

Campus as Frontier:
High Growth Student Startups at US Colleges and Universities

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DEDICATION

This is dedicated to my family.

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ABSTRACT

CAMPUS AS FRONTIER: HIGH GROWTH STUDENT STARTUPS AT US COLLEGES AND UNIVERSITIES

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This dissertation explores the complex social phenomena of students at US colleges and universities creating high growth firms and investigates the role, if any, played by the campus during the firm formation process. This dissertation employs mixed methods to better understand student entrepreneurs, their firms and the institutions where opportunity identification and firm formation processes began. Given the gap in the literature surrounding high growth firms created by students, no hypothesis is proposed or tested.

A framework for understanding the campus as a frontier, based on Frederick Jackson Turner's *Frontier Thesis* of the US, is developed and proposed to better understand the potential impact of the campus on founders and firms. This dissertation includes a case study of a US research university that has borne multiple high growth student startups and the construction of a database of high growth student founders, their firms and their colleges and universities. Making use of the themes observed in the data

collected, five common campus trails or pathways that student founders travel to high growth entrepreneurship are presented.

The dissertation presents the novel concept of the campus as frontier and constructs a database providing data on student founders and their interactions with the campus, produces a case study exploring how the campus as frontier may work at a leading research university, presents common pathways students travel across the campus frontier to high growth entrepreneurship, and places this new concept within its historical context in US higher education and innovation and entrepreneurship policy. This research has direct policy implications for those concerned with job growth, regional development, and improved quality of life, much of which springs from entrepreneurs and their firms.

CHAPTER 1: CAMPUS AS FRONTIER

1.1 Introduction

An extensive literature points to the quality and impact of America's system of higher education and its ability to educate, innovate, create jobs, increase societal wealth, and improve standards of living in an entrepreneurial economy (Leydesdorff and Etzkowitz, 1996; Economist, 2005; Kerr 2001; Cole, 2009; Thorp and Goldstein, 2010).

This dissertation investigates an important gap in the literature on higher education in the entrepreneurial era. This research explores the emergence and importance of student entrepreneurs at US colleges and universities. From Microsoft and Nike to Netscape and FedEx, many of the world's most innovative and successful companies began the firm formation process on campus while founders were students.

The complex social phenomena of students creating innovative, high growth firms while on campus has not been explored in the literature on universities and economic growth or entrepreneurship. While entrepreneurship education has received attention from multiple scholars and has become a feature on thousands of campuses, no studies have specifically investigated high growth student startups.

This dissertation begins to fill this hole in the literature and attempts to understand how, if at all, the campus impacts the creation of high growth firms by students. A database of high growth student startups, their founders, and schools was created. As far

as this author is aware, this is the first known database of students, their high growth firms and schools. Because this is exploratory research of a contemporary social phenomena, there is no hypothesis in this dissertation. Due to our limited knowledge of these firms, the population size, and many other basic data, it would be premature to offer and test hypotheses in this research.

Few societal institutions represent contemporary United States and its strengths as well as its system of higher education and its leading entrepreneurial economy (Economist, 2005; Crow, 2008; Cole, 2009; Acs and Szerb, 2012). The uniqueness of its higher education and entrepreneurial sectors makes the US an outlier globally and supports academics, social critics, and politicians that subscribe to some strain of *American exceptionalism* – the belief that in many critical factors the US is fundamentally different from all other nations (Turner, 1923; De Tocqueville, 1988; Schaefer, 1991; Lipset, 1996).

Higher education and entrepreneurship reached soaring heights in scale and impact in the United States during the twentieth century with both taking central roles across economy and society (Drucker, 1993; Audretsch and Thurik, 2001; Bok, 2003; Leydesdorff and Etzkowitz, 2000; Florida, 2000). In many cases and in a growing segment of academic literature, higher education and entrepreneurship and economic growth are deeply intertwined (Etzkowitz et al, 2000; Bok, 2003, Thorp and Goldstein, 2010; Florida et al, 2006; Roberts and Eesely, 2009). Leaders globally continue to try to learn from and replicate American successes in high impact entrepreneurship and higher

education while those within the US continue to debate the future role of higher education and entrepreneurship in the US (Bok, 2003; Thorp and Goldstein, 2010).

One area in particular where higher education and high growth entrepreneurship converge is the growing population of high growth firms created by students on campuses in the United States. This research focuses on a specific intersection between entrepreneurship and leading American colleges and universities, exploring how students identify entrepreneurial opportunities and begin the firm formation process while on campus.

The purpose of this dissertation is to provide both quantitative and qualitative data and analysis related to high growth student startups, their founders and educational ecosystems from which these firms emerged. This research will expand our understanding of the role of higher education in high growth entrepreneurship and societal change and will offer data, analysis, founder pathways and a frontier framework to place the social phenomena of high growth student startups into context with our current understanding higher education, entrepreneurship and public policy in the United States.

1.2 Research Background

Higher education and entrepreneurship are key features of many recent policy debates from technological innovation and job growth to rising student debt levels and online disruption. In recent decades researchers, policy makers, and members of the media have pointed to these two societal institutions as crucial factors in economic growth, job creation and increased standards of living in the United States. While

economists, sociologists, management thinkers and others have weighed in on these two fields in increasing numbers, policies intended to spur high impact entrepreneurship and improve higher education output are difficult to validate.

This dissertation supports Schumpeter's (1942) claim that entrepreneurs are changemakers in capitalist economies and that it is their actions and ability to create new combinations of economic assets that leads to improved standards of living. Of course, entrepreneurs do not operate in a vacuum (Gartner, 1985; Baumol, 1990; Aldrich, 1990) and this research builds onto a series of papers by William Gartner and colleagues (Gartner 1985, 1988; Katz & Gartner 1988), arguing that our understanding of entrepreneurship will be limited if we only observe the entrepreneur. Gartner (1985, 1988) argues that we must consider four levels of analysis when attempting to understand entrepreneurship: the entrepreneur(s), the firm, the environment, and processes through which the entrepreneur(s), the firm and the environment interact (Gartner, 1985). Following the insights provided by Gartner, this dissertation will make use of multi-level qualitative and quantitative research to explore firm formation processes, the founders, firms and the campuses (environments) that played host as high impact organizations were developed by students.

The exploration of the campus environment brings this research into direct contact with the vast literature on higher education in the United States. Generally speaking, higher education in the United States has been responsive to society's needs (Slosson, 1910; Rudolph, 1990; Kerr, 1991; Thelin 2004; Cole, 2009). In recent decades, the rise of the entrepreneurial economy (Economist, 1976; Drucker 1985; Audretsch &

Thurik 2000) has been met with the rise of the entrepreneurial university and college (Crow, 2008; Leydesdorff & Etzkowitz 1996; Etzkowitz et al, 2000; Bok, 2003; Florida et al, 2006; Thorp and Goldstein 2010). The demand for more entrepreneurially engaged institutions continues and policy makers and higher education leaders often struggle to meet demands from many stakeholders for new offerings, technologies, applications, and responses to the entrepreneurial age.

The responsive nature of higher education in the United States is one of the reasons it has been relied on to solve many of society's greatest challenges (Veysey, 1965; Rudolph 1990; Cole 2009; Thorp and Goldstein, 2010). From developing weapons to defeat Nazism to developing drugs to combat HIV, higher education in the US is expected to produce and over the past half century higher education has become entrepreneurially engaged (Thelin, 2004; Rudolph, 1990; Cole 2009; Thorp and Goldstein, 2010).

The institutions in this research are diverse in size, location, history, and countless other attributes and their physical space and campuses vary as well. This is not a surprise given the size and diversity of higher education in the US (Bok, 2013). Due to this, no formal definition of the campus is employed in this research. Life on campus or the 'collegiate way' as described by Rudolph (1990) assumes a social and developmental impact on students that goes beyond the academic and intellectual. Due to the small size and rural location of many early colleges in the US, a cohesive campus community and strong 'campus life,' has been a goal of higher education leaders since the earliest days in

the US. It is this campus, a physical location and community that is the working definition of campus in this research.

In some cases entrepreneurs were active on campus before policy makers, administrators, and faculty attempted to institutionalize entrepreneurship on campus. This reality is consistent with the history of higher education in the US and the broader cultural, political and economic history of individuals and small groups bringing innovative, value producing endeavors that eventually spread across the economy and society (Rudolph, 1990; Lipset, 1996; De Tocqueville, 1988; Turner, 2008).

As noted earlier, the United States is a global leader in high growth entrepreneurship and higher education. From innovative startups to research funding, Nobel prizes, wealth creation and philanthropy, the exceptional nature of the United States is evident. The literature and theories of American exceptionalism have important roles in this dissertation as US higher education is the birthplace of the high growth student firms in this research.

According to Shafer (1991, p.i), “American ‘exceptionalism’ summarized is the notion that the United States was created differently, developed differently, and thus has to be understood differently – essentially on its own terms and within its own context.” This dissertation will make use of Frederick Jackson Turner’s theories of American exceptionalism to offer a context for considering US campuses and high growth entrepreneurs, but potentially for a broader pool of innovators.

Turner (1896) argues that readily available economic assets, diverse populations, and liberty were all available on the American frontier and that mix led to a new kind of

social, political and economic system in the US. Turner's *Frontier Thesis* is used as a model in the development of a 'frontier framework' for understanding campus environments and their capacity to support high growth entrepreneurs. Table 1.1 provides a broad overview of the attributes of the American frontier as seen by Turner and their potential counterparts on the modern US university and college.

Table 1.1: Turner's frontier and the modern US college and university

Frontier attribute	Turner's US frontier	Modern US university and college
Available assets	Land, mineral wealth, water, game, burgeoning populations, growing transportation, communication and financial networks	Course, extracurricular, peers, faculty, alumni, networks to other institutions, research, labs and libraries
Liberty (freedom and choice)	No early governments, no established social institutions or conventions, no incumbent economic powers	Dispersed decision making for administration and faculty, freedom of research and field of study, extra-curricular choices, part-time/full-time/executive options, transfer system, egalitarian systems
Diverse populations	Changed over time, nationality and place of birth, wealth, method of arrival, fluid social status	Ethnicity, place of birth, field of study, age, education levels, political ideologies, regenerating youthful populations, visiting scholars and students; full time/part time; adjuncts/research faculty/teaching faculty; networks beyond campus, alumni

1.3 Research Problem and Question

Important debates on higher education, economic growth and jobs make our lack of data on high growth student entrepreneurs, their firms, and the role, if any, that

campuses played in the firm formation process an important problem. This is the central research problem of this dissertation.

While much work has been done investigating high growth firms, little, if any research explores the specific subset of high growth firms created by students at US colleges and universities. Moreover, in previous attempts to assess the role of the higher education in the entrepreneurial economy, little work explored firms created by students on campuses, though their impact on economic growth, job creation, and social change has been massive.

As this dissertation will show, student entrepreneurs across the US have created world changing, high growth firms on campus while researchers across the quad have consumed forests of paper measuring university patent portfolios, immigrant PhD attainment, and technology transfer and innovation park strategies.

In November 2011, online coupon company Groupon, completed an Initial Public Offering (IPO) on the NASDAQ that valued the company at over \$16 billion (Raice and Smith, 2011)¹. Groupon was created by University of Chicago Harris School of Public Policy graduate student Andrew Mason in 2008. Mason had originally come to the Harris School to work on an online public policy visualization tool called Policy Tree, but soon set about creating The Point, the precursor the Groupon.²

¹ At the time of publication of this research (July 2015), GRPN had a market cap of more than \$3 billion.

² Groupon, an online coupon service was founded by Harris School of Public Policy student Andrew Mason and was dubbed the fastest growing company in world history by Fortune Magazine in 2010. Groupon, with Mason as CEO, went public in November 2011 and in raising \$700 million that day it was the largest IPO of a US Internet company since Google's IPO in 2004. Grub Hub, a winner of the University of Chicago Booth School of Business' New Venture Challenge business contest in 2005 completed its IPO in April 2014.

In 2011, the year Mason's Groupon went public, 11 other startups created by students at the University of Chicago raised more than \$85 million dollars in equity investment (Polsky Center, 2011b). One of those firms receiving investment, Braintree Financial, would be acquired by eBay for \$800 million dollars in cash in 2013. Another one of the firms receiving investment in 2011, online food delivery platform GrubHub, would complete an IPO of its own in April 2014 (Chowdhry, 2013; Calia, 2014).

Over the past 15 years, the University of Chicago, and its graduate school of business, in particular, have become a regular source of high growth student created firms. Table 1.2 presents a selection of the recent high growth student created firms from the University of Chicago and select data for each firm.

Table 1.2: Select high growth student startups from the University of Chicago

Firm name	Year Founded	Founder/school /status	Additional information
Medspeed	1998	Jake Crampton / Booth School of Business / Graduate 1999	Started as class project; won 1998 NVC; early investors were Booth alumni; over \$10 million in revenue annually and 300 employees
Grubhub	2004	Sean Mahoney / Booth School of Business / Graduate 2010	Won 2006 NVC; raised \$34 million in venture financing; completed IPO April 2014
Braintree Financial	2006	Bryan Johnson / Booth School, Executive MBA / completed program	Won 2007 NVC; \$85 million in venture funding in 2012, acquired by eBay for \$800 million in cash in 2013
Groupon	2008	Andrew Mason, Harris School of Public Policy, left school	IPO 4 November 2011, Founder, Andrew Mason fired in 2013
Bump Technologies	2008	David Lieb, Jake Mintz / Booth School of Business / Lieb & Mintz both left school	Founders met at Booth, won 2009 business plan competition; participated in Y Combinator accelerator program, Google acquired in 2013
All Tuition (formerly edulender)	2011	Sue Khim / College / Leave of absence 2010	Khim participated in NVC as an undergraduate; raised money; left school and lives in Silicon Valley
MouseHouse	2012	Umar Khokhar MD/PhD and Imran Ahmad MBA (2013)	Won 2013 NVC; won \$100K investment at 2014 Rice Business Competition; raised over \$750K in financing

The research question pursued and described in Chapter 3 will fill gaps in the literature and has direct implications for specific stakeholders and the public at large as the search for sustainable economic growth and job creation continues and the value and role of higher education plays a key part of such discussions (Menad, 2003; Thiel, 2013; Kamenetz, 2010; Stephens, 2013).

1.4 Goals of Research

The goal of this dissertation is straightforward: to begin our understanding of a specific segment of high growth firms and to understand the influence, if any, the campus environment had on these firms and founders during the firm formation process.

In order to achieve the goal of this research and answer the research question, a database of high growth firms, their student founders, and universities will be presented as will a case study of a university that has been the birthplace of multiple high growth student created firms. As far as the author is aware, this database is the first attempt to track and organize high growth student firms. Themes in the qualitative and quantitative data collected are used to propose common campus pathways that students travel to high growth entrepreneurship. A ‘frontier framework,’ based on Turner’s theories, will be introduced to help explore and interpret the role the campus may be capable of playing in support of high growth firms founded by students. The collected data and proposed framework will support exploration of the research problem and the answering of the research question.

This dissertation will provide entrepreneurs, policy makers, higher education administrators and funders, and others data, analysis, and frameworks to better make

decisions related to entrepreneurship and higher education. Moreover, the research goal and question will support our understanding of entrepreneurship and higher education in the US at both the micro and macro levels – highlighting processes of specific founders, firms, and campuses as well as an initial understanding of the population of high growth student created firms and their campuses.

1.5 Methodology

This dissertation makes use of mixed methodologies, employing both quantitative and qualitative methods in approaching the research problem and question. This choice of methodology is due to the complex nature of new venture creation and the diversity of processes employed by high growth startups (Gartner, 1985).

This dissertation required the creation and analysis of a database of high growth firms created by students at US colleges and universities. The database includes variables on student founders, their firms, the colleges and universities they attended, and interactions between the founders, firms, and campuses.

Additionally, this dissertation presents a case study of a leading research university in the US, the University of Chicago, as it has been the birthplace of many high growth startups created by students. The case was compiled using ethnographic observation, document analysis and semi-structured interviews. Additional data was collected from entrepreneurs, faculty, and visits to other universities and environments that have experienced the emergence high growth student startups.

1.6 Organization of Dissertation

Chapter 2 will discuss academic literature from the fields of entrepreneurship, the history of higher education in the United States, and American exceptionalism, a particular sub-field within American Studies. Chapter 3 will discuss the research problem and question and will describe the methodology employed in completing this research, the rationale for the research design, and a discussion of data and variables. Chapter 4 presents the database of high growth student startups, their firms, and their colleges and universities. Chapter 5 presents a case study of the University of Chicago. Chapter 6 uses the themes from the collected data, both quantitative and qualitative, to propose five basic pathways that students may take to high growth entrepreneurship. Chapter 7 examines the policy implications of this dissertation, its research question and data. Finally, Chapter 8 offers conclusions, including a summary, contributions to literature and opportunities for future research.

1.7 Conclusion

This research explores the intersection of higher education and entrepreneurship in the US via exploratory research on high growth student entrepreneurs. Mixed methods and careful data collection were employed to better understand the role, if any, that the campus played in experiences of high growth student entrepreneurs at US colleges and universities. While this research does not test a hypothesis, the research question and data collected form a solid addition to the literature from which hypotheses can be developed and further research undertaken.

Policy makers have long expected innovative output with economic impact from higher education in the US and this research contributes to that policy dialogue. The research question, data collected and analyzed, and frontier framework offered provide value to policy makers and leaders attempting to build higher education institutions and structures for the entrepreneurial economy.

CHAPTER 2: AMERICAN EXCEPTIONALISM, HIGHER EDUCATION AND ENTREPRENEURSHIP

2.1 Introduction

This chapter will explore relevant literature from the fields of entrepreneurship, US higher education, and American exceptionalism as these three fields intersect in the search to understand the complex phenomena of high growth firms created by students at US colleges and universities.

2.2 American Exceptionalism

The literature on American exceptionalism is diverse, theoretical, historical and touches many fields and policy areas as scholars, policy makers, and the public cannot ignore the presence of the United States globally (Shafer, 1991). The ability to have a simple, organizing principle to understand an entire nation seems to be irresistible, fulfilling a human need to simplify complex and challenging issues. According to Shafer (1991: p.i), “American ‘exceptionalism’ summarized, is the notion that the United States was created differently, developed differently, and thus has to be understood differently – essentially on its own terms and within its own context” This section will explore Frederick Jackson Turner’s *Frontier Thesis* of American History, one of the most influential theories in American studies (Hofstadter and Lipset: 1968). Turner’s theory and imagery, has been employed, since its introduction, to explain the unique character of US citizens and the institutions they have built.

2.2.1 Turner's Frontier Thesis of American History

Turner's basic argument was that the settlement of unregulated, asset rich areas, known collectively as the American frontier, by a diverse lot of people, forged an American character, political entity, and institution building process that is unique and holds liberty and economic self-determination as its ideal (Turner, 1896). Turner first introduced his thesis in 1893, just after the official 'closing' of the frontier in 1890. In the years that followed, Turner openly worried that the United States' unique frontier character, society, and political system would be challenged by the industrial era that the United States had entered (Turner, 1896).

The *Frontier Thesis* argues three attributes of the frontier interacted to create an exceptional and egalitarian type of person, society, and set of institutions (Turner, 1896; 1920). Firstly, Turner's frontier offered great economic opportunities and available assets. This, of course, was a central reason for the founding of some of the American colonies and the commercial opportunities of the frontier beckoned in a similar manner. Many of the colonies were chartered as commercial colonies and indentured servitude was the most popular way to get to the colonies and the frontier during the colonial period (Galenson, 1984).

As the early colonies survived and eventually prospered, people began to push beyond the original colonies and settlements near the East coast. Opportunities, from fur trapping and trading to fertile fields and minerals, were available in all directions. As successive waves arrived and moved further inland, they found timber, more lands, game, great rivers (and river power), mineral wealth and other available economic assets.

According to Turner, the economic opportunity of the frontier lasted almost 400 hundred years (Turner, 1893). Moreover, the waves of pioneers and settlers led to huge and refreshing markets. Many fortunes were made ‘mining the miners.’

The second frontier attribute critical to shaping the American character and the country’s institutions was the fact that the frontier was a ‘savage’ land, well beyond the control of traditional European and coastal institutions, norms and ways of life (Turner, 1920).

Being beyond the physical and institutional reach of European modeled power centers on the coast, the people of the frontier gained greater control in shaping their own destinies. European institutions had few advocates on the frontier.

