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

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1. Introduction to the Problem, the Broad Research Question and Motivation

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?

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).

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). 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).

Growth and innovation, however, are often constrained within small firms by lack of liquidity, even when technical opportunity is present (Acs, 1992). 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”.

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).

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. 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.

The Definition of Bootstrap Financing

Ever since Amar Bhidé (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 1.1.

Table 1.1: Definitions of Bootstrap Financing

Source	Definition
Bhíde (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.

Source	Definition
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.

Neeley (2004b) compiled the most extensive classifications of bootstrap finance categories and techniques, shown in in Table 1.2.

Table 1.2: 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

Category	Sources
	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 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

Category	Sources
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.

2. Literature Review

The following section explores the peer-reviewed literature dealing with how high-technology 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.

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 a third of the studies in the literature review on bootstrap financing focus on technology-based businesses. See Table 2.1.

Table 2.1: 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

Reference	No. of Firms	Location of Firms	Firms' Sector	Research Methodology
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).

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).

Case studies are rarely used in bootstrap financing research. Out of the 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).

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

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.

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.

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 analysis are

examined. 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. Case study methodology is a way to design a longitudinal research, 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).

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.

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 or an autobiography, which has been published by a reputable publisher (see Table 3.1).

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).

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. Wise, 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

4. Analysis and Findings

Analysis - Apple Inc.: One of Ten Case Studies

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 did not want to cater 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 4.1.

Table 4.1: 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	In the first months 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.

Categories Neeley (2004b)	Sources / Techniques	Examples
	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).

Findings

Although all the firms researched in this dissertation 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 (HP and Facebook respectively), making the analysis truly longitudinal.

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 4.2.

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

Table 4.2: 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 Harian 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 Lazanidis, [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

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 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.

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 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 4.3.

Table 4.3: 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 oeuvre
Digital Equipment Corporation	tangible	MIT + Route 128 of Massachusetts	to create an oeuvre
Apple Inc.	tangible and intangible	Hewlett-Packard Company + network of Homebrew Computer Club + Silicon Valley	to create an oeuvre
Microsoft Corporation	intangible	Lakeside College + Harvard University + Washington State	to create an oeuvre

Company	Product Type at the Early Stages of Growth: Tangible/Intangible	Institutional Contexts	Entrepreneur's Main Motivation
		University	
Dell Inc.	tangible	Texas University	to create an oeuvre
Amazon.com	intangible	Princeton University + D. E. Shaw & Co.	financial gain + to create an oeuvre
Research In Motion BlackBerry	tangible and intangible	Waterloo University + strong governmental support	financial gain + to create an oeuvre
eBay Inc.	intangible	Silicon Valley	to create an oeuvre
Google Inc.	intangible	Stanford University + Silicon Valley	to create an oeuvre
Facebook Inc.	intangible	Harvard University + Silicon Valley	to create an oeuvre

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.

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 1.2.

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. Shiller 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 4.4.

Table 4.4: 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

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
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 4.5.

Table 4.5: 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>				
Hewlett-Packard Company	1939						1957
Digital Equipment Corporation	1957			1957	1957		1966

Category (Neeley, 2004b)	Owners' Resources	Relationship Resources		Quasi- Equity	First Round Venture Capital	Sub- sidies	IPO
	<i>Founder(s)</i>	<i>Family</i>	<i>Friend(s)</i>	<i>Angel Investor</i>			
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 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 a possible 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 4.5.

5. 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 launched 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.

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