided into categories identified by Neeley (2004b) and are summarized in Table 4.7 on page 99.

Table 4.7: Bootstrapping Examples at Blackberry Limited

Categories Neeley (2004b)	Sources / Techniques	Examples
Owner's Resources	Forgone Salary	Lazaridis and Fregin did not pay themselves salary for the first fifteen months.
Owner's Borrowings	Line of Credit	Balsillie increased the mortgage on his house to invest in BlackBerry.
	Severance Payment	Balsillie used his severance payment to invest in Blackberry.
Relationship Resources	Cash Contribution (Investment from Family/Friend)	Lazaridis's parents invested \$15,000 in their son's venture.
	Donated Labour	Linda Grey (sister of early employee Barnstijn) designed the logo for free.
	Below-market Salary	Chris Shaw a friend and fellow student wrote the software for BlackBerry's first product, the Budgie.
Cash and Asset Management	Used Equipment Purchases	Lazaridis bought a used computer from the University Waterloo.
Outsourcing	Professional Services	BlackBerry hired Tasker Electronics to make the Surface Mount Technology card for \$150 each.
Subsidies and Incentives	Government Incentives	1. Lazaridis received \$15,000 from the Ontario government's Student Venture Loan.

Categories Neeley (2004b)	Sources / Techniques	Examples
		2. BlackBerry received a grant under the Industry Research Assistance Program to study Surface Mount Technology. 3. Ontario Development Corp. loaned \$250,000 to RIM. 4. BlackBerry received \$4.7 million grant from the Ontario Technology Fund. 5. RIM to advantage of the Experimental Research and Development Tax Incentive Program.
	University Resources	Lazaridis and Fregin Worked on the point-of-sales devices on weekends often using University of Waterloo facilities.

Institutional Context

In 1979, Mike Lazaridis enrolled at the University of Waterloo in electrical engineering with an option in computer science. One of Canada’s top institutions for engineering, mathematics and computer science, University of Waterloo had a co-op program, which was unique among post-secondary schools in Canada. Students alternated between a four months academic term on campus and a pre-arranged work term of equal duration in the industry. And since students would witness all sorts of state-of-the-art implementations during their practicums, instructors had to be up-to-date on research. The university was not only visionary—the professors, for example, were permitted to retain ownership of personal inventions, rather than, as was the case at other institutions, surrender all rights to the university—but it also fostered entrepreneurship. When Lazaridis needed permission from the university’s president to take a leave of absence to start a business, Dough Write, the president, made a half-hearted attempt to dissuade him, but in the end said to him: “Speaking personally, just between you and me, go for it” (McQueen, 2010, p.42).

Canada and Ontario offer generous programs to help entrepreneurs and technological start-ups. Lazaridis took advantage of the Ontario government’s Student Venture Loan program. BlackBerry received grants from the Industry Research Assistance Program, loan from the Ontario Development Corp., and grant from the Ontario Technology Fund, and tax rebated through the Experimental Research and Development Tax incentive program.

Background and Motivation of Founders and Finance Providers

Born in Istanbul, Turkey, to Greek parents, Lazaridis was five years old when his family moved to Canada in 1966, settling in Windsor, Ontario. He demonstrated an early interest in technology; at age 12, he won a prize at the Windsor Public Library for reading every science book in the library. In high school he was a frequent visitor of the well-equipped shop. At university Lazaridis strived:

In high school it is about football, track and field, and social events, so I was cloistered in the shop program. I had a few really good friends and we pretty well stuck to ourselves. All the popular people lived on a different stratum. When I came here (to Waterloo), it was the opposite: everybody was like those people that I spent time within high school. This was an engineering school. This guy built a computer, that guy built a radio control system, everybody built something or at least had an interest in building something. Here the most popular students were the ones who knew how to run the labs. I knew how to run the labs, so it was a different world (McQueen, 2010, p.31).

Michael Lazaridis and Dough Fregin met in sixth grade and stayed friends right through high-school graduation. Both attended W.F. Herman Secondary School in Windsor, where they both combined academic subjects with the time spent in the school's technical shop, a loaded schedule, shared by few other students. They loved science fairs and would tinker in the electronics shop room after classes. Fregin enrolled in the University of Windsor to study engineering, but shortly thereafter abandoned his studies, after getting a call from Lazaridis who was starting a company and needed help.

One of Lazaridis's co-op terms was at Control Data Corporation to help to create a state-of-the-art computer. When head office ordered the engineers to modify the design by slowing the performance they have been achieving, many of them left the company and moved to Silicon Valley. This episode gave Lazaridis a reason to start his own company, where he could have more control over the events. He resolved that any business he would head would honour engineers with innovative ideas (McQueen, 2010). Larry Smith, who has taught entrepreneurship to more than 16,000 students, said about Lazaridis:

He was turned off by his co-op employers because he felt that they were making compromises. One of the reasons he wants to do his own business is because he does not think excellence can be achieved with respect to the

employers he had. What he wanted was fairly clear: freedom to design to a high standard of excellence in an environment where he could have control of responsibilities. He is an engineer, so he is interested in innovation. He wants to make something new (McQueen, 2010, p.36).

Nick Lazaridis, Michael's father, owned and operated a shop in Istanbul that sold women's wear and perfume. Due to riots and increasing instability he moved to Germany with his family. From there they eventually moved to Windsor, Canada where he worked on a Chrysler automobile assembly line, while his wife owned and operated a seamstress shop. Even though their life was modest and frugal, they acquired income properties with their savings. Michael Lazaridis absorbed this entrepreneurial spirit from his family. His parents were disappointed that he would not finish university, but supported him in starting his venture by loaning him \$15,000 at the very beginning (McQueen, 2010).

4.8 eBay Inc.

Company Background

Pierre Omidyar liked to write software in his spare time. He programmed AuctionWeb over a long-weekend in September 1995 and posted it as part of his larger personal site. At first just a hobby (Cohen, 2002), he offered the program for free since it was part of a larger personal site, and his expenses were minimal. Although Omidyar had no marketing devices, advertising budget, or deals with other sites, the concept caught on in just a matter of weeks. By the end of 1995, AuctionWeb had hosted thousands of auctions and attracted more than 10,000 individual bids (Cohen, 2002, p.25); his website administrator started to complain that AuctionWeb was attracting so much traffic that it was slowing down the system.

In February 1996, ignoring Omidyar's protest that AuctionWeb was not a business; the site provider began charging him \$250, the rate for a commercial account. To offset the costs of the monthly fee, Omidyar started charging AuctionWeb users 5 percent of the sale price for items below \$25.00, and 2.5 percent for items above \$25.00. He had no way of knowing if users would be willing to pay to use his site (Cohen, 2002). However, with every day that passed, more cash and check-filled envelopes would be delivered to his home. When in June of the same year AuctionWeb generated \$10,000 in a month,

Omidyar decided it was time to quit his day job. He hired a part-time help who did nothing but opened the envelopes and deposited the money, but with hundreds of envelopes flooding the office and piling up in the corner, he could not keep up. It was time to turn AuctionWeb into a proper business.

In 1996, Omidyar hired Jeff Skoll as the first president. Skoll, a Stanford MBA of Canadian descent, was taken by the business model of people buying and selling on the Internet, people who never see each other but actually send money and stuff back and forth. AuctionWeb had an unusual relationship with its customers; not only were they referred to as *community*, but their views were extremely important. When Mary Lou Song, a newly hired public relation executive, developed a colour system for feedbacks without first consulting AuctionWeb users, she got loads of angry mail. The community did not believe that she would dare to change something so inconsequential as colours without their approval. In Song's words: "If Macdonald's unveils a new sandwich, people just decide to buy it or not. They don't say: 'Why didn't you talk to me?'" (Cohen, 2002, p.42). The company's growth was phenomenal; in January 1997 alone, 2 million auctions were hosted on AuctionWeb. Omidyar officially changed the company's name to eBay in September 1997, and a year later the company went public. At that time eBay had unheard-of gross profit margins of 88%. Analysts, who looked down on eBay as an online flea market, were surprised that within three months of going public the company produced 3 billionaires (Cohen, 2002, p.150).