Describing life “beyond the Alleghenies,” Turner wrote,

“The pioneer was taught in the school of experience that the crops of one area would not do for a new frontier; that the scythe of the clearing must be replaced by the reaper of the prairies. He was forced to make old tools serve new uses; to shape former habits, institutions and ideas to changed conditions; and to find new means when the old proved inapplicable. He was building a new society as well as breaking new soil; he had the ideal of nonconformity and of change. He rebelled against the conventional.” (Turner, 1920, p.228)

“Besides the ideals of conquest and of discovery, the pioneer had the ideal of personal development, free from social and governmental constraint.” (Ibid)

Not only was the ‘establishment’ not physically present or dominant on the frontier, but European and Eastern institutions and customs would not have benefited the frontier inhabitants dealing with the reality of frontier life (Turner, 1920; Billington, 1966). In explaining the inhospitable nature of the frontier to established norms, Turner explained, “The separation of the Western man from the seaboard, and his environment,

made him a large degree free from European precedents and forces. He looked at things independently and with small regard or appreciation for the best Old World experience,” (Turner 1896, p.5). The frontier was a place of experimentation and independence.

It should be noted that as new frontiers were pierced, institutions (political, educational, civic, economic, etc.) would be established and become hybrids of European institutions and frontier needs and practicality (Turner, 1906; Billington, 1966). Higher education would be one such institution impacted by this process (Slosson, 1910; Rudolph, 1990).

The third significant attribute of the frontier that Turner highlights is that a diverse group of people settled the American frontier (Turner, 1896). This diversity helped create a unique national identity, hybrid institutions, and an evolving political and economic structure that deviated from European norms (Turner 1896, 1920).

In presenting his theory for the first time at the 1893 World’s Fair in Chicago, Turner a 32 year-old historian at the time, notes the basic diversity of the frontier versus the East Coast, even during early colonial times:

“First we note the frontier promoted the formation of a composite nationality for the American people. The coast was predominantly English, but the later waves of continental immigration flowed across the free lands. This was the case from the early colonial days. The Scotch-Irish and the Palatine German, or ‘Pennsylvania Dutch,’ furnished the dominant element in the stock of the colonial frontier.

With these people were also freed indentured servants, or redemptioners, who at the expiration of their time of service passed to the frontier. Governor Spotswood of Virginia wrote in 1717, ‘The inhabitants of our frontiers are composed generally of such as have been transported hither as servants, and, being out of their time, settle themselves where land is to be taken up and that will produce the necessary of life with little labour.’

Very generally, these redemptioners were of non-English stock. *In*

the crucible of the frontier the immigrants were Americanized, liberated, and fused into a mixed-race, English in neither nationality nor characteristics.” (emphasis added) (Turner 2008, p.27)

This diversity of population would continue for centuries through various waves of immigration and continues today. The diverse population, when mixed with the economic opportunity and lack of institutions on the frontier led to the exceptionalism that Turner writes about; a political, social, and economic culture that differentiated the United States from Europe.

Turner’s theory on the frontier’s crucial role in creating a new democracy and a new kind of person was meant to separate US history from Europe (Turner 1893, 1920; Hofstadter and Lipset 1968). Turner argues for something truly unique having been created in the US via the frontier experience. This was in stark contrast to the leading theories of his time, which argued that European philosophies (as evidenced by the ‘founding fathers’) were responsible for US social and political development (Elkins and McKittrick 1968). Turner supported a more muscular and independent history, he wrote:

“American democracy came from the forest, and its destiny drove it to material conquests, but the materialism of the pioneer was not the dull contented materialism of an old and fixed society. Both the native settler and the European immigrant saw in this free and competitive movement of the frontier the chance to break the bondage of social rank and rise to a higher plane of existence.” (Turner 1920, p.132)

For Turner, and a generation of scholars to follow, the American frontier was the open space that supported liberty across the economic, social, political, and religious space and created a truly unique country and people. While Turner acknowledges native people and other challenging issues of U.S. frontier history, his writings are a selected version of a fuller history.

White (1995) points out the contrast between Turner's idealized history of the West and the West presented by *Buffalo Bill Cody's Wild West Show*, a popular attraction around the turn of the century. The two men, one an academic and the other a pioneer turned entertainer and entrepreneur, used very different methods to tell the frontier story. Turner simply wrote and delivered speeches centered on man's philosophical and entrepreneurial conquest over nature ('forest democracy') whereas Buffalo Bill theatrically presented the violence of the frontier (framed as unprovoked attacks by natives) including reenactments of scalplings and an actual scalp on display (White, 1995).

It is worth noting that while Turner was an official participant in the 1896 World's Fair presenting his work at American Historical Society's meeting at the fair, while Buffalo Bill set up shop outside of the official fairgrounds. White (1995) argues there are no records of the two men meeting.

2.2.2 The Process of the Frontier

A crucial reason that the frontier impacted American character and social institutions was that it lasted for nearly 400 years. As Turner wrote, "Each new frontier did indeed furnish a new field of opportunity, a gate of escape from the bondage of the past," (Turner, 1920, p.38). New fields of opportunity went on for generations as great numbers of people helped forge the unique American character Turner argued for. Slaves, native people, and the environment would pay a price for this great mix of frontier attributes.

Presenting in 1893, Turner stated,

“Thus American development has exhibited not merely an advance along a single line, but a return to primitive conditions on a continually advancing frontier line, and a new development for that area. American social development has been continually beginning over again on the frontier. This perennial rebirth, this fluidity of American life, this expansion westward with its new opportunities, its continuous touch with the simplicity of primitive society, furnish the forces dominating American character.” (Turner, 1920, p.14)

For Turner the frontier was to be understood as a process more than an actual physical or geographic location or definition (Turner, 2008; Billington, 1966; Madsen, 1993). Billington (1966) points out that Turner never had an exact definition of the frontier and was much more interested in economic, social, and political processes that occurred there. Billington (1966, p.16) argues, “That he twisted the meaning of the word frontier; to suit a variety of moods is unquestionable. At times the frontier was the edge of the settled territory, the outer edge of free land, the line of settlement; at others it was the ‘West,’ or a ‘form of society’ rather than an area, or a ‘process’”.

2.2.3 The Culture and Imagery of the Frontier

Turner’s Thesis set off a flurry of activity in American studies and would dominate the field of U.S. History for decades to come before failing out of favor (Billington, 1966; Elkins and McKittrick, 1968; Higham, 1968). The idea of frontier and the pioneer has been picked up repeatedly in popular culture, policy, and economics from Turner’s time to today. From advertising and public policy to popular culture, pioneer and frontier imagery is a regular feature in American society.

For example, in laying out a national science policy for the US after World War II, Vannevar Bush, a former Stanford Engineering Dean, founder of Raytheon, and

architect of U.S. science efforts during the war, used the frontier metaphor in shaping scientific research policy for the U.S.

As the war ended, Bush released a report, *Science: the Endless Frontier* (1945). It was a blueprint for a national science and technology innovation system. Bush argued that unleashing the “creative and productive energies of the American people” is the key to producing “new and more attractive and cheaper products” (Bush, 1945, p.2). The report asks:

“Where will these new products come from? How will we find ways to make better products at lower cost? The answer is clear. There must be a stream of new scientific knowledge to turn the wheels of private and public enterprise. There must be plenty of men and women trained in science and technology for upon them depend both the creation of new knowledge and its application to practical purposes.

More and better scientific research is essential to the achievement of our goal of full employment.” (Bush: 1945, p.2)

Bush was an entrepreneur, but the report was not solely focused on the economic uses of university research; it directed attention to the importance of the renewal of scientific talent as well as military, health, and social applications of technology (Bush, 1945).

Much of Bush’s blueprint would eventually be employed to build a system of federal grants, peer review and competition as the drivers for knowledge creation at the university level in the service of national goals, often economic (Cole, 2009). The system has its critics, but the rankings of U.S. research, the flocking of foreign scientists to American research universities, and the numbers of international prizes awarded to U.S. based and trained academics is without equal (Economist: 2005, Cole: 2009, Thorp &

Goldstein: 2010) and supports Bush's notion of science being an endless frontier with recurring opportunities.

In 2013, nearly 70 years after the Bushes' *Endless Frontier*, the National Bureau of Economic Research engaged scholars from multiple fields for a symposium, *The Changing Frontier: Rethinking Science and Innovation Policy* (Jaffe and Jones, 2013). Their naming of the symposium and framing of science and innovation policy with frontier imagery highlights the cultural, economic, and policy impact that Turner's theories and core ideas still hold today.

2.2.4 Contributions to American Exceptionalism

The use of Turner's *Frontier Thesis* in researching the intersection of entrepreneurship and higher education offers a novel employment of a key theory of American exceptionalism. Building a framework for viewing universities and high impact entrepreneurs on top of Turner's concepts extends the literature of American exceptionalism and brings a new tool to researchers and policy makers attempting to understand the unique system of higher education in the US.

It must be noted that the rise of German style research universities, to be discussed in a later section of this chapter, occurred as the frontier was closing and played a central role in 'civilizing' once 'savage' areas (to use Turner's language). Moreover, the university, as explored below, was a societal tool innovation (especially in view of the land grant movement) to help exploit the successes of the frontier (ie land and mineral wealth, burgeoning cities). As the section on higher education will highlight, many of the greatest institutions of higher education were created with funds from entrepreneurs that

made their fortunes settling and exploiting the frontier and its swelling populations. In an odd twist, this proposed research explores whether the contemporary US research university, which was initially created to subdue the frontier and manage its passage, has now taken its place as the locus of liberation and economic opportunity in contemporary America.

2.3 History of US Higher Education

This section reviews the key themes in the literature on the history and evolution higher education, business education, and entrepreneurship in the United States. The early introduction of colleges in North America highlights the desire by some early colonists for a North America that replicated Europe. There were 9 colleges in existence by time of the American Revolution, all of which exist today and all of which are considered to be among the best in the world (Economist, 2005)³.

2.3.1 The British Model

The curriculum of the earliest colleges was dominated by classic languages and philosophy and could be traced to ancient Greece; it was designed to prepare elites who would be civic, religious, and educational leaders (Rudolph, 1990; Thelin, 2004).

Institutional structures – a central location, master instructors with autonomy, examinations and degrees – dated to medieval Europe (Kerr, 2001; Crow, 2008).

Most colonial, revolutionary, and pre-Civil War colleges would follow the elite British model and a period of college building occurred in the US through the 19th

³ Harvard (1636), College of William & Mary (1693), Yale University (1701), University of Pennsylvania (1740), Princeton University (1746), Columbia University (1754), Brown University (1764), Rutgers University (1766), Dartmouth College (1769).

century (Rudolph, 1990). With frontiers breached and new states entering the union, local leaders pushed for their own colleges, often with the help of business and political hands and often under the leadership of various religious denominations (Mardsen, 1994). In establishing colleges, cities were competing with cities, states with other states, and denominations with other denominations in a race to ‘civilize’ the American Frontier.

At the early colleges, professors were poorly paid, students had few rights, and the value of the output was unclear, especially in an age of limitless possibilities on the American frontier (Veysey, 1965; Rudolph, 1990). Students were lectured to in traditional methods and in languages such as Latin or Greek. The course of studies varied by student, often with no set time or clear course of study for completion (Rudolph, 1990).

Pre-civil war campuses, whether Harvard or Miami of Ohio, were bare bone affairs, depending on donations and tuition and these two sources of revenue would limit their ability to grow beyond basic, elitist institutions and limit the quality of their offerings (Rudolph, 1990; Kamenetz, 2010).

Colleges sprouted across the land, but there was little there beyond a skeleton structure, a small number of students and a few supporters trying to establish some kind of elite institution in a land where innovative structures, political, economic, and otherwise, were being created which each new frontier (Turner, 1923; De Toqueville, 2004).

By the Civil War there were 182 colleges in the United States, though most Americans did not know much about them or care to send their children (Altbach, 2000;

Cole, 2009). As America was growing its British style colleges, with their limited reach, a new model for higher education was being created in Germany: the research university.

2.3.2 The German Model

Berlin University, the first modern research university, was founded by Prussian educator and state bureaucrat Von Humboldt in 1809. His innovation would immediately change society's conception of the scope, importance, and role of higher education (Flexner, 1994; Veysey, 1965; Kerr, 2001).

Humboldt's graduate focused institution was dedicated to teaching science and finding new knowledge. In practice this meant that new fields would be explored and the university would offer the resources (ie laboratories, libraries) to support such efforts (Flexner, 1994; Kerr, 2001). This was the birth of the modern research university and Humboldt's university, as the product of a bureaucrat, was designed to work for the benefit of an industrializing Germany and would be managed directly by state authorities.

Humboldt's institution was radically different from previous models in higher education (Flexner, 1994; Kerr, 2001; Goldstein and Buck, 2010). According to Clark Kerr, former Chancellor of the University of California and creator of the much imitated California Master Plan for Postsecondary Education:

“The emphasis was on philosophy and science, on research, on graduate instruction, on the freedom of professors and students (*Lehrfreiheit and Lernfreiheit*). The department was created, and the institute. The professor was established as a great figure within and without the university.” (Kerr: 2001, p. 11)

The German model supported interdisciplinary studies through institutes and interacted with off campus sectors of society; scientific institutes were particularly important to the interactions with an industrializing Germany (Flexner, 1994).

Like the British model before it, the German model would come to the US, and would be adapted by different institutions, leaders, and funders to meet the needs of the nation, specific states and cities, and even specific industries, social classes, and professions (Slosson, 1910; Rudolph, 1990). Many reforming education leaders in the US spent time at German research universities and worked to import their structures and practices (Rudolph, 1990).

Post-Civil War America began to build universities based on the German model in earnest through the early part of the 21st century with higher education and local leaders attempting to provide practical knowledge, tools, and graduates.

Federal funding for higher education, through The Morrill Act of 1862 and The Hatch Act of 1887, set up broad frameworks for funding and using research universities to achieve public goals. While these were federal policies, they allowed individual state and private universities and their leaders to support research and technology to solve local needs (Rudolph, 1990; Thelin, 2004).

The Hatch Act, for example, provided funding for agricultural research stations at land grant universities. Thelin (2004) recounts that German botanists were not trusted upon arrival at the University of Kentucky, but eventually won great praise as their methods for testing and certifying the quality of fertilizer provided direct benefits to the farmers of the state. Not only did these policies solve public needs, they helped build the

trust of local populations by serving their needs with practical offerings and education, a nod to Berlin rather than Oxford (Rudolph 1990; Thelin 2004).

The value of higher education and the university would eventually become known not just in agriculture, but via engineering in manufacturing, chemistry in industry, and also in the military (Carlsson et al, 2007; Thelin, 2004).

Over time, the new research universities, with the support of philanthropists and local and federal government would begin to show their worth to society. The research university would start to become a central institution in an America pushing west and industrializing. Over time citizens, businesses, and policymakers would come to view the research university as a central institution in society.

2.3.3 Reform of Foreign Models

With the early transplantation of the British college model to North America came immediate calls for reform, especially as it related to curriculum (Rudolph, 1990; Thelin, 2004). It was clear to many that England was different from North America and early Americans realized that traditional European models would not work on this new continent, whether trapping fur in upstate New York, homesteading in Oklahoma, or building a college in Michigan (Turner, 1923).

Reformers were present throughout the leadership and faculty of many British model colleges in the late 1700s and the early 1800s and much of their effort focused on evolving the curriculum to include more practical subjects such as math, science, and engineering (Rudolph, 1990; Thelin, 2004). Engineering and science had been taught in

Europe since the middle of the 18th century and some reformers and college builders in the U.S. took notice and action (Carlsson et al, 2007).

Ben Franklin's College of Philadelphia, opened in 1751, and Thomas Jefferson's University of Virginia, founded in 1819, hinted at the possibilities of deviating from the British model and offering students more practical subjects including sciences and math (Veysey, 1965; Rudolph, 1990). In his *The Great American University* Cole writes,

“In 1749, Benjamin Franklin outlined a course of education in a pamphlet entitled *Proposals for Education of Youth in Pensilvania*. Students would be prepared for public service and business, quite a different mission from the ecclesiastical purposes outlined by Harvard and Yale. In keeping Franklin's interest in science and in promoting useful knowledge, the University of Pennsylvania was designed to produce men of practical affairs rather than scholars or ministers. About one-third of the three year curriculum was devoted to science and practical studies” (Cole, 2009, p.35)

Jefferson's University of Virginia offered multiple schools and nodes of leadership and students were free to choose their courses. This radical decision, according to Rudolph (1990), would forever change higher education. Rudolph writes, “One of the most liberating regulations in the history of American higher education—indeed in the history of liberty in America—was the one adopted by the University of Virginia board of visitors in 1824: ‘Every student shall be free to attend the schools of his choice, and no other than he chooses’” (Rudolph, 1990, p.126). This undergraduate freedom (which would take decades to spread across the higher education landscape in America), combined with research freedom introduced later with the German model, would make US campuses liberating places for students at all levels.

Andrew Carnegie, who would eventually fund universities and other educational initiatives, represented the view many held regarding the British model college in an expanding America in the mid to late 1800s:

“While the college student has been learning a little about the barbarous and petty squabbles of the far-distant past, or trying to master languages which are dead, such knowledge seems adapted for life upon another planet than this as far as business affairs are concerned, the future captain of industry is hotly engaged in the school of experience, obtaining the very knowledge required for his future triumphs. College education as it exists is fatal to success in that domain.” (Veysey, 1965, p. 14-15)

The literature shows that reformers did make some headway. The rise of professional schools, both within colleges and vocational schools, would satiate some of the demand. For example, the first engineering schools would be created at West Point in 1802 and 22 years later at Rensselaer Polytechnic Institute (Rosenberg and Nelson, 1994). As pointed out by Carlsson et al (2007), the rise of engineering schools, whether mechanical, electrical, or chemical aligned well with an industrializing nation and was less controlled and more flexible than European programs.

Professionalism would grow in many directions, such as Cornell University’s work with hotels and its focus on hospitality (Veysey, 1965). Abraham Flexner, a supporter of the ‘pure’ German research model and others (including supporters of the classic curriculum) found the trend repugnant (Flexner, 1994). He writes, “Of the professional faculties, a clear case can, I think, be made out for law and medicine; not for denominational religion, which involves bias, hardly perhaps for education, certainly not at all for business, journalism, domestic ‘science,’ or ‘library science’” (Flexner, 1994, p.29). (The evolution of business education will be discussed in detail below)

It is important to note that American students, unlike their predecessors in England, played a central role in reforming the British college model in North America. By the early 1800s, students began to demand more than just recitation of classics, poor treatment from greybeard faculty members, and limited resources (Rudolph, 1990; Thelin, 2004; Kamenetz, 2010). Living in dormitories in sparse, newly established towns (few other living arrangements existed) hastened the rebellion and thoughts of activities beyond the reach and rule of college leaders (Thelin, 2004).

Literary societies and debating groups were the first student organizations to flourish, and in many cases provided resources such as speakers and libraries that early colleges did not furnish; Phi Beta Kappa was one of the first, radical, extra-curricular activities on campus (Rudolph, 1990; Kamenetz, 2010).

Though some early reformers had a clear vision of an ‘American’ college, it would take over a century for many of the innovations to become implemented across a majority of campuses (Rudolph, 1990; Thelin, 2004; Kerr, 2001). Henry Tappan, the reforming president that laid the groundwork for transitioning the University of Michigan into a leading German model research university, wrote in 1851,

“Hence, we fall in disrepute, and young men of ability contrive to prepare themselves for active life without our aid. In connection with this the commercial spirit of our country, and the many avenues of wealth which are opened before enterprise, create a distaste for study deeply inimical to education. The manufacturer, the merchant, the gold-digger, will not pause in their career to gain intellectual accomplishments. While gaining knowledge, they are losing the opportunities to gain money.” (Tappan, 1851, p. 490-1)

A few institutions and leaders such as Franklin, Jefferson and Tappan would attempt radical change, but most would move incrementally. Tappan was eventually

chased out of the University of Michigan, a decision the school publicly denounced years later.

2.3.4 Hybridization of Foreign Models: Clark Kerr's "Multiversity"

During the research university building era, some in the US would build new, research and graduate focused universities modeled on Humboldt's (eg Cornell University, University of Chicago, Stanford University and Johns Hopkins University), while most would graft German style research apparatus and graduate programs onto existing British style colleges (eg University of Michigan, Harvard University, Yale University).

The German model was research focused and interdisciplinary; it evolved and mutated in the US with its merging with undergraduate colleges and local needs and culture. For example, student and professor worked collaboratively in US graduate schools, whereas in Germany, a master apprentice relationship existed (Cole, 2009). Extracurricular activities would multiple at both the graduate and undergraduate levels.

Leaders such as Tappan, Van Hise and Harper at the urban University of Chicago would graft new responsibilities and organizations onto growing American research universities (Rudolph, 1990; Slosson, 1910; Flexner, 1994; Kerr, 2001). Over time, with deeper integration into regional ecosystems, a new kind of institution would be born. Clark Kerr would call this the 'multiversity' (Kerr, 2001).

The multiversity would expand in ever more directions and engage ever more stakeholders. Writing in 1963, Kerr describes the research intensive, undergraduate welcoming, socially and economically integrated multiversity by building off of

Abraham Flexner's influential studies on research universities from 1930. Kerr contrasts the new US institutions with classic research universities, explaining,

“Flexner thought of the university as an ‘organism.’ In an organism, the parts and the whole are inextricably bound together. Not so the multiversity – many parts can be added and subtracted with little effect on the whole or even little notice taken or any blood spilled. It is more a mechanism – a series of processes producing a series of results – a mechanism held together by administrative rules and powered by money.” (Kerr, 1991, p.15)

Today's US research university, or Kerr's multiversity, is a modular institution. The British style undergraduate college and the German model graduate schools typically form the center base, but multiple institutions, activities, organizations, and undertakings integrate or release from the core depending on the needs of the students, faculty, and other stakeholders. Examples of these modules include research institutes, science parks, professional schools, executive education programs, media partnerships, hospitals and healthcare systems, athletics programs, and integration with regional trade groups and policy-making structures. Critics of these trends follow the line of Veblen, Flexner, and others, but the multiversity continues to be a leader in education, economy, and society.

2.3.5 American Mutation: Business and Entrepreneurship Education

As the 20th Century closed, business was the single largest field in US higher education, awarding approximately 20% of all bachelor degrees and 25% of masters degrees. A recent Harvard Business School case study argued that 15 percent of the \$250 billion higher education market was business education and US institutions awarded over

85 percent of business degrees globally (Rukstad and Collis, 2001). Business schools are a good representation of the scope of Kerr's multiversity and the various ways it connects across and beyond campus – professional degrees, career services, business and economic research, high public prestige etc.

The idea of studying business, management, and commercial activities was not started in the US, but contemporary business education was created in the US, from curricular structure and institutional organization and extensive and multileveled connections to the economy, and is being exported abroad aggressively (Pfeffer and Fong, 2004). The MBA (Masters in Business Administration) has been referred to as the first truly global degree (Mintzberg, 2004).

The growth of business education is a twist in the history of American higher education. Leading research universities in the US have created a business education model that many policy makers, citizens, and businesses globally are attempting to emulate (Pfeffer and Fong, 2004).

Like many of the leading research universities in the US, business schools from the US dominate global rankings (Pfeffer and Fong, 2004; Bennis and O'Toole, 2005). For example, the 2010 *Financial Times* global business school rankings have 10 US schools in the top 20 with 2010 being the first time a non-US school holds the designation as the best business school in the world.⁴ The 2011 rankings have the University of Pennsylvania's Wharton School tied with London Business School for the

⁴ The Financial Times Global MBA Rankings dates to 1999 and is but one of many institutions that attempt to rank business programs globally. As a media outlet for global experience and credibility in the business community it was chosen for illustrative purposes. For a full description on methodology and historical data and results <http://rankings.ft.com/businessschoolrankings/rankings/sequence/global-mba-rankings/2>

top spot. The non-US hold on the top spot wouldn't last long as Stanford took number #1 in 2012 and Harvard was number #1 in 2013.

2.3.6 The Evolution of Business Education in the United States

As discussed, post-Civil War, most colleges were managing the rise of the German research university model. Business education, at the time, was monopolized by private, 'commercial colleges' located in commercial and financial centers such as Boston and New York (Daniel, 1998; Mellon, 1986).

A handful of land grant universities taught courses under the heading business during the 1800s (Spender, 2006). The Wharton School at the University of Pennsylvania is acknowledged as the first business school (founded in 1881), but in 1893 there were around 500 small private schools teaching skills such as arithmetic, penmanship, accounting, and communications (Daniel, 1998). Many business leaders and policy makers believed these institutions were not fit for a growing country (Daniel, 1998).

There were only 3 business schools at US colleges and universities at the turn of the century, but by 1911 there were 147 schools of business schools and another 224 were offering business classes (Gordon and Howell, 1959). During this boom in business education, great diversity in faculty, methods, and concepts of business education could be found. From retail operations and labor relations to statistics and law, there was little uniformity as the field experienced rapid growth driven by demand (Gordon and Howell, 1959; Daniel, 1998).

Each school would create their own offerings on their frontier in the rush to provide business education. There was no European model to import for business

education. When the Great Depression arrived the government and others turned to business schools to compile data on business conditions and later to manage New Deal programs and war related activities (Daniel, 1998).

Through and after the war years, business education would grow at the undergraduate level; in 1920, 3.1% of undergraduates earned business degrees, by 1940, this number would reach 9.1% and by 1950, 15.3% of 4 year undergraduate degrees would be in the field of business (Gordon and Howell, 1959).

By mid-century, business schools, with their burgeoning undergraduate student bodies (in response to the industrialization of America and the GI Bill), would become powerful units at major research universities. That said, as many analysts point out, the schools did not attract quality students, research was deemed substandard, and other colleges and units across campus held business schools in low-esteem (Gordon and Howell, 1959; Daniel, 1998; Mintzberg, 2004; Bennis and O'Toole, 2005).

In 1959, two major foundation reports, one from Carnegie and one from Ford, would deeply influence business education and bring uniformity to structures and curriculum (Daniel, 1998). Models and structures for undergraduate and graduate instruction would arrive as well as powerful research infrastructure and extensive professional networks and relationships (Daniel, 1998; Pfeffer and Fong, 2002; Mintzberg, 2004). Additionally, business schools and faculty are regularly the highest funded on campuses of major research universities (Bok, 2003).

To the chagrin of many academics (including some business school professors and deans), a professional school model of business education, created in the US, without

lineage to Athens, Cambridge, or Berlin, now dominates demand, profit, and the ‘mindset’ of leading research university campuses (Bok, 2003; Pfeffer and Fong: 2002; Mintzberg, 2004; Khurana, 2007; Menad, 2010)

2.3.7 The Rise of Entrepreneurship Education

As business schools flourished in the postwar era, their structures, research methods, and institutions grew to match that of more established fields in the sciences and social sciences (Bennis and O’Toole, 2005; Spender, 2006). Today, entrepreneurship education, research, and centers are the fastest growing on campus and within business schools following a path to ‘normalcy’ much as general business education did (Katz, 2004; Finkle et al, 2006; Solomon, 2007).

Schumpeter began economically driven research on entrepreneurship in the 1920s at Harvard and the first entrepreneurship course was taught at Harvard Business School in 1947 (Katz, 2003; Shane and Venkataram, 2000). Since the 1970s, there has been an explosion in coursework, entrepreneurship centers, entrepreneurship endowments, and concentrations (Katz: 2004, Venkataram: 2000, Fine et al: 2006, Solomon: 2007). The rate has accelerated over the past 15 years.

The pace of development on the entrepreneurship education front has matched the growing importance of entrepreneurship and innovation to the economic, commercial and social life of the contemporary society (Drucker, 1993; Audretsch and Thurik, 2000; Etzkowitz et al, 2000; Thorp and Goldstein, 2010). In an age where knowledge and innovation are believed to lead to economic growth and improved standards of living, it is

not surprising the US higher education has responded to the shift from an industrial to entrepreneurial economy with expanded offerings.

Today entrepreneurship education is deeply established in the business school landscape (Kuratko, 2005; Solomon, 2007). There are nearly 50 academic journals, over 2,000 courses are taught at more than 1,600 institutions, and more than 400 endowed positions in the field of entrepreneurship exist (Katz, 2003, 2008; Kuratko, 2005; Solomon, 2004, 2007).

The literature explains that various other academic units in the modern research university offer entrepreneurship courses. For example, schools of engineering, law schools, public policy schools, economics departments, schools of art and health and countless others teach and or instruct on the subject of entrepreneurship (Katz: 2003). For example, in August 2011, Stanford University announced the launch of its new National Center for Teaching Innovation and Entrepreneurship in Engineering; the center was funded with an initial \$10 million, 5 year grant from the National Science Foundation (Inventors Digest, 2011). The goal of this initiative is to more effectively teach innovation and entrepreneurship to engineering students.

While there are still arguments surrounding the ‘legitimacy’ or ‘maturity’ of entrepreneurship education within the university and the business school, it is expanding and growing in the fertile soil of leading research universities. Many entrepreneurship focused ‘modular’ pieces have been attached to leading research universities and business schools in recent years, some of these entrepreneurship units will be discussed in more detail below. The introduction of entrepreneurship

education within (and outside of) the business school is another mutation introduced by a responsive US higher education sector.

The role of student demands is clear in the rise of entrepreneurship education given the increase in curricular offerings, endowments, journals, and other educational infrastructure (Katz, 2003; Solomon, 2007). In one four year period in the 1990s, Fiet shows that Northwestern's Kellogg School of Management (a consistently top ranked business school) first year student's expressed interest in entrepreneurship as a major rose from 7% in 1993 to 45% in 1996 (Fiet, 2001, p.102). According to Steven L. Kaplan, faculty director of the Polsky Center for Entrepreneurship at the University of Chicago's Booth School of Business, entrepreneurship is now the second most popular concentration at the school, historically known for its quantitative strength and Wall Street focused graduates (S Kaplan, 2011). The rise of entrepreneurship education has been driven by student demand and changes in research opportunities for scholars according to studies completed by Bhidé (2000), Katz (2003) and Solomon (2007).

For example, the business plan competition, an extracurricular activity in which students write business plans for new ventures (often beginning the firm formation process) and present them to investors, entrepreneurs and others with entrepreneurial experience., has become a standard feature across entrepreneurship education (Gartner and Vesper, 1994; Katz, 2008). The business plan contest was created in 1982 by students at the University of Texas at Austin business school in their quest for an efficient and fun extracurricular activity (Cadenhead, 2002). Bo Fishback of the Kauffman

Foundation estimates there are more than 700 business plan competitions today, many of which are not associated with higher education (Farrell, 2010).

Student demand has driven much of the development of the multiversity and its recent expansions in entrepreneurship. Critics of this higher education consumerism can be found in the literature, represented by past writers such as Veblen (1918), Veysey (1965) and Flexner (1930) and current critics such as Bok (2003), Kamenetz (2010), and Menad (2010). While business school specific critics have emerged such as Pfeffer and Fong (2002, 2004), Mintzberg (2004) Bennis and O'Toole (2005) and Khurana (2007), entrepreneurship education has been spared thus far, likely because growth, organization, and regularization are still under way. Surely reformers, critics, and further student demands will continue to influence the path of entrepreneurship education.

Roberts and Eesely (2009) highlight the impact of MIT's alumni entrepreneurs, arguing the school's graduates and their 25,800 active firms, if measured in aggregate, would be the 17th largest economy in the world with a GDP of nearly \$2 trillion. Eesely and Miller (2012) completed a similar study of Stanford University's impact and offers similar findings of massive impact. While these studies highlight the role of leading research universities in preparing people for entrepreneurship these offerings say little about entrepreneurship education and structures and processes on the campus that may support student entrepreneurs. It also is biased as MIT and Stanford specialize in highly technical education, research, and external relations and have deep, historical connections to regional technology economies.

There are few studies attempting to assess the quality of entrepreneurship education. A study of graduates of the Berger Entrepreneurship Program at the University of Arizona was completed and argued that these graduates earned more money than their general management counterparts (Charney and Libecap, 2000). While this study is a beginning, it uses the ‘financial security’ framework and employment as a measure. This framework, measuring salaries of those employed by others, doesn’t seem to make sense for measuring entrepreneurship education as the implied goal is that students will play a role in creating new firms.

Lange et al (2005) performed a study attempting to find out if writing a business plan influenced the outcome of a new venture. This study used Babson alumni only and found that unless substantial capital was required, a business plan had no effect on outcome (Lange et al, 2005). The study did find some differences in performance based on degree attainment – BS vs MBA.

Bhide (2000) shows that college attendance is the norm for high impact entrepreneurs, but says little of their field of study or their interactions with the university beyond matriculation and attainment of a degree.

SBA Office of the Advocacy’s Chief Economist Moutray reviewed a 10 year longitudinal study of the BA class of 1993, and found that the self-employed were more likely to be social science and other majors rather than business majors (Moutray, 2008). Business and science majors were more likely to be employed at for-profit firms. Another interesting finding of Moutray’s study is that graduate education, “reduces the probability of self-employment.” (Moutray, 2008, p. 12). This supports Weaver, et al’s (2006)

literature review finding that education beyond a BA has not been found to be positively related to entrepreneurship and new venture creation.

It is worth noting that there is a large literature on technology transfer processes, but these dramatically limit the scope of entrepreneurs and business models investigated to those with patentable, technical ideas and that use university technology transfer processes in bringing their ideas to market. Retail, lifestyle, information industries, the arts, apparel, sports, services, beverages and food, social innovation, and countless other industries are left out of this line of inquiry.

2.3.7 Contributions to Higher Education Literature

This research will add to our understanding of the interaction between higher education and the entrepreneurial economy through its exploration of high growth startups created by students at US colleges and universities.

Specifically, through the data collected it will provide insight into the potential impact of higher education structures and offerings on the birth of high impact firms. This research will also illuminate the interactions between firms, founders, and their institutions of higher education.

The use of a leading US research university as the primary unit of analysis, while not generalizable, provides additional texture and depth, and a new, student focused view of the interaction between universities and high growth firms and founders. Moreover, the case chapter and the pathways chapter will provide further data and insights into the potential impact of the campus and its offerings on the decisions, actions, and processes behind high growth firms.

The proposed frontier framework will offer higher education analysts and others interested in the role of higher education in the economy, an additional method for assessing entrepreneurship and innovation in higher education.

2.4 Entrepreneurship

Entrepreneurship has garnered as much attention as fast and from such a variety of investigators as any other field of study in recent decades. This becomes apparent through even a brief survey of the field. The growth has been so fast and multi-directional that many scholars have argued that there is more confusion than knowledge (Venkataram, 1997; Shane and Venkataram, 2000). The field is still lacking a “conceptual framework” that can explain and predict behavior based on empirical data (Shane and Venkataram, 2000, p.217). This section will review some of the entrepreneurship literature that is directly relevant to the proposed research.

2.4.1 Is the Entrepreneur the Correct Unit? The Need for Multiple Lenses

An important line of thought in entrepreneurship theory was raised by William Gartner in a series of papers arguing that our understanding of entrepreneurship will always be limited and skewed if we only focus on finding the attributes of the entrepreneur (Gartner, 1985; 1988; Katz and Gartner, 1988).

“New venture creation is complex phenomenon, entrepreneurs and their firms vary widely; the actions they take and do not take and the environments they operate in and respond to are equally diverse – and all these elements form complex and unique combinations in the creation of each new venture. It is not enough for researchers to seek out and focus on some concept of the ‘average’ entrepreneur and the ‘typical’ venture creation.” (Gartner: 1985, p.697)

Pushing it further, Katz and Gartner (1988) posited that the firm was the central unit of analysis as it, with its members, partners, and others, was the unit that performed the function of bringing economic change. Gartner and others were pushing entrepreneurship literature beyond a focus on the traits of individual entrepreneurs, which many researchers were focused on.

In fact, in many cases, it was the nascent, or not yet completed organization that would provide us insight into the social and economic act of entrepreneurship (Katz and Gartner, 1988). This too was a contrast to the traits approach.

The emerging organization insight demanded that researchers not only research the existing firm, but would have to look at early actions and processes employed before a firm actually emerges – when the team or entrepreneur is going through the so-called startup process (Katz and Gartner, 1988).

A few databases and some surveying would be used to find ‘nascent’ entrepreneurs while others would employ oral histories, ethnographic techniques, surveys, and interviews to record the behaviors of entrepreneurs, founding teams and uncover the processes taken in creating a new business.

2.4.2 Nascent Entrepreneurs and Emerging Organizations

There has been a variety of research into emerging firms and or the action of ‘nascent entrepreneurs, much of it focused on identifying the actors and profiling them (Reynolds: 2004). The Global Entrepreneurship Monitor (GEM) and the Panel Study of Entrepreneurial Dynamics (PSED) have provided great insights into the level of education, motivation, and other psychological attributes of nascent entrepreneurs

(Reynolds et al, 2002, 2004). Additionally, these studies offer policy makers and researchers estimates on the population of nascent entrepreneurs. This type of data collection and research has been helpful, but falls into the traits realm and has limited usefulness for a deeper understanding of how and why entrepreneurship occurs.

An important insight offered by Gartner (1988) was that it was really the behaviors and actions of entrepreneurs that would give us insights into their impact rather than traits. This behavioral directive would be followed by more research into the actions and processes that entrepreneurs take in creating new business, whether in new ventures or through existing firms and organizations.

The exploration of the actions and sequences that entrepreneurs and founding teams go through in birthing a new organization is important to researchers, practitioners, and policymakers. The belief being that the process of firm gestation will have an important effect on success in terms of survival and or actual impact – whether measured in wealth creation, job creation, or social change. The notion led to investigations into new firm endowments (Shane and Stuart, 2002), new firm networks (Larson and Starr, 1991), and ecological approaches to new firm foundation (Aldrich, 1979).

2.4.3 Entrepreneurs, Firms, and Processes

Researchers have employed various methods, from longitudinal studies and surveys to interviews and ethnography to better understand the processes behind new ventures and the opportunities discovered. Bhawe (1994) developed an early process model of new venture creation through interviews with 27 firm founders from a variety of industries in upstate NY.

After collecting and analyzing the data, Bhavé (1994) broke the process of new venture creation into three stages, with each stage having a key variable that defines it and various actions taken in each stage.

Table 2.1: Bhavé's (1994) process model of new venture creation

Stage	Key Variable
Opportunity Stage	The business concept is the key variable
Creation & Set-Up of Production Stage	Product created for first time, most visible of three stages
Exchange Stage	Product crosses the supply demand line to the customer for first time

Additionally, Bhavé's (1994) work highlighted the iterative nature of the start-up process and the need for the founders to interact with other stakeholders and outside forces (market, partners, customers, etc) throughout the process. This line of thinking underscores the importance of processes and actors and environments around the startup in understanding new ventures and entrepreneurship.

Another important insight from Bhavé's (1994) process model is that much of the important work in the process of new venture creation is done before an organization is actually formed. This includes opportunity identification and filtration, refinement, business concept development, and various physical actions such as commitment to production processes and materials (Bhavé, 1994). These activities can be and are often performed by the entrepreneur, the team, and outside parties such as customers, vendors, and partners.

Bhave's (1994) work was crucial to highlighting the various processes, players, and stages of new firm creation. Moreover, an interesting finding in the study is that many entrepreneurs desire to create a new firm, before they have identified an opportunity.

Bhide's (2000) research on Inc. 500 Firms and their founders confirm many of Bhave's findings on the iterative nature of formation for successful firms. This is an important finding as it highlights that entrepreneurs often make opportunities, rather than being surprised when finding them a la Kirzner (1997). Bhave (1994) and Bhide (2000) highlight the need for a multidimensional view of entrepreneurship.

Others have used a process model approach to better understand entrepreneurship and have yielded further insights into not only the stages of new firm creation, but also the timelines, milestones, and social relationships needed for a new firm to emerge.

Van de Ven (1984) not only looks into the timing and sequences of new firm formation, but also highlights that outside actors and industry dynamics play a role in not only the creation of new firms, but also ultimately in their success. The study finds that the successful firms tended to be externally motivated.

Carter et al (1996) studied the processes of 71 nascent firms in a longitudinal study attempting to find out what activities nascent entrepreneurs perform, how many are performed and what the time lines looked like. Their sample showed that those who founded a firm and those who gave up were more aggressive in the types of activities they performed through the process. Moreover, the actions they took were tangible to others, such as searching for a physical location, and would more likely lead to a firm or

exit (Carter et al, 1996). Those who were still trying to launch a firm by the end of the study were likely to have been more passive throughout the process.

Carter et al (1996) also highlights the diverse sequences that nascent entrepreneurs/emerging firms follow; no patterns emerged from the study (Carter et al.: 1996). The authors note that there was no method to account for chance in the start-up process and that more in depth studies and longitudinal studies are needed.

Shane and Delmar (2004) dive deeply into the firm creation process and find that various actions of the emerging organizations (such as writing a business plan or searching for funding) play a role in legitimizing the firm to outsiders and thus eventual firm outcomes. These findings underscore the point that the entrepreneur (or new firm) does not exist in a vacuum and gathering facts and figures solely on the firm or its founders will not explain the startup process. These outcomes highlight the importance of understanding firms and their behaviors in their earliest, pre-firm days.