Financing the Early Stages of Growth

Unlike most starting entrepreneurs, financing was not an issue for Omidyar. The company was profitable from the very beginning, and could sustain itself on self-financing and bootstrapping methods. What Omidyar did struggle with, however, was the company's image: the business community was reluctant to accept his unusual business model. In January 1997, Times Mirror, a newspaper company, was contemplating buying eBay. However, Times Mirror—sceptical about an online auction site and not willing to pay the asking price—rejected the offer, and the deal fell through. Omidyar was looking for credibility without having to relinquish control.

Soon thereafter, Omidyar started looking for venture capital. In the image-conscious world of Silicon Valley, investment from a top VC firm is an important imprimatur (Cohen, 2002). A top venture capital firm would provide for strategic advice and credibility that was essential for future growth. The company's biggest advantage in recruiting investors was that it had been profitable in its first month; working against it, however, was the perception that the business was just too offbeat. In June 1997, Benchmark, a highly regarded venture capital firm, paid \$5 million for 21.5 percent of the firm. Considering that eBay did not need the money, one could argue that eBay overpaid for the tactical advice and prestige it received. A year later, when eBay went public, Benchmark's share of the company was worth more than \$4 billion, which makes this deal one of the most profitable investments in the history of venture capital (Cohen, 2002, p.76). But Pierre Omidyar insists that Benchmark's contribution was critical to eBay's success:

It's unfair to ask whether it added up to four billion dollars of guidance because no one could have anticipated just how valuable eBay would become. But when I think about whether their contribution was worth one-quarter of the company—a real partnership stake—the answer is absolutely (Cohen, 2002, p.77).

We were entrepreneurs and that was good up to a certain stage. But we did not have the experience to take the company to the next level (Cohen, 2002, p.110).

In addition to its services eBay gives individuals a degree of economic independence that in the pre-internet era would have been impossible. It is estimated that as many as 100,000 people are making their living selling on eBay (Cohen, 2002, p.110). In 2013, eBay employed 33,000 and generated \$16 billion of revenue (eBay Inc., 2013).

Bootstrapping Examples

Bootstrapping techniques used during the early stages of operations at eBay Inc. are numerous. These examples are divided into categories identified by Neeley (2004b) and are summarized in Table 4.8 on page 105.

Table 4.8: Bootstrapping Examples at eBay Inc.

Categories Neeley (2004b)	Sources / Techniques	Examples
Owner's Resources	Salary from "Other" Job	Omidyar kept his full time job for 9 months.
	Residence for Business Use	At the beginning eBay was operating from Omidyar's home.
Cooperation Resources	Equipment or Facilities (or Software) Sharing	When the Omidyar's home became too small, eBay moved to a one room in NASA Ames Technology Center that could barely fit Omidyar, Skoll and Agarpao.
Cash and Asset Management	Used Equipment	Omidyar bought used office furniture.
Outsourcing	Professional Services	Jeff Skoll, before he quit his job and joined eBay full-time, did consulting work for Omidyar.
	Temporary Employees	1. eBay hired Chris Agarpao on a part-time basis to open envelopes and deposit the money. 2. eBay hired Jim Griffith, and Patti Ruby on a part-time basis to be customer support persons.

Institutional Context

Omidyar graduated from Tufts University in Medford/Somerville, Massachusetts, with a bachelor's degree in computer science in 1988. Shortly after, Omidyar went to work for Claris, an Apple Computer subsidiary. Silicon Valley's population has swelled from 2.5 million in the fifties to over seven million today. During this time the region has experienced entrepreneurial vitality in high tech industries as defense, semiconductors, computer hardware and software, communications, telecommunication technologies, the Internet and biotechnology, and has become a veritable hotbed of high tech-entrepreneurship in the United States. No other region has been consistently at the forefront of technological and entrepreneurial innovation for so long (Saxenian, 1994). A measure of success of Silicon Valley in nurturing entrepreneurship is the number of its companies' Initial Public Offerings (IPO). Since 1983, for instance, 621 companies located in Silicon Valley went public and raised more than \$25 billion. These companies had a median age of 5.32 years at the time of IPO, which suggest that large majority of them were very young (Ferraro, 2003).

Background and Motivation of Founder

Omidyar attended Tufts University when the technology revolution started. He identified with Apple philosophy from day one, which was a reflection of not only personal preference, but also personal values. Passionate about Apple programming, Omidyar rebelled against main stream computing by staying out of the Tufts computer lab, which was stocked with PCs, and instead worked from his dormitory room on his Macintosh (Cohen, 2002, p.16). After graduating, eager to become an Apple programmer, he took a job in Silicon Valley at Claris, an Apple subsidiary. After Claris got reabsorbed by Apple, he started a company with a friend. Realizing, however, that Ink Development Corporation, his new company, would not take off in the near future, he joined General Magic, a mobile communication start-up. While at General Magic, Omidyar developed and nurtured AuctionWeb in his spare time. As a libertarian, he wanted to create a perfect global marketplace where everybody has equal rights, which was a revolutionary concept. His motivation to empower individuals led him to create a site that linked people in a network. By now it is widely recognized in purely business terms that many-to-many sites are more powerful than the many-to-one site like Amazon. Omidyar was building a community, and caring that people connected with one another. It is the best way to make a site *sticky*; in other words, to attract visitors and hold them.

4.9 Google Inc.

Company Background

Google Inc. started out as a university project in 1996. Brin and Page, two Stanford University Ph.D. students, decided they would “download the Web” and analyze the links to improve searching capabilities. Counting the number of links pointing to a Web site, Page noticed, was a way of ranking that site’s popularity. Both students had grown up in homes where academic publications were frequently discussed at the dinner table. When analyzing various web links, Page noticed a similarity between web links and citations found in academic works. The more links that led to a particular site, the more traffic that site generates, and—just like citations—the more important that site becomes. Page called his page rating system PageRank and developed a primitive search engine that he named

BackRub. While other search engines relied on matching words in queries with words on Web pages, PageRank provided an extra dimension: it put search results in a logical order for computer users. For the first time, there was a way to do an Internet search and find useful answers swiftly.

In the fall of 1997, Brin and Page decided that BackRub needed a new name. They were thinking of “googolplex”—a term describing a very large number, 10 to the power of 10 to the power of 10—and used the shortened form “google”, which was actually a misspelled version of the word. After becoming available internally at Stanford University in 1997, the popularity of the search engine grew by word of mouth. Lacking the funds to hire a designer, and artistic talents to create something elegant, Brin kept the Google homepage simple.

At first, Brin and Page were hoping to sell the product to AltaVista, Excite, Yahoo, and other ventures in order to resume their studies, but the companies were not interested. If they wanted to realize the potential of their unique search system, Yahoo’s founder suggested, they should leave Stanford and start their own business (Vise and Malseed, 2008, p.42). The domain name for Google was registered on September 15, 1997, and the company was incorporated on September 4, 1998. The first corporate office was in a friend’s garage in Menlo Park California. On August 19, 2004, five years after its inception, Google went public. In May 2011, the number of monthly online visitors reached a billion for the first time, and in 2012 the company earned \$50 billion revenue.

Financing the Early Stages of Growth

Brin and Page’s search engine was growing exponentially. But with the growth of the data and the user base also grew the need for computers. Short of cash, Brin and Page had to turn to bootstrapping. They saved money by buying parts, building their own machines, and scrounging around the dock for unclaimed computers. “Larry would scour the world to save a penny”, said Charlie Orgish, head of Stanford computer systems (Vise and Malseed, 2008, p.40). Seeing how desperate the young entrepreneurs were, their advisors gave them \$10,000 from the Stanford Digital Library Project (Vise and Malseed, 2008, p.40), and Page’s dormitory room, Gates 360, became the data center.

Page and Brin, who by late August 1998 had been working day and night on their new search system, eventually, ran out of cash, despite their frugal ways. They got in touch with Andy Bechtolsheim, a legendary investor and the founder of Sun Microsystems (also the creator of the Java programming language). Being a computer whiz himself, he appreciated the breakthrough idea that enabled Google to produce superior search results. Instead of discussing all the details he wrote a check made out to “Google Inc.” for \$100,000. Page had to incorporate the company first before cashing the check two weeks later (Vise and Malseed, 2008, p.48). The endorsement from Bechtolsheim also gave them the confidence and credibility to seek money from family and friends. They managed to raise \$1 million, which was enough to buy the computer equipment they needed to take the important next step (Vise and Malseed, 2008, p.48). While their Silicon Valley neighbours were spending millions of dollars on Super Bowl ads and extravagant marketing, Google grew in popularity and recognition without spending a dime. In 1998, they moved from the dorm to a rented house and worked in the garage. But with 500,000 queries a day, servers needed to be constantly added to the system, and keeping up with the growing demand became impossible.