Larson and Starr (1993) present a network model of new firm creation that argues for a process with stages. The network model highlights how simple relationships held by the entrepreneur grow and become layered exchanges with socio-economic networks of team members, capital providers, suppliers, customers, industry players and others (Larson and Starr, 1993). This study not only supports the notion of a multidimensional approach to entrepreneurship, but also underscores the important point that entrepreneurship is a social endeavor, with roots in social coordination and results that are social in both their benefits and costs (Larson and Starr, 1993).

Aldrich (1990) uses an ecological perspective to better understand new firm formation. While moving from the firm level to the population level constrains our understanding of some of the micro-processes of firm formation, it provides insights into environmental influences on entrepreneurship. The study highlights the various ways that the population of firms sends messages to would be entrants and that existing firms and emerging firms influence one another in positive, negative, and neutral ways (Aldrich, 1990).

Most samples in firm formation studies are small and focused on specific populations. Many employ interviews with principals after the fact and do not follow emerging organizations through the process in real time. Additionally, in most cases, few, if any of the variables measured are financial, a key variable for understanding the process employed by high impact firms – the focus of the proposed research. Investigating and understanding the firm formation process as it occurs at leading research universities will be central to my proposed research.

2.4.4 Contributions to Entrepreneurship Literature

Broadly, this research will add to our understanding of high growth firms, opportunity identification, nascent entrepreneurial behavior, nascent entrepreneurs and the role of the environment in the start-up processes. Specifically this research will provide data on the potential role of higher education in the creation of high growth firms.

This research will offer new data on high growth firms by building a database of high growth student entrepreneurs, their firms, and their universities. To the author's knowledge, this will be the only database of its kind currently available.

The use of a leading US university and campus as the main case study unit, with multiple embedded units, will greatly enhance the literature on startup processes of high impact firms and pioneer research on the processes of high growth student startups in university and college environments. The proposed archetypes of high growth student entrepreneurs will further contribute to our understanding of the processes behind high growth firms and those related to institutions of higher education. The use of case method complies with Gartner's multidimensional directive and will contribute to the ongoing theoretical development of a framework for understanding high growth entrepreneurship. Additionally, the Frontier Framework developed as part of this research will support policy makers and others understanding of environments from which support high growth firm formation, whether on campus or off.

2.5 Conclusion

American exceptionalism, higher education, and entrepreneurship merge in the form of high growth student entrepreneurship and the literature in these fields provides the context for pursuing the research problem and question in this dissertation.

Additionally, the literature from these fields help determine the appropriate methodological approach for this research. The next chapter will explore the research problem, question and methodologies chosen in pursuit of better understanding the phenomena of students creating high growth firms while on campus.

CHAPTER 3: EXPLORING THE PHENOMENA OF HIGH GROWTH STUDENT STARTUPS

3.1 Introduction to Research Problems, Question and Methods

This research is exploratory in nature and hopes to provide data and clarity around high growth student entrepreneurship and the potential role of the university and college campus in high growth student entrepreneurship.

Because of the exploratory nature of this pursuit, no hypothesis is offered. It would be premature to develop theories around high growth student entrepreneurs and higher education, design and complete tests, and experiment when our knowledge and understanding of the phenomena and population is so limited.

This chapter introduces the research problem and question, methods chosen to investigate and the rationale behind the choices. A discussion of data collection and variables is included. Finally, a ‘frontier framework’, modeled on Frederick Jackson Turner’s *Frontier Thesis* of the United States, will be offered. Turner’s idea of the US frontier, full of liberty, diversity, and assets, appears to share broad themes with the history and evolution of higher education in the United States where choice, access, and expansion of offerings have been central themes. A ‘frontier framework’ is presented as a simple tool for better answering the research problem and question presented.

3.2 Research Problem and Question

The main purpose of this research is to better understand the phenomena of high impact student entrepreneurs and the role of US university and college campuses in their development. This dissertation is exploratory in nature. This research operationalizes the term high growth student firm as: a firm where one or more of the founders was a student at the time of opportunity identification and/or the new firm formation processes; additionally, the firm must achieve \$500,000 in annual sales or 50 employees or \$500,000 in investment within 5 years of the last student founder leaving the campus.

The primary research question is:

What role, if any, does the campus have on the startup processes and actions of students as they identify entrepreneurial opportunities & launch high growth firms?

This question may appear blunt at first reading, but given the rise and diversity of entrepreneurship programs, spending and efforts on technology transfer, growing populations of university incubators and science parks, and the cost of higher education for students and their families, it is relevant to a great many discussions. Research into the campus experiences of the some of the most impactful individuals and their firm's touches many policy debates and approaches. The data uncovered in pursuing this question and the analysis applied might suggest alternatives to current paradigms, funding models, and policy choices. It is possible that findings in this research might be inconclusive or support current understanding of high growth entrepreneurship and its relationship with students and American higher education.

3.3 Methodology and Data Collection

This research made use of mixed methods to explore the social phenomena of students initiating high growth firms while on campus and the impact, if any, of the campus on their actions and startup processes. There is a lack of empirical work on these specific firms, their student founders and campuses, even among the work that connects higher education to innovation and entrepreneurship. For example, while there are many studies on technology transfer offices, spin-offs, and high impact startups, there are no studies looking specifically at student launched firms or the processes of firm formation among high growth student created firms on university campuses (Markman et al, 2005; Bercovitz and Feldmann, 2006; AUTM, 2010).⁵

Yauch and Stuedel (2003) present 3 reasons for mixed methods: 1) triangulation, 2) to more fully explain the results of analyses and 3) to guide further development and data collection. The methods employed are true to these goals and provide a rudimentary understanding of the population of high growth student startups, the potential impact of their campuses on their experiences, and qualitative data to broaden our understanding of the phenomena of high growth firms launched by students at US colleges and universities. Moreover, this exploratory research will be useful for further exploration of the research question and related questions in entrepreneurship and higher education.

⁵ The Association of University Technology Managers completes an annual survey of university technology transfer offices. This annual report, which offers broad, top line statistics, is used by many academics and policy makers to determine the entrepreneurial and innovative capacity of universities.

3.3.1 Qualitative Methods and Data Collection

This research presents a case study of the University of Chicago and in a separate chapter proposes five campus pathways that high growth student entrepreneurs appear to travel to high growth entrepreneurship while on campus. According to Yin (2009) “case studies arise out of the desire to understand complex social phenomena” and case methodology allows research to “retain holistic and meaningful characteristics of real life” (Yin, 2009, location 351). A case study, from Gerring’s (2004, p.341) perspective is “an in-depth study of a single unit (a relatively bounded phenomenon) where the scholar’s aim is to elucidate features of a larger class of similar phenomena.” In the case presented, the research university (or multiversity) will serve as the primary unit of analysis so that various features of this contemporary experience may be explored. Moreover, there will be multiple embedded subunits in the case presented and the campus pathway chapter will provide further understanding of the role of the campus in the phenomena of high growth student entrepreneurship. The subunit and student pathways explore the decisions and actions taken by students and their firms while at university.

Schramm (1971, p.8) offers further direction in understanding the appropriateness of case study methodology writing, “the essence of a case study, the central tendency among all types of case study, is that it tries to illuminate a decision or set of decisions: why they were taken, how they were implemented and with what result.” Given the literature on entrepreneurship, including the works of Gartner and Bhavé as described above, the case study focus on understanding decisions makes it congruent with exploring opportunity identification and new firm formation processes at multiversities.

The case chapter and the campus pathways discussion will offer data on the decisions of firm founders, professors, philanthropists and others that have been present and engaged in the creation of high growth student startups from American campuses.

As Schramm (1971, p.13) states, “perhaps the greatest weakness of the case study is that it places an enormous responsibility on the researcher rather than the method.” In order to ensure that method takes primary place and validity and reliability sustained, this research employed multiple modes of data collection and explored rival explanations and alternative patterns (Yin, 2009; Schramm, 1971). Careful research design, rigorous and thorough data collection and management, and maintaining a chain of evidence produces scientifically valid and reliable data for use in case studies (Yin, 2009; George and Bennet, 2004). Data and evidence collected during this research has been stored and coded on multiple hard drives with digital copies of primary and secondary materials according.

While case studies are said not to be generalizable, they can provide useful frameworks and are often used in theory building. It is hoped that this research will serve both purposes. Yin explains, “a case study is an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between the phenomenon and the context are not clearly evident” One of the challenges of the case method, according to Yin (2009) is that a case relies on multiple sources of evidence and many more variables of interest than data points (Yin, 2009, location 637).

Given the research question, the primary characteristic of the campus selected as the case study was that it had to be the ‘birthplace’ of multiple high growth firms created by students. In selecting a campus for the case study, public knowledge of successful student founders and public awareness of entrepreneurship education and institutions (classes, contests, clubs, etc.) was deemed important as this would help to answer the research question. While general public awareness of entrepreneurial offerings would not guarantee that student founders and their firms were aware of resources and opportunities that the campus presented, it would suggest general community awareness on such a campus and potential for student founders and firms to access such resources if they chose.

It was also deemed important that the case campus be classified as *Research University/Very High Research Activity* or *Research University/High Research Activity* on the Carnegie Classification of Institutions of Higher Education.⁶ Although these schools constitute less than 5% of all institutions of higher learning in the US, the 207 universities represent the strength of US higher education, the emergence of Kerr’s multiversity and account for nearly 23% of all students enrolled in the US (Carnegie Foundation, 2005). Additionally, these universities are often the source of innovation and emerging trends in higher education, as noted in previous sections, and are of great interest to students, faculty and administrators, policy makers and funders, researchers,

⁶ The Carnegie Classification is an industry standard ontology for institutions of higher education in the US. For full explanation of the Carnegie Classification of Institutions of Higher Education see <http://classifications.carnegiefoundation.org>

regional leaders, and philanthropists. A full list of Carnegie Classifications can be found in Appendix A.1.

In choosing a campus to use as a primary unit of analysis multiple research universities were visited including the University of Maryland College Park, The University of Chicago, Arizona State University, American University, the University of Virginia, Virginia Commonwealth University and the University of Michigan Ann Arbor. Additionally, hundreds of university, entrepreneurship, and general news websites were explored (from Stanford Business School and Inc Magazine to USA Today and the Wall Street Journal) and mentions of high growth firms created by students and university entrepreneurship activities were scoured.

The University of Chicago, a private research university in the *Very High Research category*, located in an urban setting, was selected for the case study as it has been the birthplace of multiple high growth firms and was accessible to the researcher.

Additionally, while the University of Chicago is highly rated for its faculty, research, and many of its schools, it is not commonly thought of as an entrepreneurship powerhouse such as Stanford University and the Massachusetts Institute of Technology. Moreover, Chicago is a dynamic and large economy, it is not seen as a role model for innovation such as Silicon Valley, Boston, Austin, Texas, or the Research Triangle in North Carolina (Saxenian, 1996; Florida, 2002). These factors put a traditionally strong research university, the University of Chicago, outside of the purview of many researchers and policy makers in the innovation and entrepreneurship space.

While the Chicago case and student pathways discussion is not meant to be generalizable, they provide a look into a contemporary phenomena and the context within which it is occurring. The case and pathways are offered to support future theory building, data collection and framework introduction.

The case study used three primary methods for data collection.

- a) Semi-structured interviews with student founders of high growth firms and non-founders that worked high growth firms. These interviews included informants from the case campus and from multiple other campuses across the US
- b) Participant observation at public events on the case campus, other campuses, and non-campus events related to entrepreneurship, including visits with entrepreneurs and others
- c) Document and media analysis, include media accounts, speeches, startup pitches and presentations, websites, business documents, videos, blogs, twitter, LinkedIn feeds, etc.

Semi-structured interviews were completed with 32 individuals. The sample included adults (over age 18) who have played a role in the creation of a high growth firms started by students at US colleges and universities. No targeting of gender, ethnicity, or health status occurred other than an attempt to reach a representative sample of those involved with entrepreneurship at US universities. Student founders of high growth firms were interviewed as were others who played a role in the opportunity identification and new firm formation processes on campus. Examples include -- faculty,

investors, mentors, philanthropists, and alumni. Interviews were continued until a saturation of themes was achieved. Additional informants, both founders and non-founders, that are not directly related to the case study campus, but involved with high growth student entrepreneurs and entrepreneurship programs were interviewed. Some non-student founders were investors, faculty members, and advisors. A full list of informants for the semi-structured interviews can be found in Appendix A.4. Additional informants provided data during multiple ethnographic observations.

Document and media analysis from the case study campus and other campuses, high growth student startups from across the US, and student founders and their firms were collected. As Schramm states (1971, p.18), “perhaps the most undervalued source of data for case study is documents.” This research makes extensive use of documents, in both the traditional and multi-media sense of the word, including documents, publications, videos, Facebook, blogs, twitter, Linkedin and public databases such as TechCrunch and Angelist.⁷ Many founders of high growth student firms, the firms themselves, and US universities have active online presences and make a great deal of data publicly available. Whenever possible digital copies of such documents were collected and stored.

Finally, participant observation was employed in completing the qualitative portions of this research. The researcher attended many entrepreneurship related events and activities on the case campus, other campuses, and off-campus locations. Business

⁷ Techcrunch and Angelist are two of the ‘crowdsourced’ public databases on venture funded firms, investors, and other information related to entrepreneurship and innovation. In most cases these sites depend on registered members submitting information with citations and links to citations. For example, SEC filings on ventures included in this research were located via these types of public databases.

plan competitions including the University of Maryland College Park's Cupid's Cup Business Competition in 2011 and 2012, the University of Chicago's Edward L. Kaplan New Venture Challenge in 2012 and 2013, and the University of Chicago's Social New Venture Challenge in 2013 were attended. Other entrepreneurship events and structures such as entrepreneurship club meetings, pitch events, and entrepreneurship office hours were attended and observed at multiple campuses and universities. Finally, the researcher visited the booths and workspaces of more than 40 student and alumni firms, incubators and accelerators, government entities, and campus organizations with links to the case campus and other US campuses during data collection. Data was collected including pictures, documents, videos, and informal interviews we conducted during these observations. A full list of events and locations can be found in Appendix A.5.

The employment of multiple qualitative data collection techniques allows for triangulation, pursuit of alternative explanations, and support for future work and data collection. The techniques used for the qualitative data collection have been employed in such a way that the data has been used in both the qualitative and quantitative portions of this research.

3.3.2 Quantitative Methods and Data Collection

For the quantitative portion of this research, a database of high growth student founders, their firms, and colleges and universities has been created. The methods for identification of high growth student founders included media accounts, university publications and websites, technology firm and venture capital databases, informant introductions, and web searches and online forum. It should be noted that few, if any,

entrepreneurs or their firms high growth firms are identified specifically as having begun on campus in the mind of a student. Typically, the researcher would find an account of an interesting firm or venture and hidden within the story would be a mention of the early days of the firm and the founder's experience as a student.

3.3.3 Introduction to the Database

In order to better explore the research question and understand the role, if any, that the campus plays in the social and economic phenomena of high growth student firms, a database of high growth student entrepreneurs, their ventures, and their colleges and universities has been created. This is the first database of its kind known to the author.

The database created for and used in this research includes 202 student founders, 114 firms created by those student founders (and in some cases with non-student co-founders) and the 60 colleges and universities attended by those students while creating their high growth startups. There are multiple variables for each student founder, firm, and institution of higher education. Data was not captured for non-student founders, though their presence was recorded. The variables will be discussed later in this chapter.

The individuals, the firms and educational institutions in this database appear in countless lists and databases related to entrepreneurship, science, innovation, and related fields, but there is no database or study known to this researcher that organizes the firms and founders based on the founder's status as a student during the opportunity identification and firm formation processes.

For example, in March 2014, *Forbes Magazine* released its list of the world's billionaires.⁸ Reviewing the top 100 suggests that high growth student entrepreneurs from US colleges and universities have impacted the world as much as any other group on the list. If one were to focus on the just the top billionaires from the US, the impact of high growth student startups is glaring. Bill Gates, co-founder of Microsoft, is #1 in the world, while the Google founders come in at #17 and #19 and Mark Zuckerberg of Facebook holds spot #21 (Forbes, 2014). Further down, Phil Knight of Nike comes in at #42 and Michael Dell holds spot #48 while Paul Allen, who left Microsoft in the early 1980s after co-founding the firm with Gates, holds the #56 spot globally (Forbes, 2014).

The massive wealth these founders, investors, and company leaders have accumulated is amazing, but as importantly it represents wealth many times that amount earned by early and senior employees, institutional and individual investors, and pension funds. Venture and angel investing also follows many of the student entrepreneurs' successes, as accumulated wealth is put to work supporting the next generation of innovators and entrepreneurs.

The impact of the billionaire high impact student founders includes jobs for thousands, millions in recurring revenues for tax collecting authorities, work for commercial and residential real estate agents, home builders, professional service providers, various suppliers, and many others. A recent study by Henrekson and Sinandaji (2013) suggests that using billionaire entrepreneur data from *Forbes Magazine*

⁸ Forbes Magazine has released its list of the world's billionaires annually for 28 years. The 2014 list was released 3 March 2014. Current list and historical data is accessible via <http://www.forbes.com/billionaires/>

is a better indicator of the strength of entrepreneurial ecosystems than traditional measures such as income, self-employment, and new business formation.

Finally, the philanthropic role of high growth student entrepreneurs has accelerated in recent years and the impact of this behavior on broad societal opportunity creation has been identified as central to opportunity to creation in the U.S. (Acs, 2013). Bill Gates and his Giving Pledge movement have brought in hundreds of billions in commitments and Mark Zuckerberg was named the biggest philanthropist in 2013 with \$980 million in contributions (Acs, 2013; Di Mento, 2013).

The representation of student founders and their firms on the *Forbes*' billionaire list underscores the need for of exploring the social phenomena of high growth student startups and the campus environments from which they emerge. The lack of information on these high growth firms is peculiar given their impact on society and economy and their prominence in policy debates and daily media. It is possible these firms have not been explored because there are very few of them relative to the entire population of firms and high growth firms and many of the student created firms are privately held and information is not easily accessible (Henrekson and Johanson, 2010). Moreover, as the database and analysis will show, the rise of high growth student founders appears to be recent phenomena.

Student entrepreneurs are included in this database if they meet the following criteria:

- One of the founders was a student at the time of opportunity identification and the beginning of the startup processes as described in the literature (Bhave, Bhidé, Gartner).
- Within 5 years of the departure from campus of the last student founder, the firm created achieves \$500,000 in revenue annually, employs 50 people, or receives \$500,000 in investment.

These criteria do not exactly match the various definitions of high growth firms used by other researchers, but the criteria employed demand similar growth rates in similar time frames. For example, Henrekson and Johansson (2010) and the OECD (Ahmad, 2006) demand employment growth rates of 20% per year over a 3-year period. Other researchers use revenue growth and market share to identify fast growing firms. While the criteria employed in any study on high growth firms does not guarantee a successful, long-lived firm, they do validate a high growth path as represented by revenue growth, head-count, or investment made by non-founders.

3.4 The Development of the Database

In pursuit of the research problem and questions, the need for a database of firms, founders, and schools became evident. This database began as a weblog, Campus Entrepreneurship, in March 2007. The blog was initially created to help the researcher track student entrepreneurs, their firms, and their campuses as it became evident to the researcher that many high growth startups were created by students at US colleges and universities. While the blog has always been public, the initial goal was to keep a record of what the researcher was observing by using free, publicly available resources

including a free Wordpress (undergraduate Sean Mullenweg of University of Houston created Wordpress and is included in the database). Though the free weblog offered the ability to store data and organize it into basic categories, it did not and still does not offer database features. Eventually, many of the firms, founders, and schools stored on the weblog were entered into a more traditional database platform and became the beginning of the database. As the number observations increased, additional variables from a range of sources were included. The variables will be discussed next.

In most cases, a firm or student would come to the researchers attention on a website, media outlet, blog, university website, or an ‘alert’ tracking terms such as ‘student startups,’ ‘entrepreneurship education,’ and similar terms. While the initial story typically wouldn’t provide enough information for inclusion in this database, it would often provide a clue that the company was launched while the founders or at least one of the founders was students. From there, more research, often document and multimedia analysis, would be completed, including checking for additional data that might provide details of the founders status at time of launch, revenues, employee count, or fundraising activities. If the data verified that the firm and founders complied with the operationalized definition offered above, the firm, founder(s), and school(s) were entered into the database and the variables outlined below would be collected and added to the database.

3.4.1 Variables Included

The variables included in this database relate to the founders, their firms and their institutions of higher education are presented in Tables 3.1, 3.2, and 3.3. The variables

are intended to capture attributes of the students, firms and universities and also provide insights into the student and firms behaviors and actions while on campus. By including variables measuring actions and behaviors of student founders and firms on campus it supports answering the research question and better understanding the potential role of the campus in the development of high growth firms created by students. The breadth of variables allows for exploring whether the campus presents a frontier environment for high growth founders. Additionally, as there is limited information available on high growth student entrepreneurs and their firms, this database begins to provide basic descriptive statistics on this little known population of high growth firms and their earliest days and actions on campus.

3.4.2 Student Founder Variables

In answering the research question and filling the gap in our knowledge of high growth student founders and the role of the university in firm creation, data was collected on student founders. This data includes name, gender, degree being sought, whether degree was completed or not, the year completed, and the field of study. This data provides information on which students are participating in successful high growth entrepreneurship on campus and which actions and experiences on campus may have impacted the creation of the firm. The student founder variables collected, the labels and codes, and sources are included in Table 3.1. The data were collected from various sources including interviews, company and university websites, media accounts, LinkedIn pages and personal and company websites, blogs, and social media accounts. Whenever possible as digital or physical copy of the data source was collected and

stored. Appendix A.1 has further detailed descriptions of the sources of the data used to construct the database.

Table 3.1: Student founder variables

Variable	Format	Codes	Source
Founder ID Number	Numeric	Numeric, 200XXX	Assigned by researcher
Name	Alphabetic	Last, First	Various
Female	0,1	0=male, 1=female	Various
Level of Degree Being Sought (3 separate variables)	0,1	U, M, D	Various
Degree Completed or Not	1, 2	1=yes, 2=no	Various
Year First Degree Completed	Numeric	YEAR, 1111 =non-complete	Various
Year Second Degree Completed	Numeric	YEAR, 1111 = non complete	Various
Field(s) of Study (10 separate variables in the database)	0,1	1=yes, 0=no CompSci, CreatArt, PubPol/PubAdm, Law, Sciences, Bus, Liberal Arts, Engineering, Education, Other	Various

The collection of these variables provides a great deal of data on the founders and their experiences on campus while launching a high growth firm and provides insight into the potential role of the campus and its attributes in their entrepreneurial experiences.

3.4.3 High Growth Student Firm Variables

Collecting data on the high growth firms created by students was also crucial in understanding the role that the campus may have played in the firm's creation. Basic information such as firm name, whether the firm had a non-student founder, year

founded, its use of intellectual property owned by the founders' school, and its industry code (North American Industry Classification System - NAICS⁹) were included in the database. Additionally, whether or not the firm has a social impact goal (social entrepreneurship) as part of its business model was included as the field of social entrepreneurship has experienced rapid growth alongside entrepreneurship on campus. Table 3.2 lists the firm variables collected, labels and codes, and sources of data for the variables. Appendix A.1 provides more detailed information for the high growth student firm variables.

There are firm level variables included that attempt to measure how the firm interacted or not with the campus environment. Whether the student founders and firms used campus assets, participated in a campus pilot testing its product or service or sold to campus markets is included in the firm data in the database. Using the well known and straightforward example of Facebook, launched by Harvard students including Mark Zuckerberg in 2004, the use of these blunt, binary variables can be highlighted. From data collected, it would appear that the firm made great use of the campus in its startup processes. It made use of school networks and other assets, piloted the product on campuses and students were its core user base in its early days. For Facebook, it would appear the campus interactions were part of its firm formation. These are all binary variables and will be discussed further, but were included in an attempt to capture interactions between the firm and the 'host' campus.

⁹ The North American INdustrial Classification System breaks the economic activity of establishments in 20 sectors with thousands of subsectors. There is more information on the sectors in Appendix A.1, including Table A.1: 20 Sectors in 2012 NAICS.

Additionally, where possible, the financing activities of the firms were included in the database. All the financing variables are binary and therefore do not capture the amount of funding. The firm financing variables include: participating in an accelerator (including on campus accelerators), equity investments (angel/seed, venture capital, or IPO) and government grant(s). Whether a firm was sold or merged was also included in the database as was failure. All are binary variables, though data collected on financing was often used to validate/verify the 'high impact' status of the firm.

Another trend in financing that was observed during the completion of the research was the move towards online crowdfunding. Online platforms such as Kickstarter.com and IndieGoGo have given entrepreneurs and other creators the opportunity to present their ideas and prototypes in an attempt to get the generate public and financial support. While supporters do not receive equity in the firm, they often receive early versions of the product or supporter gifts such as t-shirts, stickers, and online thank you's. While only a handful of the companies in the database have completed crowdfunding, other sources of data, including ethnographic observation and document analysis, point to the increase use of crowdfunding for financial and product validation reasons during the firm formation process of student entrepreneurs.

Finally, as the database was being developed, it became clear that appearances on television and are becoming a regular activity for firms in the database and that in some cases (such as the TV Show Shark Tank) there was financing involved in the TV

appearance.¹⁰ This variable was included as multiple firms have been the subject of national and international television and film productions. For a vast majority of the firms the variable was recorded as unknown. It is interesting to note that ‘competition’ and pitch television products can trace their roots to the business plan competitions created at US colleges and universities.

The firm level variables in the database provide insight into the types of firms student founders are creating from campus and the actions taken during the opportunity identification and firm formation process. These variables, while broad in some cases, create a point of departure for understanding interactions between student founders, their firms, and their campuses, helping us to better discern the role of the campus in high growth student startups.

¹⁰ Shark Tank has been on NBC in the United States since 2009 and was based on a British show called Dragon’s Den. Shows such as Restaurant Startup and the Profit have highlighted entrepreneurs, financing deals and also represent increased societal interest in entrepreneurship and innovation.

Table 3.2: High growth student startup variables

Variable	Format	Codes	Source
COMPANY NUMBER	Numeric	00100	Assigned by researcher
COMPANY NAME	Alphabetic	Various	Various
YEAR FOUNDED	Numeric	YEAR	Various
NON-STUDENT FOUNDER	0,1	0=no, 1=yes	Various
UNIVERSITY IP INVOLVEMENT	0,1	0=no, 1=yes	Various, assigned by researcher
NAICS #1	6 digit numeric	Various	US Census, Various, assigned by researcher
NAICS #2	6 digit numeric	Various	US Census, Various, assigned by researcher
SOCENT	0,1	0=no, 1=yes	Various, assigned by researcher
CAMPUS ASSETS	0,1	0 = no, 1=yes	Various, assigned by researcher
CAMPUS PILOT	0,1	0 = no, 1=yes	Various, assigned by researcher
CAMPUS MARKET	0,1	0=no, 1=yes	Various, assigned by researcher
ACCELERATOR	0,1	0=no, 1=yes	Various, assigned by researcher
ANGEL/SEED	0,1	0=no, 1=yes	Various, assigned by researcher
VENTURE CAPITAL	0,1	0=no, 1=yes	Various, assigned by researcher
SALE	0,1	0=no, 1=yes	Various, assigned by researcher
MERGER	0,1	0=no, 1=yes	Various, assigned by researcher
IPO	0,1	0=no, 1=yes	Various, assigned by researcher
GOV GRANT	0,1	0=no, 1=yes	Various, assigned by researcher
FAIL	0,1	0=no, 1=yes	Various, assigned by researcher
TV SHOW	0,1,2	0=no, 1=yes, 2=unknown,	Various, assigned by researcher
CROWDFUND	0,1,2	0=no, 1=yes, 2=unknown	Various, assigned by researcher

3.4.4 College and University Variables

In attempting to discern the role of the campus in the creation of high growth firms and provide a first look at this current social and economic phenomenon, a variety of variables on the schools that high growth student founders attended were collected. From variables measuring institutional control (private versus public) and location (state) and setting (large urban to rural, remote) to research budgets and fields of research for PhD students, a great number of variables on the schools have been collected. These variables begin to uncover the various assets, diversity, and options (liberty) available on the campuses from which high growth founders and firms have emerged. Table 3.3 lists the university and college variables collected, their labels and codes, and their sources. Far more variables on these institutions are available and for particular institutions additional variables will be included in the database chapter so that ‘profiles’ of specific universities can be presented. Appendix A.1 provides further descriptions of the variables and labels associated with them as well as information on the sources of data on institutions of higher education included in this database.

Table 3.3: University and college variables

Variable	Label	Codes/Formats	Source
NAME	Institution Name	Alphabetic	IPEDS
UNTID	Unique Identification number for an institution	Numeric Code	IPEDS, CF assigned
<i>BASIC2010</i>	<i>2010 Basic Classification</i>	<i>Numeric Coded (0-33)</i>	<i>CF</i>
CITY	City location of institution	Alphabetic	IPEDS
CCSIZE SETTING	Size and setting	Numeric Code	CF
CONTROL	Control of Institution	0=public 1=private, not-for-profit, 2=private, for-profit	IPEDS
DOCTOT	Research doctoral degree total	Numeric	IPEDS
ENROLLMENT	Fall headcount all levels	Numeric	IPEDS
ENRPROFILE2010	2010 Enrollment Profile Classification	Numeric Code	CF
FACFTTOT	Total fulltime faculty engaging in primarily instruction, primarily research or both	Numeric	CF-Derived
LANDGRNT	Land-grant institution	0=no, 1=yes	IPEDS
LOCALE	Degree of urbanization (urban centric locale)	Numeric Code	IPEDS
MATOT	Master's degree total	Numeric	IPEDS
MEDICAL	Institution grants a medical degree	-2=not applicable, -1= not reported, 1=yes, 2=no	IPEDS
NONSTEM	Total non-STEM R&D expenditures (1000s)	Numeric	NSF
PCARTSCI	% masters & first professional/non-research doctorate degrees in arts and sciences	Numeric, Percentage	CF-derived
PCBUS_ND	% master's & first-professional/non-research doctorates degrees in business	Numeric, Percentage	CF-derived
PCEDU_D	% research doctoral degrees awarded in education	Numeric, Percentage	CF-derived

Variable	Label	Codes/Formats	Source
PCEDU_ND	% master's & first-professional degrees in education	Numeric, Percentage	CF-derived
PCHMSC_D	% research doctoral degrees awarded in humanities & social sciences	Numeric, Percentage	CF-derived
PCPROF_DC	% research doctoral degrees awarded in non-STEM professional fields	Numeric, Percentage	CF-derived
PCSTEM_D	% research doctoral degrees awarded in STEM fields	Numeric, Percentage	CF-derived
PC_AS_ND	% master's & first-professional/non-research doctorates degrees in arts and sciences	Numeric, Percentage	CF-derived
RESSTAFF	Non-faculty research staff (non-faculty research staff & postdocs)	Numeric, Percentage	NSF
SIZESET2010	2010 Size and Setting Classification	Numeric Code (-2-18)	CF
STABBR	State abbreviation	Alphabetic	IPEDS
STEM_D	Research doctorates in STEM fields	Numeric	CF-derived
STEM_EXP	Total STEM R&D expenditures (1000s)	Numeric, Dollars	NSF

As evidenced in the table above, there are many variables related to institutions of higher education that can provide us more insight into the campuses from which high growth student created firms emerge. The variables chosen were included in an attempt to

understand the diversity and resources and ecosystems which high growth student founders began the firm formation process.

3.4.5 Sources of Data

A majority of the data for colleges and universities comes from publicly available databases created and managed by organizations such as the US Department of Education and the Carnegie Endowment for Educational Advancement and Indiana University. The US Department of Education's Integrated Postsecondary Education Data System (IPEDS) was a key source as it aggregates data on over 4000 institutions of higher education in the US from various sources, including the Carnegie Foundation's Carnegie Classification of Institutions of Higher Education (now hosted at Indiana University's Center for Postsecondary Research).

The data sources for student founders and their firms are incredibly varied and as with much data, a majority of the information was self-reported (via websites, LinkedIn profiles, media reports, etc). Additionally, media accounts, websites, press releases, public pitches, multimedia assets, site visits/observations, and interviews have been important sources of information on many of the firms and their founders. The rise of "crowd sourced" online databases such as Techcrunch.com, which tracks startups, has been useful for tracking financing activities of many of the firms in the database. Government sources have also been employed, including the Securities and Exchange Commission as it publishes documents from certain private financing deals. As mentioned previously, whenever possible digital copies of source materials have been collected and stored. The limitations of these sources will be discussed in the next

section. Deeper, fuller descriptions of the various database sources are included in the Appendix A.1.

3.4.6 Limitations of the Database, its Data and Variables

As with any database there are considerable limitations with the variables included and the sources of data. This database is not a representative sample of the population of high growth student founders, their firms, and their institutions of higher education. The segment of high growth firms explored in this research is a segment that has received little, if any, focused research and the population of firms, founders and institutions of higher education is unknown. This segment is not tracked or regulated by any government agencies, non-governmental organizations, or trade groups.

It is possible that the founders, firms and schools included in this database have been biased by the researcher's location, professional and educational networks and experiences, fields of study, and choices of media. Additionally, survivor's bias is a possibility as many more firms fail than succeed when it comes to the broader population of firms. Failed firms do not receive the ongoing attention that surviving and successful firms receive. Moreover, failed firms cease to communicate when entering the afterlife and failed founders go on to their next projects, startups and opportunities.

It is possible that the variables chosen, analyzed, and presented are not the most useful data to answer the research problem and question presented. Data on the founders, firms, and universities were included in trying to ensure a multi-level investigation of the startup process as directed by Gartner (1985, 1988). By collecting and analyzing data on the individual founders, the firms, and their schools, three of Gartner's four levels – the

individual, firm, and environment – are included. Moreover, Gartner’s fourth level – process – is incorporated into the database through elements of the other three. For example, the author derived firm variables, *Campus Pilot*, *Campus Market*, and *Campus Assets* are attempts to capture the actions and processes of the firm in its earliest days on campus by exploring if the firm (and founders) engaged with campus assets in particular ways.

The sources used for this database are amazing for their breadth, but all have been compiled by humans, whether government data or data provided by entrepreneurs, firms, colleges and universities, or ‘crowdsourced’ outlets. Some of the variables in the database have been derived by the author and by other researchers and are based on individual interpretation of a person, firm, or university. Additionally, it is possible that in compiling the variables, researchers, including the author, may not have had access to complete information or may have collected the wrong data and therefore data related to a founder, firm or institution could be incorrect or incomplete.

3.5 Campus Pathways of Student Founders

In collecting data using qualitative and quantitative methods various themes began to emerge highlighting the paths that student founders traveled while on their campuses. From observing pitches during business plan competitions and reading stories on funding to interviewing founders, various teams and founders had similar paths on campuses during the opportunity recognition and firm formation processes. These pathways are presented in Chapter 6 and are built on both the qualitative and quantitative data collected during this research.

3.6 A Proposed Framework for the Campus as Frontier for Entrepreneurship

As discussed earlier, included in this research is a framework based on Turner's *Frontier Thesis* and its three core attributes of the frontier: readily available assets, lack of institutional control (or liberty), and diverse populations. A Turner inspired framework for exploring the campus and high growth student entrepreneurs is proposed for use by stakeholders in higher education and entrepreneurship. It is offered as an additional framework for assessing universities and other systems considered or expected to be impactful for innovation and entrepreneurship.

The proposed framework offers a theoretical contribution to the fields of entrepreneurship, higher education and economic growth. While the framework is being suggested and is at a rudimentary phase, it provides a simple view of the campus and its potential role in the emergence of high growth firms and founders.

Work from a diverse set of contributors and fields have explored the 'context' of innovation and entrepreneurship and found that is an important variable and suggest, as Gartner proposed, that the environment and culture surrounding founders will impact their decision to engage in entrepreneurship (Gartner, 1985; Saxenian, 1997; Florida, 2002; Acs et al, 2013). Acs et al's knowledge spillover theory posits that actionable knowledge varies between environments and will therefore influence how much entrepreneurship and innovation occur. Universities are considered a key source for knowledge in this scenario and many economic growth theories (Saxenian, 1997; Florida, 2002; Etzkowitz, 2008). There is no reason to believe that entrepreneurs do not exist on the campuses as well as in the regional economies that the university is central part of in

the aforementioned literature. These previous findings on context are consistent with the proposed ‘frontier framework,’ suggesting that at a minimum economic assets (knowledge) are readily available for entrepreneurs on campus just as they are to broader regional participants and institutions.

Additionally, as Jacobs (1961), Florida (2002) and Lee et al (2004) highlight, locations with diverse inhabitants are likely to see an increase in innovation and entrepreneurship and new firm formation. While most analysts explore units such as MSAs, States or Countries, these principles should hold consistent in a campus environment. Additionally, the diversity expected and often touted on the ‘campus frontier’ is likely broader than the diversity measured in the aforementioned works. As the table below highlights, the diversity on a research campus includes age, county of origin, field of study, and other elements that other studies on diversity and economic growth do not include.

The liberty enjoyed on campus does vary by institution, school or college and field of study, but the evolution and ethos of freedom on campus in the US is clear from the history of higher education and most participants in higher education today will have great freedom in choosing and executing their path on campus. The data collected and presented highlights choices that student founders had on campus -- from fields of study and concentrations to extracurricular and summer activities.

The idea of a campus as a village or city or a distinct entity of its own is not new and multiple higher education leaders (eg Thomas Jefferson) and analysts (Veysey, 1965) have made such arguments in creating and assessing institutions of higher education. The

proposed ‘frontier framework’ offers a simple, organizing principle for beginning to understand the campus and its role in the phenomena high growth student entrepreneurship.

Table 3.4: Turner’s frontier and the modern US University and college

Turner theme	Turner’s frontier	Modern US university and college
Available assets	Land, mineral wealth, water, game, burgeoning populations, growing transportation, communication and financial networks	Course, extracurricular, peers, faculty, alumni, networks to other institutions, research, labs and libraries
Liberty (freedom)	No early governments, no established social institutions or conventions, no incumbent economic powers	Dispersed decision making for administration and faculty, freedom of research and field of study, extra-curricular choices, part-time/full-time/executive options, transfer system
Diverse populations	Changed over time, nationality and place of birth, wealth, method of arrival, place of	Ethnicity, place of birth, field of study, age, education levels, political ideologies, regenerating youthful populations, visiting scholars and students; full time/part time; adjuncts/research faculty/teaching faculty

3.7 Conclusion

The phenomena of students creating high growth firms at US colleges and universities is a regular feature in the mainstream media and popular culture but has not been explored in a systematic way. The limited data on these firms, founders and their institutions demands exploratory research so that hypotheses developed and tested and furthers lines of inquiry can be identified.

Mixed methods have been employed in this research in order to triangulate, more fully explain the data collected and to guide further investigations into this important social and economic phenomena. While no hypothesis is being offered and tested, great care and attention have been paid to data collection and methodological choices for this investigation.

CHAPTER 4: DATABASE OF HIGH GROWTH STUDENT ENTREPRENEURS, THEIR FIRMS, AND THEIR COLLEGES AND UNIVERSITIES

4.1 Introduction

In order to better explore the research question, a database of high growth student entrepreneurs, their ventures, and their colleges and universities has been created. This is the first database of its kind known to the author.

The database includes 202 student founders, 114 firms created by those student founders (and in some cases with non-student co-founders) and 60 colleges and universities attended by those students while creating their high growth startups. There are multiple variables for each student founder, firm, and institution of higher education. The variables were discussed in the previous chapter.

This chapter makes use of descriptive statistics and exploratory data analysis as these methods are required in a nascent line of inquiry such as the social phenomena of high growth firms created by students at US colleges and universities.

The individuals, the firms and educational institutions in this database appear in countless lists and databases related to entrepreneurship, innovation, and higher education, however there is no database or study that organizes the ventures, founders, and educational institutions based on the founder's status as a student during the opportunity identification and firm formation processes.

As mentioned early, *Forbes* list of the world's billionaires suggests that high growth student entrepreneurs from US colleges and universities have impacted the world as much as any other group on the list.

The massive wealth these student founders, their early investors, and employees have accumulated is amazing, but as importantly it represents wealth many times that amount earned by employees, individual investors, and pension funds. Venture and angel investing often follows many of the student entrepreneur successes, as accumulated wealth is put to work supporting the next generation of innovators and entrepreneurs.

The impact of the billionaire high impact student founders includes jobs for thousands, millions in recurring revenues for tax collecting authorities, work for commercial and residential real estate agents and financing firms, professional service providers, auto dealers, and countless others. A recent study by Henrekson and Sinandaji (2013) suggests that using billionaire entrepreneur data from *Forbes Magazine* is a better indicator of the strength of entrepreneurial ecosystems than traditional measures such as income, self-employment, and new business formation. This argument underscores our needed to better understand high growth firms, their founders and the potential role of the campus.