Despite further investments from angel investors such as Jeff Bezos, the founder of Amazon.com; Ron Conway, a Silicon Valley money manager; and Ram Shriram, an investor, who made his fortune on Netscape, there was never enough money to keep up with the growth of the company. The more computers Page and Brin acquired, the more queries they could handle, and the faster the company would grow. Growing the business themselves became unfeasible (Vise and Malseed, 2008, p.61), and what is more, angel investment was not enough to satisfy the company’s growing appetite for capital. Although fearful about losing control over their company (Vise and Malseed, 2008, p.61), Page and Brin looked for venture capital:

Everyone in Silicon Valley knew that it was every entrepreneur’s dream to land funding from one of the prestigious venture capital firms on the Sand Hill Road. The right money from the right people led to the right contact that could make or break a technology business. At the same time, giving up control to venture capitalists could destroy the vision of a firm’s founders and the long-term potential of a breakthrough technology. Examining the biggest pool of potential funds to tap, the Google guys learned how company after company had lost control of their destiny. Venture capitalists

had either ramped up the firm quickly for an initial public offering or pushed them to bring in as much cash as possible through advertising (Vise and Malseed, 2008, p.62).

They decided to reach out simultaneously to two of the most established and prestigious venture capital firms in Silicon Valley: Kleiner Perkins Caufield & Bryers (KPCB) and Sequoia Capital. The founders were hoping that both firms would invest large sums, without taking control of the company (in other words, Brin and Page would remain the majority owners). In less than one year after Page and Brin left Stanford—and with help from Ron Conway and Ram Shriram who knew the venture capital firms—the deal was made. Each firm would invest \$12.5 million and accede to the request that Page and Brin remain in charge with majority control. In return, the founders had to hire an experienced industry executive: hardly an irrational request, given that Google did not even have a business plan (Vise and Malseed, 2008, p.67). Brin and Page delayed going public for as long as they could, until finally in April of 2004 they held an initial public offering. In 2012, the company had \$59.84 billion in revenue, and 49,825 employees (Google Inc., 2013).

Bootstrapping Examples

Bootstrapping techniques used during the early stages of operations at Google Inc. are numerous. These examples are divided into categories identified by Neeley (2004b) and are summarized in Table 4.9 on page 109.

Table 4.9: Bootstrapping Examples at Google Inc.

Categories Neeley (2004b)	Sources / Techniques	Examples
Owner's Resources	Forgone Salary	1. Page and Brin did not get any salary at the beginning. 2. The founders have been working day and night on their new way to search the Internet.
	Residence for Business Use	1. Google's first office was in Page's graduate house at Stanford University. 2. From the university housing they moved the operation to a friend's garage.
Owner's Borrowings	Credit Cards	The founders were borrowing on their credit cards to pay for servers.

Categories Neeley (2004b)	Sources / Techniques	Examples
Relationship Resources	Cash Contribution (Investment from Family/Friend)	Friends and family invested in Google, after the founders obtained angel investment.
Quasi-Equity	Angels, Individuals	Andy Bechtolsheim, Ram Shiram, Ron Conway, David Cheriton, and Jeff Bezos, all prominent Silicon Valley angel investors invested in Google.
Cooperation Resources	Equipment or Facilities (or Software) Sharing	They were borrowing unclaimed Stanford computers to increase their server capacity. Used the free Linux operating system.
Cash and Asset Management	Used Equipment	They took discarded Stanford computers, and fixed them.
Subsidies and Incentives	University Resources	1. Page and Brin initially used Stanford computers to develop their search engine. At one time they caused the whole Stanford network to go down. 2. The founders received \$10,000 from the Stanford Digital Library Project.

Institutional Context

Unlike MIT and other research institutions, Stanford made it easy for its Ph.D. students to work on potential commercial activities using university resources. Its Office of Technology Licensing, instead of laying claim to its students' groundbreaking on-campus work, assisted with, and paid for, the patent process, and then entered into long-term licensing agreements that enabled Stanford's students to launch start-ups. John Hennessy, Stanford's president, said: "People really understand here that sometimes the biggest way to deliver an effect to the world is not by writing a paper but taking technology you believe in and make something of it" (Vise and Malseed, 2008, p.30). In addition, unlike at other institutions, the presence of some of the most aggressive angel investors and venture capitalists found in the US made it easy for students to get funding and advice.

Background and Motivation of Founders and Finance Providers

Sergey Brin immigrated to the United States with his family from the Soviet Union at the age of six. He earned his undergraduate degree at the University of Maryland in

mathematics and in computer science. After graduation, he enrolled in Stanford University to acquire a Ph.D. in computer science. Larry Page was born in East Lansing, Michigan. He holds a Bachelor of Science in computer engineering from the University of Michigan with honors and a Master of Science in computer science from Stanford University. During a new-student-orientation day Brin, who had already been at Stanford for two years, was showing Page and other prospective students around. Brin and Page soon became friends. They had overlapping ambitions and interests, and complimentary personalities and skills. They were both second generation computer users; they grew up using computers in their elementary school years under the tutelage of their parents who used computers and sophisticated mathematics at home and at work. Both of them lived close to a major university, where their fathers were esteemed professors, and both had mothers whose job revolved around computing and technology (Vise and Malseed, 2008, p.21).

Unlike countless other entrepreneurs, Brin and Page, the founders of Google Inc., were not motivated by financial gains; instead, they “were really driven by a vision of how things ought to be, and not to make money”, said their professor Dennis Allison, “they had a bold dream of changing the world” (Vise and Malseed, 2008, p.50). Brin and Page had changed the lives of millions of people by giving them free, instant access to information about any subject.

Andy Bechtolsheim, Sun Microsystems cofounder, and Cisco executive invested in Google Inc. because of the founders’ business approach: “Instead of wasting lots of money on advertising or high-end equipment, they wanted to buy motherboards and other components to inexpensively build computers themselves. They also wanted to develop a fully searchable database before going out to talk to venture capital firms about possible funding. And they wanted their search engine to speak for itself”(Vise and Malseed, 2008, p.47).

Jeff Bezos, the founder of Amazon.com and another angel investor, said: “I just fell in love with Larry and Sergey. They had a vision. It was a customer-focused point of view” (Auletta, 2009, p.44).

4.10 Facebook Inc.

Company Background

Facebook started off as Facemash, a social networking service created by Mark Zuckerberg, a Harvard University student (Kirkpatrick, 2011). Zuckerberg used Harvard's computer network and copied dormitory images to compare students on a scale of "attractiveness". Within the first four hours of being launched, Facemash already attracted 450 visitors and 22,000 photo views. If the early success was any indication of future developments, Zuckerberg realized he would need more space on his hard drive than his laptop allowed.

In February 2004, he rewrote the program, found a hosting company, and ended up paying \$85 per month for space on the server and the social network called the Thefacebook.com (Kirkpatrick, 2011, p.30) was born. The site could provide more than just a break from studies. Eduardo Saverin, a business-savvy classmate, contributed to Zuckerberg's networking site by making a small financial investment in exchange for one third of Thefacebook. After mere 3 weeks of operation, Thefacebook attracted more than 6,000 users. Understanding that he would need help to operate and maintain the site, Zuckerberg signed an employment contract with his roommate, Dustin Moskowitz, and gave him some shares too. At this point he owned 65% of the shares, Saverin had 30% and Moskowitz owned 5% (Kirkpatrick, 2011, p.34). Zuckerberg recruited another roommate, Chris Hughes to be Thefacebook's official spokesperson. At the end, Zuckerberg, Hughes, Moskowitz, and Saverin became the company's founding quartet. Membership was initially restricted to students of Harvard College; within the first month, more than half the undergraduates at Harvard were registered on the service (Kirkpatrick, 2011).