Finally, the philanthropic role of high growth student entrepreneurs has accelerated in recent years and the impact of this behavior on broad societal opportunity creation has been identified as central to opportunity to creation in the US (Acs, 2013). Bill Gates and his Giving Pledge movement have brought in hundreds of billions in

commitments and Mark Zuckerberg was named the biggest philanthropist in 2013 with \$980 million in contributions (Acs, 2013; Di Mento, 2013).

The representation of student founders and their firms on the *Forbes'* billionaire list underscores the need for of exploring the social phenomena of high growth student startups and the campus environments from which they emerge. The lack of information on these high growth firms is peculiar given their impact on society and economy and their prominence in policy debates and daily media. It is possible these firms have not been explored because there are very few of them relative to the entire population of firms and high growth firms and many of the student created firms are privately held and information is not easily accessible (Henrekson and Johanson, 2010). Moreover, as the database and analysis will show, the rise of high growth student founders appears to be recent phenomena.

Student entrepreneurs are included in this database if they meet the following criteria:

- One of the founders was a student at the time of opportunity identification and the beginning of the startup processes as described in the literature (Bhave, Bhide, Gartner).
- Within 5 years of the departure from campus of the last student founder, the firm created by student(s) achieves \$500,000 in revenue annually, employs 50 people, or receives \$500,000 in non-family investment.

These criteria do not exactly match the various definitions of high growth firms used by other researchers, but the criteria employed demand similar growth rates in

similar time frames. For example, Henrekson and Johansson (2010) and the OECD (Ahmad, 2006) demand employment growth rates of 20% per year over a 3-year period. Other researchers use revenue growth and market share to identify fast growing firms. While the criteria employed in any study on high growth firms does not guarantee a successful, long-lived firm, they do validate a high growth path as represented by revenue growth, employment, or investment made by non-founders.

4.2 Variables, Sources, Data and Limitations in this Database

The variables included in this database relate to the founders, their firms, and their colleges and universities and are discussed in detail in Chapter 3 and Appendix A.1. The previous chapter also includes a discussion of the limitations of the variables and sources of data.

The variables included in the database are shown below in Tables 4.1, 4.2 and 4.3. The variables are intended to capture both attributes of the students, firms and universities, but also insights into their behavior and actions taken while on campus. Variables intended to measure actions and behaviors of student founders and firms on campus supports answering the research question and better understanding the role of the campus in the development of high growth firms created by students. The breadth of variables allows for exploring whether the campus presents a frontier environment to high growth founders.

Student founder variables were chosen so that a first look at the entrepreneurs involved in building high growth firms on campus can be better understood. Their fields of study, level of study, and other variables have been selected so that we can move

beyond generic descriptions of who launches firms on campus and have a better understanding of the role of the campus in the opportunity identification and firm formation process.

Table 4.1: Student founder variables

Variable	Format	Codes	Source
Founder ID Number	Numeric	Numeric, 200XXX	Assigned by researcher
Name	Alphabetic	Last, First	Various
Female	0,1	0=male, 1=female	Various
Level of Degree Being Sought (3 separate variables)	0,1	U, M, D	Various
Degree Completed or Not	1, 2	1=yes, 2=no	Various
Year First Degree Completed	Numeric	YEAR, 1111 =non-complete	Various
Year Second Degree Completed	Numeric	YEAR, 1111 = non complete	Various
Field(s) of Study (10 separate variables in the database)	0,1	1=yes, 0=no CompSci, CreatArt, PubPol/PubAdm, Law, Sciences, Bus, Liberal Arts, Engineering, Education, Other	Various

The startup variables included in the database are presented in Table 4.2. That variables collected were chosen to help better understand how student created firms emerged and were influenced by the campus. Specific variables such as Campus Pilot, Campus Assets and Campus Market were created to better understand how opportunity identification and the firm formation process may be influenced by the campus environment.

Table 4.2: High growth student startup variables

Variable	Format	Codes	Source
COMPANY NUMBER	Numeric	00100	Assigned by researcher
COMPANY NAME	Alphabetic	Various	Various
YEAR FOUNDED	Numeric	YEAR	Various
NON-STUDENT FOUNDER	0,1	0=no, 1=yes	Various
UNIVERSITY IP INVOLVEMENT	0,1	0=no, 1=yes	Various, assigned by researcher
NAICS #1	6 digit numeric	Various	US Census, Various, assigned by researcher
NAICS #2	6 digit numeric	Various	US Census, Various, assigned by researcher
SOCENT	0,1	0=no, 1=yes	Various, assigned by researcher
CAMPUS ASSETS	0,1	0 = no, 1=yes	Various, assigned by researcher
CAMPUS PILOT	0,1	0 = no, 1=yes	Various, assigned by researcher
CAMPUS MARKET	0,1	0=no, 1=yes	Various, assigned by researcher
ACCELERATOR	0,1	0=no, 1=yes	Various, assigned by researcher
ANGEL/SEED	0,1	0=no, 1=yes	Various, assigned by researcher
VENTURE CAPITAL	0,1	0=no, 1=yes	Various, assigned by researcher
SALE	0,1	0=no, 1=yes	Various, assigned by researcher
MERGER	0,1	0=no, 1=yes	Various, assigned by researcher
IPO	0,1	0=no, 1=yes	Various, assigned by researcher
GOV GRANT	0,1	0=no, 1=yes	Various, assigned by researcher
FAIL	0,1	0=no, 1=yes	Various, assigned by researcher
TV SHOW	0,1,2	0=no, 1=yes, 2=unknown,	Various, assigned by researcher
CROWDFUND	0,1,2	0=no, 1=yes, 2=unknown	Various, assigned by researcher

Given the scale and impact of higher education in the US, the data available is seemingly endless. The variables in Table 4.3 were collected in the database in order to better answer the research question as well as collect data on the assets and diversity present, or not, on campuses from which high growth student firms have emerged.

Table 4.3: University and college variables

Variable	Label	Codes/Formats	Source
NAME	Institution Name	Alphabetic	IPEDS
UNTID	Unique Identification number for an institution	Numeric Code	IPEDS, CF assigned
BASIC2010	<i>2010 Basic Classification</i>	<i>Numeric Coded (0-33)</i>	<i>CF</i>
CITY	City location of institution	Alphabetic	IPEDS
CCSIZE SETTING	Size and setting	Numeric Code	CF
CONTROL	Control of Institution	0=public 1=private, not-for-profit, 2=private, for-profit	IPEDS
DOCTOT	Research doctoral degree total	Numeric	IPEDS
ENROLLMENT	Fall headcount all levels	Numeric	IPEDS
ENRPROFILE2010	2010 Enrollment Profile Classification	Numeric Code	CF
FACFTTOT	Total fulltime faculty engaging in primarily instruction, primarily research or both	Numeric	CF-Derived
LANDGRNT	Land-grant institution	0=no, 1=yes	IPEDS
LOCALE	Degree of urbanization (urban centric locale)	Numeric Code	IPEDS
MATOT	Master's degree total	Numeric	IPEDS
MEDICAL	Institution grants a medical degree	-2=not applicable, -1= not reported, 1=yes, 2=no	IPEDS
NONSTEM	Total non-STEM R&D expenditures (1000s)	Numeric	NSF
PCARTSCI	% masters & first professional/non-research doctorate degrees in arts and sciences	Numeric, Percentage	CF-derived
PCBUS_ND	% master's & first-professional/non-research doctorates degrees in business	Numeric, Percentage	CF-derived
PCEDU_D	% research doctoral degrees awarded in education	Numeric, Percentage	CF-derived

Variable	Label	Codes/Formats	Source
PCEDU_ND	% master's & first-professional degrees in education	Numeric, Percentage	CF-derived
PCHMSC_D	% research doctoral degrees awarded in humanities & social sciences	Numeric, Percentage	CF-derived
PCPROF_DC	% research doctoral degrees awarded in non-STEM professional fields	Numeric, Percentage	CF-derived
PCSTEM_D	% research doctoral degrees awarded in STEM fields	Numeric, Percentage	CF-derived
PC_AS_ND	% master's & first-professional/non-research doctorates degrees in arts and sciences	Numeric, Percentage	CF-derived
RESSTAFF	Non-faculty research staff (non-faculty research staff & postdocs)	Numeric, Percentage	NSF
SIZESET2010	2010 Size and Setting Classification	Numeric Code (-2-18)	CF
STABBR	State abbreviation	Alphabetic	IPEDS
STEM_D	Research doctorates in STEM fields	Numeric	CF-derived
STEM_EXP	Total STEM R&D expenditures (1000s)	Numeric, Dollars	NSF

4.3 Student Founders: Data and Findings

The 202 founders in this database are a diverse group across some variables and exhibit great homogeneity on others. For example, only 17 of the 202 student founders in the database are female. While 92% of the founders are male, 83% of the student founders earned a degree while creating a high growth firm, with 17% dropping out or still in progress. More than 70% of the founders were undergrads when participating in

the firm formation process on campus, 20% percent were master's degree level students and just under 4% were doctoral students.

As noted, 17 of the 202 founders in the database are female and of those, 7 were involved in ventures that specifically target females customers (Fashionstake.com, HerCampus.com, Zyrre, and FUNK-tional Footwear). 8 of 17 female founders attended institutions in the New York and Boston metropolitan areas. Of the female founders, 13 launched their firms in 2009 or later and none launched ventures before 2000, suggesting female participation in the world of high growth student entrepreneurship may be a recent phenomena relative to male participation.

Business is the most popular field of study for founders in the database. Of the 247 fields of study observed for the 202 founders (multiple founders had more than one field of study), business accounted for 40.1% while only 3 of the founders studied law. As pointed out in Chapter 2, business accounts for more than 20% of all undergraduate degrees awarded in the US and 25% of all masters degrees (National Center for Education Statistics, 2013). Over 22% of the founders studied computer science or engineering, those fields account for 8.1% of all undergraduate degrees and 8.8% of all graduate degrees awarded in the US (National Center for Education Statistics, 2013). No founders in the sample studied education, though this field is the second most populated field across graduate education after business. Table 4.4 presents data on the founders' fields of study.

Table 4.4: Student founders' fields of study

Academic Field	Number of founders associated with academic field	Percentage of Sample of Fields of Study
Business	101	40.9%
Computer Science	26	7.5%
Creative Arts	3	1.2%
Education	0	0.0%
Engineering	39	15.3%
Law	3	1.2%
Liberal Arts	56	22.6%
Public Policy / Public Admin	2	0.9%
Sciences	9	3.6%
Other	8	3.2%
TOTALS	247	100.0%

Of the 202 founders, a vast majority completed their degree programs and graduated from the institution where they began the firm formation process. Table 4.5 highlights some of the academic achievements of the high growth student founders in the database.

Table 4.5: Selected academic information on high growth student founders

Variable	Findings
Level of Study (Doctorate, Master, Undergraduate) (A few founders completed multiple degrees or dual-degree programs)	Doctorate: 9 Master: 40 Undergraduate: 147 Undergraduate & Masters: 6
Completed Degree Program or Not	Completed: 177 Did Not Complete: 27
Year of Completion of Degree (MODE)	2004

The composite high growth student founder in the database is likely to be a male undergraduate that completed their professional degree program (business, engineering, computer science) while creating their firm. This runs contrary to conventional wisdom that argues founders drop out and are likely to be super powered research oriented students that do not complete their degree programs. The small representation of female founders is very noticeable and will be discussed with other findings later in the chapter.

4.4 Student Firms: Data and Findings

There are 114 firms in this database. The dates of founding for this sample range from 1960 (Domino's Pizza, a pizza delivery service founded in Ann Arbor Michigan by a University of Michigan architecture student) to 2012 (Mistobox, an online artisan coffee subscription service founded by 3 undergraduates studying business at the University of Arizona). The mode for year of launch is 2009 among the population in this database. The firms in this database suggest that the last 2 decades has seen a dramatic increase in number of high growth firms founded by students. Table 4.6 provides some select, descriptive statistics on the sample of firms in the database and Table 4.7 sorts the firms by decade of founding.

Table 4.6: Select data on high growth student firms

Database Element	Finding
Number of Firms	114 firms
Oldest Firm (year founded)	Domino's Pizza (1960)
Youngest Firm (year founded)	Mistobox (2012)
Year of founding (mode)	2009
Number of firms with non-student founders	26
Most common 6 digit NAICS code	518210 – Data Processing, Hosting, and Related Services

Table 4.7: High growth student firms by decade of founding

Decade of founding	Number of firms
1960s	3
1970s	3
1980s	2
1990s	9
2000s	85
2010s	12

A majority of the firms in the database did not have any non-student co-founders, and among the 26 with non-student co-founders, many of the non-student founders were associated with the firm due to campus relationships. For example, Paul Allen, co-founder of Microsoft with Bill Gates, is considered a non-student founder because at time the pair created Microsoft, Allen had already left school at Washington State University and was working in Boston to be nearer to Gates while Gates was still in school (Allen, 2011). The pair (and some of Gates' classmates) began building Microsoft while Gates was a student and Allen was an employee at Honeywell in Boston (Allen, 2011). Other

common non-student founders that student founders work with include former classmates that already graduated and professors. Tripod, a now defunct web hosting service sold for \$58 million in 1998, was founded in 1992 by Williams College students Bo Peabody and Brett Hershey with economics Professor Dick Sabot.

The range of industries that student created firms participate in is quite broad, from the manufacturing of beef jerky (NAICS 311612 –Meat Processed from Carcasses) and the delivery of late night cookies (NAICS 722515 – Accommodation and Food Service) to manufacturing of performance apparel (NAICS 315228 -- Men's and Boys' Cut and Sew Apparel Manufacturing) and providing search engines (NAICS 519130 -- Internet Publishing and Broadcasting and Web Search Portals). Table 4.8 presents summary statistics on the industries of the high growth firms in the database and examples of firms in the database in the 2 digit NAICS sector category.

Table 4.8: High growth student firms and NAICS categories

NAICS CODES	DESCRIPTION	COUNT IN DATABASE	EXAMPLE (S) FROM DATABASE
31-33	Manufacturing	26	Under Armour, Terracycle, Warby Parker, Enovative Konrol Systems
42	Wholesale Trade	5	Ready Seafood, Xenith
44-45	Retail Trade	13	Better World Books, Fashionstake.com,
48-49	Transportation & Warehousing	2	FedEx, Uship
51	Information	46	Netscape, Napster, Dosespot, Koofers
53	Real Estate and Rentals & Leasing	2	Equity Residential, MyFridgeRental.com
54	Professional, Scientific, & Technical Services	6	HigherOne, Invite, ROCS Staffing
56	Administrative & Support and Waste Management & Remediation Services	7	Kinkos, College Hunks Hauling Junks
61	Educational Services	1	Archipelago Learning
71	Arts, Entertainment, and Recreation	1	Tough Mudder
72	Accommodation and Food Services	2	Dominos Pizza, Insomnia Cookies
81	Other Services	3	College Bellhop, Dormaid

The concentration of firms in the information sector is obvious and when year of firm formation is considered, it suggests that the information and cultural resources and markets available in university environments support the formation of high growth firms. Moreover, 51 of the 60 universities are high research or very high research institutions according to the Carnegie Classification of Institutions of Higher Education and therefore have human and technical talent at the faculty, staff and research level that appear to

impact the information industries directly. Table 4.9 presents select information, at a greater level of detail (the 6 digit NAICS sector/subsector code), on the information industry firms in the database. Examples are included.

Table 4.9: Selected information industry NAICS codes and high growth student firms

NAICS information industry 6 digit code	Number of firms	Example firms
51120 – Software Publishers	8	Microsoft, Parature, Railtronix
518210 – Data Processing, Hosting, and Related Services	20	DoseSpot, Indinero, Napster, Webs Inc., Wordpress
519130 – Internet Publishing and Broadcasting and Web Search Portals	14	Facebook, Google, Groupon, Her Campus Media, Tripod, Yahoo!

Beyond exploring the industries in which the high growth student founders and their firms entered, the financing of each firm was explored. A vast majority of the firms on the list are privately held and finding direct information on their finances can be difficult. For financing activities, a binary variable (1,0) was employed to determine if the firm had received financing in any of the following ways: participation in a venture accelerator, angel or seed investment, venture capital investment, government grant or Initial Public Offering (IPO). For a majority of the firms there was little data available on the government grant variable with only 4 of the firms taking grants to help build their firm. Initially debt as a financing mechanism was also a variable, but there was such limited information on debt that it will be explored in future studies on this subject and was not included in this database.

Of the 114 firms in the database, 66 received angel or seed investment, 73 received venture capital financing, 27 were sold, 7 merged with other firms, and 16 completed an IPO. The ability to find outside equity investment appears to be the norm for the high growth firms in this database regardless of their industry.

Of the 16 firms that have completed an IPO, the most recent was GrubHub, an online food delivery platform, which went public in March of 2014 and oldest IPO among the firms in the database Fedex, which completed its IPO in 1978. A majority of the IPOs did take place in the information industries.

Table 4.10: High growth student firm IPOs

FIRM NAME	YEAR	STOCK SYMBOL (EXCHANGE)	University
Fedex	1978	FDX (NYSE)	Yale University
Nike	1980	NKE (NYSE)	Stanford University
Microsoft	1986	MSFT (NSDQ)	Harvard University
Dell	1988	DELL (NSDAQ)	University of Texas
Equity Residential	1993	EQR (NYSE)	University of Michigan
Netscape	1995	NSCP (NSDQ)*	University of Illinois
Yahoo!	1996	YHOO (NSDQ)	Stanford University
TheGlobe.com	1998	TGLO (NSDQ), (OTBB)**	Cornell University
Google	2004	GOOG (NSDQ)	Stanford University
Under Armour	2005	UA (NYSE)	University of Maryland
Higher One	2010	ONE (NYSE)	Yale University
Groupon	2011	GRPN (NSDQ)	University of Chicago
Facebook	2012	FB (NSDQ)	Harvard University
Archipelago Learning	2009	ARCL (NSDQ)	Vanderbilt University
Inogen	2014	INGN (NSDQ)	University of California – Santa Barbara
Grubhub	2014	GRUB (NYSE)	University of Chicago

* NSCP was acquired by AOL for \$10 billion in 1999.

** TGLO was delisted from the NASDAQ in April 2001 according to the company's filings with the SEC (TGLO: 2002) and now trades over the counter.

In attempting to explore, understand and discern the role of the university for high growth firms created by students on campus, variables representing interactions between the student founders, their firms and the campus were developed. The variables are *Campus Pilot*, *Campus Market*, and *Campus Assets*. All three variables are binary (1=yes, 0=no). *Campus Pilot* attempts to measure whether the founders and their firm or nascent firm completed some form of campus pilot with their product or service during the firm formation process. *Campus Market* attempts to communicate whether the

product or service offered by the firm targets any of the various markets that make up higher education – from athletic equipment and food to software and search engines. Finally, *Campus Assets*, the broadest of three variables introduced, attempts to discern whether the firm or the founders relied on campus assets during the opportunity identification and firm formation process on the way to becoming a high growth firm as defined by this research. *Campus Assets* can range from participating in a business competition and hiring fellow students as labor (paid or unpaid) to being located in a university incubator or relying on alumni networks or extracurricular activities during the firm formation process. These variables are blunt, but help explore the role of the campus in the creation of high growth firms and the following two chapters will provide qualitative data highlighting how these variables are realized.

Of the 114 firms in the database, 81 used the campus for a pilot, 79 target the campus as a market for their products and services, and 109 made use of campus assets in the opportunity identification and startup process. The data for the three variables suggest that the campus, its various assets, populations, and opportunities played a role in the founding and creation of a vast majority of the companies in the database. In many instances the engagement with the campus provided founders and their firms the ‘frontier’ attributes of assets, liberty, and diversity. Again, these attributes and firms and founders employing them will be explored in the following two chapters.

The challenge, at this early stage of exploration, is knowing what specific role and how big an impact the campus played, harkening back to Gartner’s (1985, 1988) idea that the startup process has multiple influences, of which the environment is just one. It is

worth noting however, that just 5 of the 114 firms in the database did not make use of campus assets (broadly defined) in launching their firm while 79 of the firms actually target the campus as a market (eg Under Armour sold to athletic programs as its first target market and continues to focus on high profile athletic programs while Higher One Financials entire business model continues to focus on higher education finance).

In analyzing this database, the theme of social entrepreneurship did emerge. For a student firm to be designated a social venture, social impact must be an intended and primary goal of the founding team and built into the business model (Dees, 1999). Table 4.11 highlights the 10 social ventures identified in the database. 6 of the 10 social ventures actually manufacture a product, 2 are retailers, and 2 are in the information industries. While the observations for social ventures are limited, their industries differ from the overall sample in an interesting way in that the leading two industries flip. Manufacturing becomes the most popular industry among the social ventures and information moves to second. While the sample is small for social ventures, none were founded before 2001, and 8 of the 10 were founded in 2007 or later.

Table 4.11: High growth social ventures

Social venture name	NAICS 2 digit category	Year founded	Founder (s) universities
Terracycle	32	2001	Princeton University
Better World Books	45	2002	Notre Dame University
Zimride	51	2007	University of California – Santa Barbara, Cornell University
YouRenew	42	2008	Yale University
Hyrdosbottle	32	2009	Johns Hopkins University, University of Pennsylvania
Thinklite	33	2009	Babson College
Alltuition	51	2010	University of Chicago
Ecocraps	32	2010	Brigham Young University
Warby Parker	33	2010	University of Pennsylvania
Boosted Boards	33	2011	Stanford University

Of the 114 firms, only 6 appear to have used university owned intellectual property in the development of their firm and business model. 4 of firms those firms were in the information industries and 2 were in technical services. Commercializable university owned intellectual property, as understood in the technology transfer policy area, appears not to be a campus asset that many of the firms relied upon from the campus. This is not to say that companies in the database do not own and develop intellectual property, just that the data suggests co-ownership and licensing of intellectual property from the university attended is not prevalent in this sample during the firm formation process.

Of the 114 firms in the database, 7 have failed and ceased operating. This is a very low number relative to the survival rate of the general population of firms and venture backed firms. Also, it is possible that some or many of the 27 firms that were sold or merged were failed firms but had some remaining assets of value, so while they may not be counted as failures, it is possible their business model was flawed, leading to the sale. Moreover, it is possible the value at sale was lower than the value investors had previously paid for equity. We have no information as to whether the sales were considered ‘wins’ for the founders and investors. These low numbers of failure and ‘assumed’ failure mergers and sales support the concern around survivors bias in the database.

4.5 Colleges and Universities: Data and Findings

There are 60 US colleges and universities in this database that had at least one high growth student founder in the database and therefore one company. A majority of the institutions of higher education on the list have only one high growth student founded firm. 12 of the 60 institutions have hosted 3 or more high growth student firms and founders. These schools are listed in table 4.12 along with selected data on the number of firms, number of high growth founders, the research profile of the institutions and the size and setting of these institution. The institutional data is based on the Carnegie Foundation classifications and more information on the data sources can be found in Appendix A.1. Additional information (eg enrollment, STEM expenditures) on the 12 schools with 3 or more firms in the database can be found in Appendix A.2.

Table 4.12: Selected data for colleges and universities with 3 or more high growth student firms

INST NAME	FIRMS / FOUNDERS	PUB/ PRIV	STATE	RESEARCH CLASSIFICATION	SIZE AND SETTING
PENN	8 / 16	PRIV	PA	15, Very High Research Activity	17; Large four- year, highly residential
CHICAGO	8 / 10	PRIV	IL	15, Very High Research Activity	17; Large four- year, highly residential
HARVARD	7 / 16	PRIV	MA	15, Very High Research Activity	15; Large four- year, primarily non-residential
YALE	7 / 14	PRIV	CT	15, Very High Research Activity	17; Large four- year, highly residential
MARYLAND	7 / 10	PUB	MD	15, Very High Research Activity	16, Large four- year, primarily residential
STANFORD	6 / 10	PRIV	CA	15, Very High Research Activity	17; Large four- year, highly residential
BABSON	5 / 9	PRIV	MA	29, Spec/Bus-Special Focus Institution	-2, Special Focus
COLUMBIA	4 / 5	PRIV	NY	15, Very High Research Activity	17; Large four- year, highly residential
CORNELL	4 / 5	PRIV	NY	15, Very High Research Activity	17; Large four- year, highly residential
DUKE	4 / 5	PRIV	NC	15, Very High Research Activity	17; Large four- year, highly residential
MICH	4 / 7	PUB	MI	15, Very High Research Activity	16, Large four- year, primarily residential
UCSB	3 / 6	PUB	CA	15, Very High Research Activity	16, Large four- year, primarily residential

Eleven of the 12 universities with three or more founders are well known *very high research activity* universities in the Carnegie Classification and are known for their impact across a variety of fields (Carnegie Classification, 2010). The 11 are the universities that rank near the top across a variety of fields. The twelfth institution is Babson College, it is classified as a special focus institution (Carnegie Classification, 2010) and its focus is business and specifically entrepreneurship. Babson ranks at or near the top on most rankings of entrepreneurship programs (both undergraduate and graduate).

The data on the schools with three or more high growth firms suggest a few themes worth exploring. 7 of the 12 schools have enrollment profiles of a majority graduate and professional students and only 3, Babson University, Cornell University and University of Michigan-Ann Arbor are classified as majority undergraduate enrollment. Additionally, a majority of the firms are private universities, with only one public institutions, the University of Maryland -- College Park in the top 5. With regard to location, California, New York, and Massachusetts each have two institutions on the list of top 12.

Of the broader database, overall, of the 60 schools, only 10 are majority graduate and professional students; while 25 are categorized as majority undergraduate. These enrollment profiles differ quite a bit from the schools with more than 3 high growth firms in the database. This broader set of universities is a primary reason that a majority of the founders in the sample were undergraduate students at the time of opportunity recognition and firm formation.

Of all the schools on the list, enrollments range in size from 2,141 students (Williams College) to over 50,000 students enrolled (University of Texas at Austin). 13 of the institutions are land grant universities, while only 2 of the list of top 12 high growth startup sources are land grant universities. There are 22 public schools and 38 private not-for-profit among 60 US institutions in the database and 3 public schools among the list of 12. There are no private, for-profit institutions in the sample.

The universities are located in 29 states and Massachusetts is the home of the most schools with 11, California is next with 6, and Pennsylvania and New York each have 4 schools represented. 19 of the institutions are located in large cities, while 15 are located in midsized cities, and another 12 are in small cities. There are suburban schools, including 9 located in large suburbs, 1 in a midsize suburb (UCSB), 2 in small suburbs, and 1 each in fringe, distant and remote towns. Table 4.13 highlights the diverse settings of the 60 institutions that have hosted the high growth firms and student founders in the database. The data is from the Carnegie Foundation.

Table 4.13: Colleges and universities by level of urbanization

Urbanization	Number of Institutions	Examples
Large Cities	19	Johns Hopkins University, Northeastern University, University of Chicago
Midsized Cities	15	Colorado State University, University of Wisconsin – Madison, Yale University
Small Cities	12	Cornell University, Lehigh University, University of North Carolina – Chapel Hill
Large Suburbs	9	Stanford University, University of Maryland – College Park, Pepperdine University
Midsized Suburbs	1	University of California – Santa Barbara
Small Suburbs	2	University of Oklahoma Norman Campus, University of Virginia Main Campus
Towns (fringe, distant, & remote)	3	University of Massachusetts Amherst, Williams College

The colleges and universities in the database exhibit certain consistencies. The data suggest that institutions that are welcoming to undergraduates with large research apparatus including faculty and Phd programs across many fields are supportive of student entrepreneurs. They are likely located in large or midsized cities or large suburbs. The number of firms by the institutions varies, though a majority of the schools only appear on the list with one high growth firm.

As mentioned, 12 schools were home to 3 or more firms and additional 9 schools had 2 firms included in the database, leaving 39 colleges and universities with just one firm in the selected sample. Two-thirds of the schools in the database have one high growth firm included in the database. The top 12 schools provided more than half of the firms and founders in the database. There are a variety of potential explanations for this

and will be covered in the discussion on areas for future research. Additionally, even among the cluster of campuses with more than three firms there is diversity in academic specialties, local conditions, alumni and enrollments sizes, and most importantly institutional history and culture. The case of the University of Chicago, presented in the next chapter, and the pathways of high growth student founders, explored in Chapter 6, will highlight the diversity of campus experiences of high growth founders and their firms.

4.7 Conclusion

On first pass, there appears to be great uniformity among the high growth student founders, their firms and universities. The composite founder is likely a male, undergraduate business student at a very high research activity level university. The data suggests that the composite founder launched their firms in the information industries after the year 2000.

That said, even among this rare breed of high growth student founders, firms, and schools, all are not created equally. Many of these firms are recently funded and have revenues under \$5 million dollars annually and their long-term survival is still in question. Others bring in billions a year in revenue, have been existence for more than 10 years, employ tens of thousands of people, dominate their industries, and have created new industries, improved quality of life globally, directly impact regional economies, and lead to global philanthropy (eg Microsoft, Google, Nike, FedEx, Facebook, Netscape).

The institutions of higher education that host these firms also appear homogenous through traditional academic lens, fitting in the highest categories according to outlets

from the Carnegie Foundation to Times World Higher Education Rankings. That said, a majority of the host institutions in the database only had 1 high growth firm and this includes smaller, non-research focused institutions such as Williams College, Chapman University, Pepperdine University, and University of Northern Colorado. This data suggests that without leading research programs, PhD structures, and top rated professional schools and networks, students are able to launch high impact firms from campus more ‘modest’ campus environments. The scale and offerings, compared across enrollment, departments, research funding and other metrics are limited when compared to the colleges and universities that hosted multiple high growth firms. While these campuses don’t appear to produce high growth firms with the regularity of some other larger, research intensive institutions, the social phenomena of high growth student startups does exist and occur on smaller, less research intensive campuses. No attempt was made to measure and quantify the frontier attributes of diversity, liberty (offerings), and assets on the campuses explored, but given the clustering of high growth firms and founders the qualitative and qualitative data collected suggests that well funded, very high research activities may present more frontier like attributes than do smaller colleges and universities.

The variables *Campus Pilot*, *Campus Market*, and *Campus Assets*, as mentioned earlier, are broad, but suggest that the campus played a role in the development of nearly all of the firms in the database. Though great diversity exists, many founders and firms participated in entrepreneurship and product classes, business plan contests, sourced investment from university related angel groups and contests, and participated in various

accelerator programs connected to their institutions; programs intended to support entrepreneurial and innovative activities. Other student founders did not engage in such direct entrepreneurial activities, instead used peer groups, dorm rooms and coffee shops, sports teams and extracurricular networks, and took non-entrepreneurship specific courses in business, liberal arts, engineering, computer science, and other fields while beginning the firm formation process. The next two chapters, a case study of the University of Chicago and an exploration of regular pathways of high growth student founders on campus, will shed further light on the liberty, assets available, and lack of institutional control that certain high growth student founders and firms experienced.

Further research, including additional data collection techniques, is needed in order to drill down to a greater level of detail on these variables and the specific interactions they attempt to capture. This variety of firms, founders and institutions in the database and their diverse experiences are congruent with Gartner's (1985, 1988) warning of the kaleidoscope like nature of the firm formation process where founders, environment, firms, and process blend in a multitude of changing ways.

The public and media highlight notable undergraduate founder dropouts including Bill Gates, Mark Zuckerberg, and Michael Dell, but completion of degrees is the norm. Kevin Plank of Under Armour, Fred Smith of FedEx, and most of the others in this database finished the degree programs that brought them to campus in the first place. In fact, there are six founders in the database that earned multiple degrees while launching their firms.

The data in the database does suggest that technology and urbanization play a role in the creation of high growth student firms. 46 of the 114 firms are in the information industry and the mode for the year of founding for the firms in the database is 2009. Additionally, for many of the firms in other industries, information technology plays a key role in their business model though they are classified in non information sectors. Examples include Warby Parker (an eyeglass producer developed by University of Pennsylvania MBA students that distributes their wares online) and Sole Bicycles (a fixed gear bike producer launched by USC undergrads that relied on website Alibaba.com to source and connect with suppliers all over the world). This data suggests that environments with leading technology and research resources (eg very high research activity level institutions) may offer more assets and opportunities for entrepreneurs entering those industries or employing those assets in their firm's creation and business model.

Additionally, as discussed above, 49 of the 60 institutions of higher education that served as the immediate surrounding environment for the firm was a high research or very high research university and 4 more were doctoral/research universities. Of those 49 high or very high research universities, only 2 are not in cities or suburbs (by definition near cities). Campus connections to metropolitan economies have been pointed to as a source of innovation and entrepreneurship by various authors (Saxenian, 1996; Florida et al, 2006) and there is no reason to believe that the relationship is only one way. The next two chapters will include qualitative data highlighting metropolitan connections employed by high growth student founders.

The database compiled for this research was produced in attempt to explore the research problem and question of this work. This database does not provide clear answers as to exactly what elements of a university specific individuals and firms used in driving towards high growth, however, it presents clear themes that can be used for further research and development of theories on entrepreneurship, higher education and growth.

The database suggests that the highest level research activity universities, their broad program offerings and large research budgets, support the emergence of high growth firms created by students. While the founders of the firms are mostly undergraduates and graduate students in professional programs (business and engineering), the research university milieu appears to support the creation of high growth student firms. The performance of the top 12 universities in the database suggest that those environments may play an important role in the emergence of high growth student firms. Some may interpret this as the latest iteration of the ‘best and the brightest’ or ‘elite’ in the US. The data and analysis do support this idea, as much of the activity explored in this research took place at top rated institutions of higher education in the US. That said, the ‘best and the brightest’ are crucial indicators for the values and aspirations of society and economy and as discussed these leading institutions are often models for the entire higher education sector in the US and beyond as well as crucial factors in innovation and growth.

CHAPTER 5: THE UNIVERSITY OF CHICAGO: ROCKEFELLER AND HARPER'S FRONTIER

5.1 Introduction

"It was the best investment I ever made in my entire life,"

John D. Rockefeller, referring to
the University of Chicago
(Rudolph, 1990 p. 352)

When Frederick Jackson Turner attended the World's Fair in 1893 to present his thesis to the American Historical Society, he was standing face to face with the industrial era he feared would destroy the unique American society developed through the frontier process. It is unlikely Turner realized that a man made institution, the University of Chicago, rising next to the Ferris Wheel at the Columbian Exposition, would present assets and opportunities to a diverse set of people from its inception.

This chapter will explore the background, including the founding and driving philosophy of the University of Chicago, its business school's entrance into the field of entrepreneurship and the various assets and opportunities through which students experience entrepreneurship on campus. Mini cases of student founders and their firms from the University of Chicago will be included as subunits within this case study of the University of Chicago.¹¹

¹¹ Groupon, an online coupon service was founded by Harris School of Public Policy student Andrew Mason and was dubbed the fastest growing company in world history by Fortune Magazine in 2010. Groupon, with Mason as CEO, went public in November 2011 and in raising \$700 million that day it was

5.2 The University of Chicago

Inspiring gothic architecture, forming classic campus quadrangles is often the first thing that catches a visitor's eyes as they enter the campus of the University of Chicago, founded in 1892. The layout and style of the campus communicates the seriousness of the university and its aspirational nature. Visitors arriving via Lake Shore Drive -- an urban highway hugging Lake Michigan -- will have passed the Museum of Science and Industry while entering campus. The museum is one of the few surviving buildings from the 1893 World's Fair in Chicago -- the famed "City of White" -- that captured the world's attention and gave visitors a taste of the dawning industrial age that the US was entering.

The World's Fair of 1893 was known as the Columbian Exposition as it celebrated the 400-year anniversary of Christopher Columbus' arrival in North America. The arrival of Columbus was the beginning point for Frederick Jackson Turner's *Frontier Theory of American History* that posited a break from European political, cultural and economic history and the World's Fair of 1893 was the first time Turner publicly presented his Frontier Thesis. As the Columbian Exhibition ran along the lakefront, parts of it were located on the grounds and adjacent to the grounds of the just born University of Chicago, and the inspiring, the campus served as backdrop for countless photographers in the emerging picture postcard industry (Thelin, 2004).

the largest IPO of a US Internet company since Google's IPO in 2004. Grub Hub, a winner of the University of Chicago Booth School of Business' New Venture Challenge business contest in 2005 completed its IPO in April 2014.

John D. Rockefeller originally agreed to fund the University of Chicago with the intention that it would be a national Baptist College (Storr, 1966). However, through the concerted effort and leadership of a handful of Baptist leaders, academic innovators and Chicagoland leaders, it would instead become one of the most respected and productive research universities in the world (Slosson, 1910; Storr, 1966; Thelin, 2004). The University of Chicago is consistently ranked in the top ten of world universities and also leads across a variety of specialties.¹²

The University of Chicago was born in the era when American higher education leaders were importing and experimenting with the German research model (Rudolph, 1990; Thelin, 2004). This era would lay the groundwork for nearly a century of U.S. leadership in higher education, research, science, and sustained economic growth (Rudolph, 1990).

In describing the research university building era higher education historian Frederick Rudolph argues:

“But no episode was more important in shaping the outlook and expectations of American higher education during these years than the founding of the University of Chicago one of those events in American history that brought into focus the spirit of the age. The cast of characters itself was remarkable: John D. Rockefeller, now busily engaged in good works, in 1888 having come to the conclusion that he would like to found a new college in Chicago, but waiting for the voice of his baptist denomination to call upon him to do so; Thomas W. Goodspeed, secretary of the Baptist Union Theological Seminary in Chicago, using his influence to shape a decision for Chicago; Augustus H. Strong of the Rochester Theological Seminary, using his influence to shape a decision for New

¹² Ranked number 10 in world university rankings Times Higher Education higher <http://www.timeshighereducation.co.uk/world-university-rankings/2012-13/world-ranking/institution/university-of-chicago> ; 2012-2013 QS world rankings. <http://www.topuniversities.com/university-rankings/world-university-rankings/2012>

York; the Reverend Frederick T. Gates, secretary of the American Baptist Education Society, holding off the small and hungry Baptist colleges throughout the land; and William Rainey Harper, young Baptist layman and Hebrew scholar, in 1888 in his thirty-second year the holder of three professorships at Yale, one of the most incredible men to move across the university scene. (Rudolph, p. 349/350)

The arrivals of the University of Chicago and the World's Fair were symbolic of Chicago's emerging role in a burgeoning, industrializing America and the value that research based institutions of higher education could play as the country moved into this new age of science, capital, urbanization, and machines (Thelin, 2004). This transition concerned Turner and threatened his concept of an American frontier and ethos that he believed was born and strengthened in the open spaces of the frontier, not the dense cities of the industrial era.

In less than a year, 27 million paid visitors would attend the World's Fair in 1893, making it the largest tourist event in the US up to that point. The Columbian Exposition amazed, entertained and pleased with the introduction of Pabst Blue Ribbon Beer and Cracker Jacks, as well as the world's first Ferris Wheel, which provided a stellar view of the grounds of the University of Chicago as it rose on the Southside of Chicago (Thelin 2004). Appendix A.2 contains a picture from 1893 of the Ferris Wheel being built next to the Walker Museum on the University of Chicago's early campus as well as other visual data from University of Chicago. Global cultures and industrial marvels were experienced by millions that visited the World's Fair and the new born University of Chicago.

Additionally, and importantly, as the world marveled at emerging technologies and global cultures on the Midway Plaisance in Chicago, Frederick Jackson Turner,

attending a meeting of the *American Historical Society* held as part of the World's Fair, would, publicly present his *Frontier Thesis* for the very first time and share his, "lament over the disappearing influence of frontier freedom," (McNeil, 1991, p. 1).

Chicago was emerging as center of commerce, culture and power, second only to New York, and the new university, with Rockefeller's funds and Harper's brilliance and energy, would quickly grow to become a national powerhouse (Slosson 1910, Rudolph 1990). The University of Chicago would become a uniting force for the growing metropolis Carl Sandberg would refer to as the *City of Big Shoulders*.

Many of Chicago's wealthiest citizens, whether Baptist or not, participated in a fundraising matching program with Rockefeller, with Chicagoans matching Rockefeller's initial million dollar contribution with a million of their own (Goodspeed, 1916). The city and its top citizens and interests were immediately invested in the success of the institution being built on a parcel of land contributed by Chicago merchant king Marshall Field (Goodspeed, 1916).