Following the success at Harvard in March 2004, Facebook expanded to the universities of Columbia, Stanford, and Yale, and ultimately to all the Ivy League colleges. From there, it was a short step to spreading to Boston University, New York University, MIT, and gradually most universities in Canada and the United States. By the end of May, Thefacebook was operating at 34 schools and had almost 100,000 users (Kirkpatrick, 2011, p.42). Zuckerberg left Harvard University, and in June 2004 the company moved its

operation to Palo Alto, where he connected with Sean Parker, a new confidant, who would become a major character in the development of the company. Zuckerberg gave Parker 6.47 percent of the company (Kirkpatrick, 2011, p.64). A high-school version of the site and photo hosting options were launched in 2005, and the site changed its name to simply Facebook (Kirkpatrick, 2011, p.153). In 2006, the New Feed (a way to getting friends to join site) was introduced, followed by the address-book importer and open registration, which allowed anyone (student, or not) to join. The company was growing. In late 2007, Facebook had 100,000 business pages, which allowed companies to promote themselves and attract customers. Traffic to Facebook increased steadily. According to the Nielsen Media Research study, released in December 2011, Facebook was the second most accessed website in the US (behind Google) (Kirkpatrick, 2011, p.237). Facebook held an initial public offering on May 17, 2012, negotiating a share price of \$38 apiece.

Financing the Early Stages of Growth

Bootstrapping and self-financing were essential to Facebook's beginnings. The social networking site started with an initial investment from Zuckerberg and Savarin, who managed to invest \$1,000 each (Kirkpatrick, 2011, p.30). By the end of March 2004, when the active-user number surpassed 30,000, Facebook was paying \$450 per month for five servers. To keep the company afloat, Zuckerberg and Saverin each agreed to invest another \$10,000 each (Kirkpatrick, 2011, p.40). However, more servers were needed to manage the increasing traffic, which became costly. Reaching into the account Saverin had set up, where the advertising money was deposited, Zuckerberg invested another \$20,000. To this he added his savings from programming and website jobs as well as contributions from his parents; in fact, in the summer of 2004 alone, Zuckerberg and his family ended up spending \$85,000 (Kirkpatrick, 2011, p.63). Twenty-five new servers alone cost \$28,000. Facebook still needed more funds.

Peter Thiel, the co-founder of PayPal and angel investor, loaned \$500,000 of his money in exchange for 10.2 percent share of the company, a non-substantive amount in the financial life of Facebook. In addition, angel investors Reid Hoffman and Mark Pincus, and friends of Zuckerberg's contributed another \$100,000. Western Technology Investment (WTI) also gave a three year credit-line for \$300,000. Werdgar, a partner in WTI personally

invested \$25,000 in equity. Eventually WTI provided another \$300,000 loan that would convert to shares. In May 2005, the Washington Post and several venture capital firms showed interest in Facebook. Following intense negotiations, the venture capital firm Accel Partners invested around \$12.7 million for 15% of the company with Zuckerberg retaining control. In July, WTI extended another \$3 million loan to Facebook (Kirkpatrick, 2011, p.127).

Finally the company had plenty of money; no longer would servers be strung together with hanging wire. By the end of October 2005, revenues from advertisements were around \$1 million per month; its costs, however, were around \$1.5 million. Facebook was losing \$6 million per year. This amount came from Accel's investment. To finance the growth, Facebook raised more money in 2006 from venture capitalists as a second round investment. Premier venture firms Graylock Partners and Meritech Capital Partners invested \$27.5 million, which again relieved the financial pressure.

While Facebook was operated in the dorm, two months after its launch Zuckerberg got the first offer to buy the company from an investor (Kirkpatrick, 2011, p.41). Despite the numerous offers for the company that Zuckerberg has received over the years, he has remained opposed to selling it. Facebook has grown from being a dorm room novelty to a social media giant that has an effect on marketing, politics, business, and even our sense of identity. Its social impact continues to grow throughout the globe. (It is hardly surprising that Marshall McLuhan, who coined the term global village, is a favourite at the company.) In December 2013, Facebook had 1.2 billion users (Facebook Inc., 2013).

Bootstrapping Examples

Bootstrapping techniques used during the early stages of operations at Facebook Inc. are numerous. These examples are divided into categories identified by Neeley (2004b) and are summarized in Table 4.10 on page 115.

Table 4.10: Bootstrapping Examples at Facebook Inc.

Categories Neeley (2004b)	Sources / Techniques	Examples
Owner's Resources	Savings Accounts	Zuckerberg and Savarin invested \$1000 each to found Facebook, and within months they invested another \$10,000 each.
	Salary from "Other" Job	Zuckerberg used his money saved from programming and website jobs to finance Facebook.
	Residence for Business Use	At the beginning Facebook was operating Zuckerberg's dormitory.
Relationship Resources	Cash Contribution (Investment from Family/Friend)	Zuckerberg's parents contributed to their son's venture. Some of Zuckerberg friends also invested in Facebook.
	Below-market Salary	Zuckerberg's friend from Harvard worked for below-market salary.
Quasi-Equity	Angels, Individuals	Peter Thiel, an angel investor invested \$500,000 in Facebook. Angel investors Reid Hoffman, and Mark Pincus also contributed.
Cooperation Resources	Equipment or Facilities (or Software) Sharing	Facebook used MySQL, an open source database, and PHP and Apache Web server tools
Cash and Asset Management	Used Equipment	For a while Facebook had 'used' office furniture in their office.
Outsourcing	Professional Services	Originally data center and servers operations were managed by a third-party company. Then Facebook hired Taner Halicioglu, an engineer, who worked from San Jose.
	Temporary Employees	Facebook hired Erik Schultink and Stephen Dawson-Haggerty, two Harvard students for the summer of 2004.
Subsidies and Incentives	University Resources	Zuckerberg used Harvard's computer to start Facebook.

Institutional Context

Harvard University, one of the most prestigious universities was an ideal backdrop for Facebook. At first, one could join Facebook only with a Harvard.edu email address, which made the social network exclusive. Sam Lessin, a friend of Zuckerberg and early user of Facebook said: "There is incredible latent social competition at Harvard, which I think really helped Facebook in the early days" (Kirkpatrick, 2011, p.40). Harvard confers an

imprimatur that carries unique weight in any field. A Harvard connection makes a product desirable, and someone with a high self-image would be drawn to a social network that started in Harvard. After only the second week of launching, students from other universities were emailing Zuckerberg asking when they could join the social network (Kirkpatrick, 2011, p.34).

Background and Motivation of Founders and Finance Providers

Mark Zuckerberg was born in White Plains, New York. He attended Phillips Exeter Academy in his junior year, where he won prizes in science (math, astronomy and physics) and classical studies. On his college application, Zuckerberg claimed that he could read and write French, Hebrew, Latin, and ancient Greek. He was captain of the fencing team (Kirkpatrick, 2011). Harvard provided the founders of Facebook with unique resources for developing his business. “At Harvard people were starting up websites pretty frequently”, said Moskowitz, one of the founders (Kirkpatrick, 2011, p.39). Zuckerberg and his roommates had extraordinary talents: Moskowitz was a hard-working programmer, intellectual, and a leader, while Chris Hughes was exceptionally articulate and polished.

Making Thefacebook fun was more important to the founders than making it into a business. In an interview with *Harvard Crimson* Zuckerberg said that he did not create the Website with the intension of generating revenue (Kirkpatrick, 2011, p.33). In another interview with the *Stanford Daily* he told: “I know it sounds corny, but I’d love to improve people’s lives, especially socially”. He also said that the site was still costing him eighty-five dollars per month, he did not feel any business imperative” (Kirkpatrick, 2011, p.35). Only four months after Facebook’s creation, Zuckerberg turned down an offer to sell it for \$10 million.

Peter Thiel, the co-founder of PayPal, an on-line payment service was an early investor in Facebook. He describes his motive for investing as follows:

The most important investment theme for the first half of the twenty-first century will be the question of how globalization will happen. If globalization doesn’t happen, then there is no future for the world. The question then becomes what are the best investments that are geared

towards globalization. Facebook is perhaps the purest expression of that I can think of (Kirkpatrick, 2011, p.11).

4.11 Findings

Although all the researched firms are in the high-technology sector, they are not necessarily recent ventures; in fact, more than half a century separates the oldest from the youngest company researched in this dissertation (HP and Facebook respectively), making the analysis truly longitudinal.

Types of Innovations Introduced by Founders

Since HP's incorporation, many technological changes have occurred: the appearance of mini-computers, the evolution of personal computers and the communication technology revolution, the arrival of the Internet and social media, and many more. The entrepreneurs studied in this dissertation were instrumental in bringing about these changes. Their ventures introduced not only technological, but also organizational and social innovations. In 1949, at a gathering of business leaders, David Packard voiced an innovative view on business organization: "A company has a responsibility to recognize the dignity of its employees as human beings, to the well-being of its customers, and to the community at large" (Packard et al., 1995, p.xiv). Apple, Microsoft, Amazon, and eBay introduced an innovative incentive system. Although their employees were working very hard for less than industry-standard salary, they received generous stock options. When the companies went public, a number of long-time employees became millionaires. Dell Inc., Amazon, and eBay initiated a marketing-organizational innovation. By bypassing the middleperson and offering PCs directly to the end users Dell transformed the way customers buy electronics. Dell was the first personal computer retailer that offered an unconditional 30-days money back guarantee. Amazon changed the way we define the concept of a store, and contributed to globalizing merchandising. Omidyar's novel idea of connecting sellers and buyers on-line created a new market place that provided opportunities to previously isolated people. These companies created new marketing paradigms. Google and Facebook pioneered in the field of social innovation. Google made easy access to information, and enabled everyone with a computer to form new connections. Facebook provided a novel method of social interaction. All of the ventures created either new

technologies, or—as in the case of DEC, Apple, and Microsoft—a new industry, or used technology as a means to introduce marketing, organizational, or social innovations.

Thick Description

When analyzing the descriptive information, I detected some commonalities among the founders; first, their age: all of the entrepreneurs were young when they founded their companies (Michael Dell, the youngest, was 19 years old, and Ken Olsen, the oldest, was barely 31); and each one of the entrepreneurs had at least started university. Wozniak, Jobs, Gates, Allen, Dell, Lazaridis, Page, Brin, Zuckerberg and Moskovitz interrupted their studies to focus on their companies. Another obvious similarity would be their gender. See Table 4.11 on page 119.

All of the founders had an entrepreneurial bent, which found expression in two different ways. Some entrepreneurs, like Hewlett and Packard, Lazaridis and Fregin, proceeded to start a company without a specific product in mind. They tried several diverse products or services before hitting upon the winning formula. Others, like the founders of DEC, Apple, Microsoft, Dell, Amazon, BlackBerry, Google, and Facebook recognized an opportunity and immediately focused on it. Omidyar, the founder of eBay, is unique in this respect because he straddles both of these groups. He never set out to become an entrepreneur; instead, he started a hobby, and his passion for the service he provided led him to become a founder. He recognized the opportunity but only after it became viable.

It is interesting to note that of the ten ventures only three—HP, DEC, and Apple—had a rudimentary business plan at the early stages. When discussing the idea of founding a company, Hewlett and Packard wrote down their thoughts. It began with a general statement about design and manufacture of products in the electrical engineering field, followed by a surprising statement: “The question of what to manufacture was postponed” (Packard et al., 1995, p.XI). Ken Olsen and Harlan Anderson were asked to submit a business plan when they approached ARD for funding. They studied Chapter 5 of Paul Samuelson’s bestselling textbook *Economics* on how to form a business. They also concentrated on the Appendix, which presented a fictitious business case of a toothpaste company. “We studied that model backwards and forwards until we could have started a

Table 4.11: Case-Study Founders and their Ventures

Company	Year Founded	Founders	Age of Founders	Education of Founders	IPO Date	Years Elapsed from Foundation to IPO	Company's Location at the time of Foundation	Industry
Hewlett-Packard Company	1939	Bill Hewlett and Dave Packard	26 27	Master's degree Master's degree	Nov. 6, 1957	18	Palo Alto, California, United States	Hardware manufacturing
Digital Equipment Corporation	1957	Ken Olsen Harlan Anderson	31 28	Master's degree Master's degree	Aug. 19, 1966	9	Maynard, Massachusetts, United States	Hardware manufacturing
Apple Inc.	1976	Steve Wozniak Steve Jobs [Ronald Wayne]	26 21 [n/a]	Left university Left university	Dec. 12, 1980	4	Cupertino, California, United States	Hardware manufacturing
Microsoft Corporation	1975	Bill Gates Paul Allen	20 22	Left university Left university	Mar. 13, 1986	11	Albuquerque, New Mexico, United States	Software development
Dell Inc.	1984	Michael Dell	19	Left university	Jun. 22, 1988	4	Austin, Texas, United States	Hardware manufacturing
Amazon.com	1994	Jeffrey Bezos	30	Bachelor's degree	May 15, 1997	3	Bellevue, Washington, United States	Software development
Research In Motion BlackBerry	1984	Douglas Fregin, Mike Lazaridis, [Jim Balsillie]	23 23 [n/a]	Left university Master's degree	Oct. 28, 1997	13	Waterloo, Ontario, Canada	Hardware manufacturing
eBay Inc.	1995	Pierre Omidyar	28	Bachelor's degree	Sep. 9, 1998	3	Campbell, California, United States	Hardware manufacturing
Google Inc.	1998	Larry Page Sergey Brin	25 25	Left university Left university	Aug. 19, 2004	6	Menlo Park, California, United States	Software developments
Facebook Inc.	2004	Mark Zuckerberg Chris Hughes Dustin Moskovitz Eduardo Saverin	20 21 20 22	Left university Bachelor's degree Left university Bachelor's degree	May 18, 2012	8	Cambridge, Massachusetts, United States	Software developments

toothpaste company”, Anderson said (Rifkin and Harrar, 1988, p.12). When Steve Jobs was looking for money to finance the manufacturing of his computer, Valentine, the preeminent Silicon Valley investor, told him that to get financing, among other things, he needed a business plan. Mike Markkula, who became an angel investor in Apple, tried to work with Jobs on a business plan but Jobs, who promised to write various chapters, never honoured the promise. At the end Markkula, an outsider at the time, wrote the whole plan.

With the exception of Dell, Amazon, and eBay, the companies were started by a partnership. Although not a founder, Jeff Skoll was hired by Pierre Omidyar within less than 6 months after the foundation of eBay. Skoll became a trusted partner of Omidyar’s until both left the company in 1999. The partners of each venture have complimentary personalities. For example, Wayne, who was a third partner for a little while in Apple Inc., described Jobs and Wozniak’s partnership:

They were very different, but they made a very powerful team. Jobs at times seemed to be driven by demons, while Woz seemed naïf who was toyed with by angels. Jobs had a bravado that helped him to get things done, occasionally manipulating people. He could be charismatic, even mesmerizing, but also cold and brutal. Wozniak, in contrast, was shy and socially awkward, which made him seem childishly sweet” (Isaacson, 2011, p.64).

When Lazaridis phoned his friend Fregin, to tell him that he was thinking of starting a company and was needing help, he knew that every dreamer needs a detail man, and he could not make go of any business without his boyhood friend at his side (McQueen, 2010, p.41).

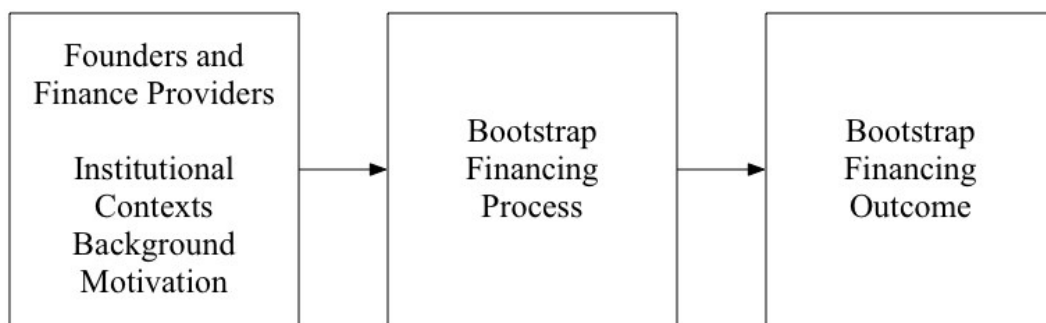
Similarly the partnership between the founders of eBay was built on complimentary characteristics:

In Skoll, Omidyar found a yang to his yin. “It was the perfect balance”, says Omidyar. “I tended to think more intuitively, and he could say, okay, let’s see how we can actually get that done”, Skoll was the hard-driving one, the one focused on business development and fending off the competition. The more easygoing, Omidyar tended the website and nurtured the ActionWeb community” (Cohen, 2002, p.32).

The Process Dynamics of Bootstrapping

The Merriam Webster dictionary defines process “as a series of actions that produce something or that lead to a particular result” (Merriam-Webster, 2014). Processes are by their nature a collection of actions. They exist at more than one time, exhibiting temporal properties, and can change over time. Furthermore, they can be multifaceted, and may consist of more than one type of action. A process has a dimension which relates to an action, and a dimension that relates to time. This analysis acknowledges these fundamentals and draws them together to study these distinct dimensions of the bootstrapping process, answering the questions what? and when? The bootstrapping process does not occur in a vacuum: the institutional context, the founders’ and finance providers’ backgrounds and their motivations influence the actions that they take at any given time. See Figure 4.1 on page 121.

Figure 4.1: Bootstrap Financing Process



Institutional Context

The institutional background was instrumental in assisting the entrepreneurs in the formation of their ventures. Like Gates and Allen, who were introduced to computers at Lakeside College, other entrepreneurs found the university environment influential in developing their desire to start a venture. With the exemption of Lazaridis, all of them studied at some of the best universities in the US, which were fertile environments to the aspiring founders, universities where they developed a rich network of friends. Jeff Bezos found all of his employments before starting his business through his connections from Princeton University. These institutions were endowed with state-of-the-art research facilities with excellent instructors. In the 1950s, for example, MIT was the leader of

computer technology, and its Lincoln Laboratory conducted advanced research in that field, employing the brightest minds like Ken Olsen, one of the founders of DEC. From the mid-1970s onward, Stanford University, where Larry Brin and Sergey Page started to develop the software of Google in Stanford as a Ph.D. project, became a center of the new technologies. Similarly, Lazaridis attended Waterloo University which, with strong co-op program and entrepreneurship studies, is one of the leading universities to study engineering in Canada. Lazaridis made sure that RIM's office was close to the University of Waterloo to attract the top graduates for future employment. He liked to say that "we built the refinery next to the gold mine" (McQueen, 2010, p.148).

Around these universities grew another layer of institutions that provided opportunities for starting ventures. They are Route 128 of Massachusetts near MIT, and Silicon Valley (near Stanford), where the iconic Homebrew Computer Club held its meetings. These areas offered a network of innovative companies and a pool of bright, young, risk-taking individuals and venture capitalists. Until the late 1960s the east coast was the centre of venture capitalists, as exemplified by such companies as ARD, the Rockefeller Brothers, Greylock Capital, and Fidelity Ventures. In the early 1970s, however, many new venture capital firms started opening up on the west coast. While the original Silicon Valley venture capitalists primarily had experience in investment banking and finance, the new wave of venture capitalists featured many former entrepreneurs or managers of high-tech firms. They understood technology and were willing to take much higher risks than traditional banking institutions, and were financing entrepreneurs with path-breaking technologies and very little managerial experience (Ante, 2008).

Background and Motivation of Founders and Finance Providers

Most of the founders demonstrated interest in technology and, when available, computers, from an early age. In the 1930s, Both Bill Hewlett and David Packard experimented with radios and even with explosives when they were in school. Bill Gates, in the early 1970s, and Michael Dell, a decade later, were so obsessed with computers that their respective parents had to ban their use for a while. By the early 2000s Larry Page and Sergey Brin grew up in households, where computers were part of the family culture from their early ages on. The founders' environments—their families, friends, and teachers—nurtured

their interest in technology, which later on turned into passion. Each founder excelled in high school, many of them often in more than one subject. They all got into universities with rigorous entrance procedures.

All of the angel investors, who helped to finance the ventures, had had entrepreneurial experiences and/or technical backgrounds. General Doriot, who provided funds for DEC had been an accomplished army organizer, Michael Markkula, the angel investor in Apple had made his fortune on stock options while working at Fairchild and later at Intel. Jeff Bezos, who invested in Google, had founded Amazon; and similarly, Peter Thiel, one of the investors in Facebook, had co-founded PayPal.

Motivation can be either intrinsic or extrinsic. Internally, entrepreneurs may be motivated by a personal challenge, or the excitement they derive from the activity. By contrast, external motivators arise from the outside of the individual; extrinsically motivated individuals are mostly driven by wealth and status. The two motivations are not necessarily mutually exclusive; in other words, an aspiring entrepreneur can be driven by internal rewards, such as sense of accomplishment, and by external ones, such as money. The founders with the exception of Jeff Bezos and Lazaridis and Fregin were all motivated mainly by internal rewards. eBay, for example, offered its services initially for free, and Google and Facebook still offer their products with no charge. In 2005 Michael Wolf of Viacom tried to pursue Zuckerberg to sell Facebook. He visited Zuckerberg, and when they stopped by his apartment, he noticed that it was very spartan: a mattress, a bamboo mat and books on the floor, and a lamp. When Wolf asked him:

Why don't you just sell to us? You will be very wealthy. "You just saw my apartment", Zuckerberg replied. "I don't really need any money. And anyway, I don't think I am ever going to have an idea this good" (Kirkpatrick, 2011, p.168).

Although creating an *oeuvre* was more important for most founders than making money, financial rewards were also a motivating factor. Although largely driven by extrinsic rewards, Bezos and Lazaridis were also intrinsically-motivated. Bezos, for example, defined his company's mission statement as "to be the earth's most customer-centric company where people can find and discover anything they want to buy on line" (Brandt, 2011, p.1). Larry Smith, Lazaridis's professor said about him: "He was an exceptional

student. What stood out was his approach to what he wished to do, rather than his ideas. He is an engineer, so he is interested in innovation. He wanted to make something new” (McQueen, 2010, p.37).

Friends and family members invested in the ventures because they believed in the founders and their ideas. They witnessed closely the entrepreneurs’ passion and dedication. They knew the founders’ personalities and expected them to succeed. They also wanted to help out and invested despite the risk of losing the investment. (See Table 4.12 on page 124.)

The angel investors had mixed motives. Markkula did not need money; he took on a lot of stress and work when he decided to help Wozniak and Jobs to create Apple. His main motive was to participate in the personal computer revolution. The other angel investors realized how extraordinary the small ventures and their founders were; in addition to seeking financial reward they wanted to be part of those extraordinary companies.

Table 4.12: Institutional Contexts and Main Motivation

Company	Product Type at the Early Stages of Growth: Tangible/Intangible	Institutional Contexts	Entrepreneur’s Main Motivation
Hewlett-Packard Company	tangible	Stanford University + Silicon Valley	to create an <i>oeuvre</i>
Digital Equipment Corporation	tangible	MIT + Route 128 of Massachusetts	to create an <i>oeuvre</i>
Apple Inc.	tangible and intangible	Hewlett-Packard Company + network of Homebrew Computer Club + Silicon Valley	to create an <i>oeuvre</i>
Microsoft Corporation	intangible	Lakeside College + Harvard University + Washington State University	to create an <i>oeuvre</i>
Dell Inc.	tangible	Texas University	to create an <i>oeuvre</i>
Amazon.com	intangible	Princeton University + D. E. Shaw & Co.	financial gain + to create an <i>oeuvre</i>

Company	Product Type at the Early Stages of Growth: Tangible/Intangible	Institutional Contexts	Entrepreneur's Main Motivation
Research In Motion BlackBerry	tangible and intangible	Waterloo University + strong governmental support	financial gain + to create an <i>oeuvre</i>
eBay Inc.	intangible	Silicon Valley	to create an <i>oeuvre</i>
Google Inc.	intangible	Stanford University + Silicon Valley	to create an <i>oeuvre</i>
Facebook Inc.	intangible	Harvard University + Silicon Valley	to create an <i>oeuvre</i>

Although entrepreneurs relied heavily on bootstrapping methods, they would not have been able to take their ventures to the proverbial *next level* without external financing. As successful former entrepreneurs, angel investors had numerous contacts in the technology field, which helped them to secure further investments. Nick Hanauer, for example—a friend, and one of the first angel investors in Amazon.com—used his network of business associates to obtain funds from another twenty angel investors. Similarly, Peter Thiel—the co-founder of PayPal and the first outside investor in Facebook—helped to secure additional angel investments.

What all investors had in common was that they recognized a good idea when they saw one. In addition to depending on plain business sense, they often relied on instinct. Mike Markkula, for example, like Don Valentine before him, could have been put off by Wozniak's and Jobs' unkempt appearances; instead, he saw potential in their ideas, and provided funds for their venture. Similarly, Andy Bechtolsheim, the co-founder of Sun Microsystems, not only immediately realized that Page and Brin came up with an exceptional product, but he also wrote them a cheque for \$100,000 on the spur of the moment. Besides the obvious financial help, Bechtolsheim's endorsement gave the young entrepreneurs confidence. In fact, all of the angel investors in this dissertation provided vital services to the founders. They were mentors, teachers, and advisors, and thus they helped the young and unexperienced entrepreneurs recognize the full potentials of their businesses.

Bootstrapping Techniques (What? and When?)

In this research I use the list of bootstrapping techniques compiled by Neely (2004b). Cash contributions, which I interpreted as all investments from family and/or friends are listed in Neely's table under the bootstrapping category of Relationship Resources. Also, angels as individuals or groups are included in the category of Quasi-Equity as shown in Table 1.7 on page 36.

To meet the needs for capital necessary for starting their companies, entrepreneurs turned to bootstrapping methods. By far the most commonly used bootstrapping techniques are to be found under the category of *Owner's Resources*. Bill Hewlett, for example, invested his savings of \$538 to kick-start his business; Steve Wozniak sold his precious HP scientific calculator and Steve Jobs his Volkswagen van. Similarly, Paul Allen advanced his savings from his employment, while Bill Gates, a skillful poker player, invested his gains from the games. But every new business needs space to flourish. To offset the costs of renting a commercial space, many innovative companies, such as HP, Apple, and, Amazon, started off in garages, or homes (e.g., eBay); others, like Microsoft, Dell, Google, and Facebook—brainchildren of student minds—were run from college dormitories. (When Google outgrew the dormitory, it moved into a garage.)

The entrepreneurs' frugalities at the early stages of the company's life were legendary. Not only did all of them at one point forgo their salary to finance the venture's growth, but they were saving money whenever possible. Olsen, for example, had no doors in his bathroom, because they were expensive to mount; to save money, Omidyar used beach chairs in his office; Jeff Bezos held company meetings inside the coffee shop of a Barnes and Noble bookstore; and instead of buying a conference table, Page and Brin used a green ping-pong table.

After exhausting their own resources, founders turned to *Relationship Resources*. Both family and friends were instrumental in providing not only financial support—Dell, Amazon, BlackBerry, Google, and Facebook all received funds from friends and family members—but also resources (often in form of unpaid labour). Jobs's mother, for

example, acted as a secretary, and his sister as the accountant, and when it was time to assemble computers, his friends all helped out; similarly, Packard's wife, Lucy, did the books for several years; and Bezos's wife, Mackenzie, assisted with phone calls, ordering and purchasing, secretarial duties, and accounting.

The most frequently used *Outsourcing* techniques were hiring temporary employees and employing professional services. In many cases founders would save money by hiring fellow students, who were available at student rates to work when needed. For example, Bill Gates recruited his protégé Chris Larson, from Lakeside College and Monte Davidoff from Harvard for the summer to help to develop the programming language BASIC. When they arrived in Albuquerque, both of them shared an apartment with Allen and Gates (Wallace and Erickson, 1993, p.94). Professional services provided the expertise on an as-needed basis, which cost less than a full-time employee. The founders did not have to provide space for them, or invest in their equipment. David Packard hired Ernie Shiller, who had a one-man shop just down the street from their Addison Avenue garage to do the sheet metal work for their cabinets. Ernie was a good craftsman, and did HP's sheet metal work for a number of years (Packard et al., 1995, p.49).

Obtaining or purchasing used equipment was the most frequently used bootstrapping method in the *Cash or Asset Management* category. Many starting ventures used second-hand office furniture, tools, and even computers. David Packard carried a used Sears Roebuck drill press from the east coast to California, which became HP's first equipment (Packard et al., 1995, p.34). Lazaridis bought a surplus computer that did not work from Waterloo University's for \$650. He fixed the unit himself and designed the GM system and other works with it for two years (McQueen, 2010, p.45). See Table 4.13 on page 128.

Table 4.13: Bootstrapping Techniques Used by Founders

Categories (Neeley, 2004b)	Hewlett Packard Company	Digital Equipment Corporation	Apple Inc.	Microsoft Corporation	Dell Inc.	Amazon.com	Research In Motion Blackberry	eBay Inc.	Google Inc.	Facebook Inc.	Total for Each Category
Owner's Resources	4		4	4	2	3	1	2	2	3	25
Owner's Borrowing	1						2		1		4
Relationship Resources	1	1	2	1	1	2	3		1	2	14
Quasi-Equity		1	1			1			1	1	5
Cooperation Resources	1	1		1		1		1	1	1	7
Cash or Asset Management	2	1	2	1	1		1	1	1	1	11
Outsourcing	1	1	2	2	1		1	2		2	12
Subsidies and Incentives				1			2		1	1	5
Total Number of Instances of Bootstrapping Techniques Used by Each Company	10	5	11	10	5	7	10	6	8	11	83

While founders relied on most bootstrapping methods continuously, they turned to family or friends only once, and only in the early stages of companies' life. Those founders who received funding from friends and family obtained it within less than two years from starting their businesses. Angel investment followed very soon. Google is the only exception to this, in that Brin and Page obtained investment from Andy Bechtolsheim before they would turn to their families and friends. RIM received substantial financial support from various government bodies. See Table 4.14 on page 129.

Table 4.14: Companies' Sources of Funds and the Year They Were Contributed

Category (Neeley, 2004b)	Owners' Resources	Relationship Resources		Quasi- Equity	First Round Venture Capital	Subsidies	IPO
	<i>Founder(s)</i>	<i>Family</i>	<i>Friend(s)</i>	<i>Angel Investor</i>			
Hewlett-Packard Company	1939						1957
Digital Equipment Corporation	1957			1957	1957		1966
Apple Inc.	1976		1976	1977	1978		1980
Microsoft Corporation	1975				1981		1986
Dell Inc.	1984(1)*	1984(2)			1987 Private Placement		1988
Amazon.com	1994	1995(1)	1995(2)	1995(3)	1996		1997
Research In Motion BlackBerry	1984	1984			1996	1984	1997
eBay Inc.	1995				1997		1998
Google Inc.	1998(1)	1998(3)	1998(3)	1998(2)	1999	1998	2004
Facebook Inc.	2004(1)	2004(2)		2004(3)	2005		2012

*Note: The numbers in parentheses indicate the sequences of these activities in a given year

Although funds from family and friends were only used by six founders, this method provided a large inflow of cash at the beginning of their operations, when they needed it the most. Jobs and Wozniak received a \$5000 loan from a friend's father. Although Michael Dell's parents initially disapproved of their son's dropping out of school, they did end up investing \$300,000 into his business (Spiceland et al., 2011, p.4). And, having well-paying jobs, they were able to help him with a substantial amount. Jeff Bezos's family was willing to invest in Amazon because they had as much faith in him as he did in himself. Bezos's father bought 582,528 shares of Amazon for \$100,000 (Brandt, 2011, p.61). Just like Dell's parents, Lazaridis's parents were not happy that their son left university, but helped him with a \$15,000 loan to launch his business (McQueen, 2010, p.43). Similarly, after obtaining their angel investment, Page and Brin gained confidence and credibility to raise

close to a million dollars from family and friends (Vise and Malseed, 2008, p.48). And lastly, Zuckerberg's parents invested \$85,000 in Facebook (Kirkpatrick, 2011, p.63).

Bootstrapping became a way of life for most founders. Packard, for example, recalls:

The day of our first public listing on the New York Stock Exchange did not start smoothly. A few of us flew to New York the day before the event and stayed uptown at the Essex House. Early next morning, we set off for Wall Street. It never occurred to me to take a taxi; instead we jumped on the BMT subway, and headed downtown. Unfortunately, I was not much of a subway navigator, after much debate, we made the wrong connection at Times Square. We arrived on Wall Street several minutes late and we were immediately ushered into a huge corner office and greeted by the chairman of the exchange, Keith Funston. He chuckled when I explained that we'd gotten lost on the subway. I don't think he could fathom that we would take the subway to such an important event, but we did (Packard et al., 1995, p.89)!

Bootstrapping Techniques (Why?)

Nascent technology-based companies need funds to grow. Traditional ways of obtaining funds are through debt- or equity financing. The ventures studied in this dissertation were founded by young individuals, some of whom had left university to pursue their dreams. Many of them not only lacked entrepreneurial experiences, but in fact had never worked before. What is more, they wanted to create companies in then still non-existing industries, industries that were considered high-risk by most traditional lending institutions. (Both David Packard and Steve Jobs were turned down when approaching banks for a loan.) Selling equity in the business would have been another option, but that would have likely resulted in loss of control, which none of the founders wanted. Bootstrap financing therefore provided the companies with an opportunity for growth. It was easily obtainable, convenient, and non-bureaucratic; similarly bootstrapping required neither a formal business plan nor collateral. The techniques used by the founders of the ventures were intuitive and effective. They provided just enough funding to help the ventures advance to the next level, where they became desirable investment targets for venture capitalists.

One of the reasons some entrepreneurs studied in this dissertation looked for venture capitalists was to finance the growth of their companies. Angel investment was crucial in financing the early stages of growth, but turning a small start-up manufacturing company

into a global corporation requires more extensive capital, more than angel investors were able to provide. DEC, Apple and RIM needed substantial amounts to finance the manufacturing of their products, while Google and Facebook, for example, had to add expensive servers at a rapid rate; who but venture capitalists would have been able to provide the funds necessary in such a short period of time? When the founders finally decided to turn to venture capitals, many of them were courted by venture capitalists, for the “privilege” to invest in them.

In addition to raising funds necessary to finance a company, venture capitalists also prepared the companies for the initial public offering (IPO). Going public was a way for the companies to raise money, for both the founder and venture capitalist to realize their investments, but it was also an exit strategy for anybody with an equity stake. Besides allowing the companies to raise even more money, going public added credibility to their businesses. Omidyar, for example, was convinced that going public would be a powerful branding event for his little known company (and he was right!).

HP and Microsoft, however, had different reasons for becoming public companies. The 1934 Securities-and-Exchange Act required all companies to register and file public reports as soon as stocks had been distributed to 500 or more individuals. HP and Microsoft had given stock options to a large number of staff and were planning to further reward loyal employees. The companies had no choice but to go public.

With the exception of HP, nine of the companies that went public had consulted venture capitalists. HP also differed from other companies in that it took longest to go public (18 years, compared to Amazon and eBay that took only 3 years). See Table 4.14 on page 129.

5 Conclusions, Contributions, and Recommendations

5.1 Conclusions

This study has explored bootstrap financing methods used by entrepreneurs of technology-based new ventures at the early stages of growth. From the outset of the study, I accepted Neeley's (2004b) descriptions of bootstrapping techniques and further built on them. In the quest to learn from highly successful entrepreneurs in this study I turned my focus on how they obtained funds to grow their ventures and precisely which bootstrapping methods they used. The dissertation provided further evidence that financial bootstrapping methods are indeed an essential feature of business start-ups, particularly in the high-technology sector. High-technology giants launch their ventures with bootstrapping techniques, which include, but are not limited to, funds from families, friends, and angel investors.

The ten cases show not only that many of the bootstrapping concepts identified in earlier research are indeed used in practice, but also at what stages of growth they are implemented. In doing so they shed some light on the "process dynamics" surrounding the use of bootstrapping techniques: the founders started and/or graduated from the best universities in North America, which in turn, together with their surroundings such as Silicon Valley or Route 138, were a fertile environment for their start-ups. Each venture introduced either technological, organizational, marketing, or social innovation (or some combination of them). Perhaps the most important contribution of this study is that entrepreneurs, who irremediably changed the world we live in, started their ventures with simple, intuitive, and humble methods of financing.

The findings highlight some of the financial challenges founders face in the seed and start-up stages of their ventures. Although no consensus can be reached on the best way to approach early stages of financing, the examples used throughout my dissertation showcase the importance and effectiveness of various bootstrapping methods, methods that require considerable flexibility and nuances in their execution. It is evident from the ten case studies that highly successful entrepreneurs of technology firms are aware of the importance of bootstrap financing, either by intuition or through common sense.

The study demonstrates that the founders, all of whom were bright students studying at reputable universities, were motivated by intrinsic factors. They had a passion, in some case an obsession for technology, and wanted to spearhead the new technological movement. Starting their own ventures, they realized, would give them the opportunity to fulfill their dreams. The founders in this dissertation, who left university to start their ventures, reasoned that if they waited until graduating, opportunities would pass them by, and ended up abandoning their studies against their parents' wishes. With little collateral or entrepreneurial experience and with a plan to launch a venture in a high-risk field, they had no choice but to resort to bootstrapping strategy. After first exhausting their own funds, they turned to their family and friends, and to angel investors. Although most of the founders used bootstrapping methods all the way until their company became public, their high-growth ventures needed more money than bootstrapping could ever provide; consequently, with the exception of Hewlett and Packard, they all turned to venture capitalists.

5.2 Contributions

This dissertation takes a small step in understanding how high-technology superstars finance the early stages of their ventures. Their experiences contribute to the knowledge of the academic community, policy-makers, and the entrepreneurial community.

In the academic community and among policy-makers, formal venture capital plays a centre-stage role, while informal investments and bootstrap financing methods get little consideration. Many business plan contests in entrepreneurship programs stress the importance of formal planning of fundraising activities, yet none of them focus on bootstrapping methods. Studying what founders of successful technology firms do to finance their ventures is essential. Drawing on these lessons scholars can develop new ideas and frameworks for entrepreneurship education and training. Using these examples would draw more attention to these issues and would help young entrepreneurs navigate the sea of challenges that confront any new business startup. This study demonstrated the factors influencing entrepreneurs' early stages of financing. The findings of this study can

help the formal and informal finance providers allocate their resources more effectively and efficiently among founders.

This is one of few studies that use case-study methodology to analyze the financing strategies of highly successful entrepreneurs. By becoming aware of the experiences of these entrepreneurs, practicing or would-be entrepreneurs can adjust their plans and expectations.

5.3 Recommendations for Future Research

Entrepreneurship, as it has been described in literature, is about eventuality, creation, pioneering, newness, and initiatives (Aldrich and Martinez, 2001, McKenzie, 2007). The classifications of bootstrapping techniques in the existing literature are rigid and often do not include many imaginative or complex ways founders bootstrap their new ventures. Future research should expand on the existing taxonomy and classifications.

The present research is a first attempt to understand the relationship between bootstrap financing and “star” ventures’ growths. Future case studies on this subject should draw not only on biographies or autobiographies but also on such research methods as field notes, participants’ interviews, video excerpts, electronic communication, and others. Bygrave and Reynolds (2005) suggest that the source of financing depends on where a start-up sits on an entrepreneurial spectrum. Future research in the area of bootstrap financing could involve case studies of nascent entrepreneurs on the middle of the spectrum, such as start-up ventures founded on opportunities that are more limited than the ones studied in this research. A contribution could be made by studying segments of the financing process. An in-depth study of the angel investment process, the venture capital process, and their dynamic interaction would be beneficial. There is also a need in academic research to provide a formal theoretical framework to help explain the practices of bootstrap financing. This new theoretical framework should be an interdisciplinary effort involving research from entrepreneurial strategy, technology management, managerial finance, and accounting, and from the fields of sociology and anthropology.

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