5.3 Charles Rainey Harper and the University of Chicago's DNA

Charles Rainey Harper, an academic overachiever and innovator and a Hebrew scholar by training, held 3 positions at Yale by the age of 33. Early on, as an instructor at tiny Morgan Park Academy outside of Chicago, Harper established summer courses as well as correspondence courses, an incredible advance for that time (Goodspeed, 1916). Harper would innovate through his career and when it became clear he was Rockefeller's choice to oversee the building of a Baptist institution in Chicago, he put together a vision for a research university unlike any other the world had ever seen and far beyond the

ideas of Rockefeller and the other backers (Slosson, 1910; Rudolph, 1990; Thelin 2004). Moreover, Harper had the confidence (or arrogance) to negotiate deftly with Rockefeller for financial support as his visions and plans expanded (Goodspeed, 1916; Slosson, 1910; Rudolph, 1990).

In serving as the first President of the University of Chicago, Harper would oversee a flurry of educational innovations including the creation of the academic publishing industry with the University of Chicago Press (which has published the Chicago Manual of Style since 1906),¹³ the rethinking of academic calendars, and the introduction of multiple new fields of inquiry. Harper was building an early prototype of the multiversity Clark Kerr would write about over 50 years later.

In 1910, after touring America's top universities, chemistry professor and agricultural experiment station alumni turned journalist Edwin Slosson published the book *Great American Universities*. His work was full of quantitative and qualitative insights on 14 of the top universities in America. This work was the forerunner of the modern university ranking industry. All of the schools on Slosson's 1910 still remain at the top when rankings of major research universities are released – both public and private.¹⁴

“In our time three universities have been raised from the seed: Johns Hopkins, Leland Stanford, and Chicago. The youngest, and greatest and most original of these is

¹³ The History of the University of Chicago Press is fascinating in its own as it is responsible for many firsts in Academic Publishing and various fields. Basic information the organization can be found online. <http://press.uchicago.edu/press/presshistory.html>

¹⁴ The universities in Slosson's *Great American Universities* were: Harvard, Yale, Princeton, Stanford, University of California, University of Michigan, University of Wisconsin, University of Minnesota, University of Illinois, Cornell, University of Pennsylvania, Johns Hopkins, Chicago, and Columbia.

the University of Chicago. Scarcely had it cotyledons appeared above the service of the Midway soil when it was seen to be a new species, a mutant,” wrote Slosson (1910, p. 405).

Slosson argued, “The University of Chicago achieved its success, first, by manifesting a still greater originality and adaptability, as in summer work, extension courses, and the use of print, for example, and second, by rising above the zone of competitors in giving more advanced work in pure science and the humanities,” (Slosson 1910 p. 434). Harper argued in his *The Trend In Higher Education* (1905, pp.27-28) that, “the true university, the university of the future, is one the motto of which will be; Service for mankind wherever mankind is, whether within scholastic walls or without those walls and in the world at large.”

With institutions such as the Oriental Institute and new approaches such as the Chicago School of Sociology, Harper’s University of Chicago would be interdisciplinary and at times very combative and rebellious (Goodspeed, 1916). Members of the University community treated Chicago as a laboratory and attempted to use their work on campus in order to impact and improve the world off campus (just as Harper had written) so it would not be uncommon to hear a member of the school’s sociology department arguing against industrial leadership given the conditions they observed on the south side of Chicago.

While focused on research and graduate work, Harper’s university represented, supported and engaged Chicago as it transitioned from frontier capital to densely populated, urban, industrial and muscular (Rudolph, 1990). In his famous poem *Chicago*,

written in 1914, Carl Sandburg described the character of the city emerging on the shores of Lake Michigan,

“Hog butcher to the world,
Tool maker, stacker of wheat,
Player with railroads and the nation’s freight handler;
Stormy, husky, brawling
The city of big shoulders” (Sandburg, 1914)

Harper would go out of his way to connect to the world beyond the campus and would use various methods to make the University of Chicago a rallying point, representation, and strength of the city of big shoulders.

Harper brought talented people to Chicago by raiding other schools for leading faculty and even enticed Alonzo Stagg, the most famous football coach in America, to leave Yale and lead the University of Chicago football team and serve as a Professor of Physical Education (Storr, 1966; Rudolph, 1990). The success of the team under Stagg, in an era when college football was the biggest national sport, created an insatiable public demand for stories on the team (Rudolph, 1990). While it hardly seems possible given the University of Chicago’s more recent history, during Harper’s time the University of Chicago Maroons were a national powerhouse on the gridiron and fully supported by the scholarly Harper. Alonzo Stagg wrote in 1891 (Storr, 1966 pp. 179) in describing Harper’s answer to where athletics stand at a university, “I am most heartily in favor of them. I want you to develop teams which we can send around the country and knock out all the colleges.” While football and athletics may seem basic pursuits relative to research and teaching, Stagg was in fact the most innovative coach of his era and his

program became a central cultural connection among students and between the University of Chicago, the city of Chicago and the entire Midwest.

As with football, Harper built bridges to the city and the region through various academic innovations such as the creation of a junior college, extensive summer school offerings and equality of opportunity when East Coast Ivy Schools were not as welcoming -- for example, by 1902, 48% of U of C's students were female and by the mid 1930's nearly one-third of the undergraduates were Jewish (Thelin, 2004; McNeil 1991).

McNeil (1991, p.54), writing about being a student in the 1930's stated, "the University of Chicago became a place to rise in the social scale, where old ideas, old habits and old prejudices were left behind and where secular thrusts, tested by reason and embodied in science, could be counted on both to liberate the mind and prepare a self-selected body of students for successful professional careers."

Less than forty years after its founding within earshot of Frederick Jackson Turner's dire pronouncement on the death of America's frontier, the University of Chicago, a man made institution in a dense, industrial city, had taken on many of the attributes of the frontier that Turner believed crucial to American style democracy and economic growth.

The University of Chicago became an innovative, open place that would influence and in many ways represent the city that was its home. In wrapping up his poem *Chicago*, about the city that the University of Chicago grew with and came to represent, Sandburg pens:

“Fierce as a dog with tongue lapping for action, cunning as a savage pitted against
the wilderness,
Bareheaded,
Shoveling,
Wrecking,
Planning,
Building, breaking, rebuilding,
Under the smoke, dust all over his mouth, laughing with white teeth,
Under the terrible burden of destiny, laughing as a young man laughs,
Laughing even as an ignorant fighter laughs who has never lost a battle,
Bragging and laughing that under his wrist is the pulse, and. Under his ribs the
heart of the people:
Laughing,
The stormy, husky, brawling laughter of youth, half naked, sweating, proud to be
Hog Butcher, Tool Maker, Stacker of Wheat, Player with Railroads and
Freight, Handler to the World”

(Sandburg, 1914)

The University of Chicago, birthed with the largesse of Rockefeller and the institutional mutations of Harper, would hold the mindset and approach Sandburg had witnessed in the city at large. The University that Harper had built did in fact want to be Hog Butcher, Tool Maker, Stacker of Wheat ‘to the world’. In explaining Harper and his school Slosson stated, “For the new projects were not merely broad; they were iconoclastic. Though varied in their character, most of them had the same aim, the breaking down of barriers between the life of the university and the life outside, barriers which six centuries of scholasticism had erected, buttressed, and adorned” (Slosson, 1910, p. 406).

5.4 The University of Chicago, Business Education and Entrepreneurship

Many of the early buildings that formed the campus in Harper’s era are still around and later structures often took a similar form and material, giving the campus of the University of Chicago a singular style. Gothic structures with gargoyles, wildlife, and

other forms peer down on the students, faculty and staff below and give the campus tangible personality. In 2004, among the Gothic buildings and their watchful eyes, a massive, modern glass and steel building, bearing the name Harper Center, the University of Chicago's Booth School of Business opened a new home.¹⁵ The structure housing the Booth School is a break from the gothic and stone architecture dating to Charles R. Harper. Appendix A.2 contains multiple images of the University of Chicago campus including examples of architectural style and images of the Harper Center.

The Harper Center, whose immediate neighbors include Frank Lloyd Wright's Robie House and the massive Rockefeller Chapel, is a fitting home for the often #1 ranked Booth School of Business (Businessweek 2012, Businessweek 2010) as its modern style represents the sea change that has occurred as the school has become a key point of passage for many high growth startups created by students at the University of Chicago. Though the new building may be one of the newest and most modern on campus, the business school itself was founded in 1902 and is the second oldest in the United States after the University of Pennsylvania's Wharton School (Daniel: 1998).

For a business school known for its deep theoretical work in fields such as finance and economics, its rise as a center of high growth entrepreneurship is noteworthy. The move to a new building and a focus on entrepreneurship evoke images of the rebirth and break from the past that Turner and Sandburg each described.

In 1898, when the University of Chicago began teaching business, the field clearly fit with the mission of supporting the city as it grew. Harper and others had

¹⁵ The Harper Center is named after a different Charles Harper. The namesake for the building is Booth graduate Charles M. Harper ('50), former CEO of ConAgra.

engaged the powerful Chicago business community in founding the university so it was no surprise that professional education offerings would cohabitate with researchers, scientists and football as the goal of the university was to be part of the world outside of the campus (Storr, 1966; Daniel, 1998)

Moreover, as part of Harper's university, the business school has always shared many traits of the broader research university. For example, it was the first school to offer a PhD in business, it published the first academic journal for business (the *Journal of Business*), and by the 1930s offered a downtown campus with evening classes to extend opportunities to working professionals of Chicago. Additionally, the school's research has been instrumental in the fields of finance and economics and at one point (1997) Chicago's business school had 6 Nobel Prize winners on faculty.¹⁶

With such strength in economics and finance, Chicago, its faculty and its graduates became an important part of the financial infrastructure of the global economy as it grew through the 1970s, 1980s and 1990s. Each year, research from Chicago would influence Wall Street, corporate America, and policy, while hundreds of Chicago MBAs would make their way to Wall Street, top consulting firms, leading corporate offices, and government agencies. The 'modern' business school job of getting graduates good jobs and providing high level research functioned well at the University of Chicago and the school was meeting the demands of its students, their employers, and various other stakeholders through the 1990s.

¹⁶ The 6 Nobel Prize winners in residence at the University of Chicago Booth School of Business in 1997 were: George Stigler (1982), Merton Miller (1990), Ronald Coase (1991), Garry Becker (1992), Robert Fogel (1993), and Merton Scholes (1994). <http://www.chicagobooth.edu/about/history>

5.4.1 The Entrepreneurship Program at Chicago's Booth School of Business

In the mid-1990s Robert Hamada, the Dean of Chicago's Graduate School Business School, it would not be named Booth until 2008, charged a young, newly tenured Finance Professor, Steven N. Kaplan, with building a leading entrepreneurship program. Joseph Neubauer, a 1965 graduate of the school, made a \$1.5 million gift to establish the Neubauer Family Chair in Entrepreneurial Studies in 1994 due to his belief that entrepreneurs create wealth for others and that their behavior was not random (University of Chicago Chronicle, 1996). Kaplan's research in Private Equity placed him closest to entrepreneurship of the faculty and he was tapped to fill the chair and build a program (Kaplan S, 2011).

According to Kaplan (2011), at the time the school only offered a few entrepreneurship classes, there was no concentration, a business competition (the New Venture Challenge - NVC) had just begun in 1997, and ARCH Ventures -- a venture fund associated with University of Chicago research and intellectual property -- was a few years into its existence. There were a few entrepreneurial offerings and activities on campus, but they were few and uncoordinated.

The initial vision for an entrepreneurship program, according to Kaplan, was that students would learn about entrepreneurship and gain tools so that if they became entrepreneurs they would possess a basic skillset and set of experiences to draw from (Kaplan S, 2011). There was no notion in the early days of a program in which students would actually launch and build high growth companies with regularity (Kaplan S, 2011). That would begin happening via the school's business plan contest, the New Venture

Challenge (NVC) rather quickly and the ‘emerging’ program would soon uncover and present to the world new ventures making impact or with the potential to make serious economic and social impact. Since the late 90s, Kaplan and others have effectively worked with students, faculty, staff, graduates, and donors in creating a top entrepreneurship program that has produced multiple high growth firms.¹⁷

By 1998, with two NVCs completed and growing student and donor interest in entrepreneurship, it became obvious that classes and a contest were not enough to fill the demand. Plans for a center for entrepreneurship were put together and with the stated goal of making Chicago “the premier business school in the Midwest for entrepreneurship and venture capital,” (GSB New Venture News, 1998, p. 1; Kaplan S, 2011).

It is worth noting that before the school launched plans for an entrepreneurship center or offered the New Venture Challenge (the business competition), business school students at the school had created The Entrepreneur and Venture Capital Group. This leadership in extracurricular activities and exposing fields worth pursuing follows in the US tradition of students as a key source of innovations on US campuses (Rudolph, 1990; Thelin, 2004).

Additionally, according to Kaplan (2011), it was crucial from the start that whatever program the school built it would be student facing and would be experiential in nature including fellowships, contests, conferences, and work with ARCH Ventures, the

¹⁷ University of Chicago Booth School of Business is highly ranked in the various entrepreneurship ranking made available. <http://www.businessweek.com/articles/2013-01-14/mba-rankings-top-schools-for-entrepreneurship>

intellectual property focused venture firm associated with the University of Chicago (Kaplan, 2011; Holroyd, 1998). This pedagogical choice of practical coursework and experiences is consistent with the history of US higher education, dating back to Jefferson's University of Virginia and Franklin's University of Pennsylvania.

5.4.2 The Chicago New Venture Challenge (NVC)

On the morning of May 30, 2013, Professor Steven L. Kaplan stood before a packed classroom with tiered amphitheater style seating in Harper Center and welcomed the assembled teams, judges, and guests to the 17th annual Edward L. Kaplan New Venture Challenge. In his remarks, Kaplan reminded everyone that in its 17 years, NVC has helped launch more than 85 firms that have gone on to raise over \$300 in equity capital investments and have created over 1300 jobs (Kaplan S, 2013).

Each spring, in the Harper Center, the Polsky Center for Entrepreneurship and Innovation hosts the NVC, a business contest dating to 1996 that has grown to include 4 distinct tracks or divisions, as well as a variety of other contests and events related the competition.

The first NVC was held with the support of successful entrepreneur alumni Edward L. Kaplan (1971). In the mid-1990s, entrepreneur Edward L. Kaplan, who revolutionized the barcode industry with his company Zebra Technologies, worked directly with Professor Steven Kaplan and Dean Hamada in trying to realize the goal of a leading entrepreneurship program in Chicago (Kaplan E, 2011; Kaplan E, 2013).

In the early days of planning and building the program, Ed Kaplan, an engineer who earned his MBA from the University of Chicago in 1971, went out to collect data on

experiential programs in entrepreneurship (Kaplan E, 2011). He spent a great deal of time speaking with and visiting Chicago's cross town rival, Northwestern University's Kellogg School of Management. Kellogg was active with case competitions and an affiliate of the University of Texas's MOOT Corp (Kaplan E, 2011). Ed was convinced of the value such programming and began to support and encourage the growth of programming for Chicago and its students (Kaplan E, 2011).

Though the NVC culminates with final business presentations and an innovation expo in the Harper Center in the Spring each year, it is actually year-long process that begins in the Fall with multiple public events that explore entrepreneurship, allow potential participants to meet, present their ideas and form teams. Though run by the Polsky Center (the entrepreneurship center at the Booth School), the NVC attempts to bring people from throughout the campus and its affiliates, including researchers/scientists at federal labs managed by the University of Chicago, researchers from across campus, and faculty and staff of the medical school, and innovators from off campus.¹⁸ Since the earliest days, students, faculty and staff from the Illinois Institute of Technology (the school Ed Kaplan attended for his engineering education) have regularly been part of the planned events as the University of Chicago does not have a college of engineering (Kaplan E, 2011; Holyrod, 1998).

Past participants, faculty, alumni judges, New Venture Challenge coaches, and mentors attend and lead the early public events, providing potential participants insight into the program and the opportunities and challenges it provides (Polsky 2009; Kaplan

¹⁸ The University of Chicago runs the Department of Energy's Argonne National Lab and co-manages the Fermi National Accelerator Laboratory.

S, 2011; Stopper, 2012). Data collected during interviews and observations make it clear their participation is something they enjoy and take seriously, arriving prepared and engaging in substantive ways with participants. The NVC is meant to be open and engaging and the early events draw in students from across the campus and its programs (including its executive MBA program) and also bring in professionals from throughout the region.

The rules for the NVC support openness and choice, allowing teams applying to have any number of members from anywhere as long as at least one of the primary founders is a Booth MBA Candidate -- this includes full time, weekend, and evening students (Polsky Center, 2010a). This open approach casts a very wide net as University of Chicago's Booth School of Business is one of the largest full time programs, one of the largest part time programs, and one of the longest running executive MBA programs in the world (Businessweek, 2012). As an example, in 2012, there were over 3,000 students enrolled in the full and part-time programs at the Booth School (Businessweek 2012). Each of these 3,000 presumably have contacts across campus and beyond campus that they could potentially tap in entering the NVC. This open call for participants is not surprising given Harper's early ideas about open, engaged campuses, his support of professional schools and the fact that Chicago was one of the first business schools to create an evening program and a downtown campus for working professionals.

After the NVC's initial announcement and team building phase in the Fall, the early part of the new year is dedicated to producing feasibility studies for those who enter. There are multiple public sessions providing insights and tools for creating a

successful feasibility studies and this portion of the contest typically has a deadline of late February during the Winter quarter. During both of these phases faculty, alumni, and practitioners from startups, services providers, and parts of the entrepreneurial ecosystem attend and engage participants at the events. In recent years, some of these events have taken place online, further extending the reach of the NVC. Table 5.1 provides a sample and short summary of some of the NVC events that are offered.

Table 5.1: Sample and summary of select Chicago NVC events

Event	Summary
NVC Kickoff	interactive event offering overview of NVC process, access to faculty and staff, opportunities to meet potential teammates and pitch ideas
Ideation Sessions	interactive sessions for students to learn about university research and opportunities for business applications and commercialization
D4Lab	A workshop series and fellowship in partnership with the Illinois Institute of Technology. D4Lab helps multidisciplinary teams identify problem areas and design solutions in specific industries
Big Ideas, Big Problems	Annual forum for the university community to discuss solutions to major societal problems faced at local and global levels (recent topics include global health and cybersecurity)
LinkedIn 'Ideas Marketplace' Network	Active online community allows for students and others interested in participating in the NVC to post ideas and form teams
SeedCon	Annual conference hosted by Entrepreneurship and Venture Capital student group and Polsky Center. Features speakers, workshops and a fast pitch competition

In the early years of the competition around 30 teams submitted applications during the first round (Truong, 1998; Kaplan S, 2011) while recent NVCs garner well over 150 submissions annually (Kaplan, 2011; Polsky, 2013). The public and sustained

sequence of events has created a scenario where one platform at the University of Chicago is generating 100s of ideas annually for innovative student created firms.

After the second round, where feasibility summaries are submitted, 25-30 of the teams are selected and their MBA members enroll in the New Venture Challenge course during the spring semester. The first year of the competition was the only year that there was not a class associated with the class and according to Steven Kaplan (2011) it was student demand that led to the creation of the course.

In the NVC course the teams are bombarded with mentors from Chicago's venture community and the school's vast network -- alumni and otherwise (Kaplan S, 2011). In recent years the Polsky Center's annual reports list 100s of entrepreneurs, financiers, lawyers and others that come to campus to work with students and others during the NVC process (Polsky, 2011; Polsky, 2012; Kaplan S, 2011).

Additionally, each team that participates in the course is matched to a coach -- again an experienced startup professional -- that has networks and experience beyond the campus that they then bring to their team (Houlihan, 2006; Kaplan S 2011). The teams are also connected to specific people who have domain expertise and these connections typically come from the course instructors, the team coaches, alumni, or friends of the school (Kaplan S, 2011).

The early parts of the NVC demand that teams identify and try to validate an opportunity – the first stage in new venture creation (Bhave 1994). Moreover as the Van de Ven (1944) and Carter et al. (1996) suggest, new ventures that actually launch are more likely to expose their ideas, intentions, and actions to outsiders. External

engagement and exposure is part of the NVC and for 30 the teams that make it to the class it is 3 months of constant feedback, repeated presentations to coaches and mentors, and curriculum supporting the continual improvement of the business model. Bhavé's (1994) process model, developed through analysis of the INC 500 list of fastest growing startups, points to constant iteration and business model refinement as the norm for successful firms. The outside influences and repeated interactions of the NVC help in the refinement and emergence of the emerging firm and team in important ways.

Larson and Starr's (1993) networked model of firm development, argues that as a startup moves through the firm formation process, from nascent to actual entity, it must expand its networks and layers of networks. The year-long process of the NVC, especially for the 30 course participants and 10 finalists offers just such an experience and opportunity for participating teams.

The engagement of outsiders from related industries and services providers delivers direct and timely information to NVC participants as they attempt to develop their ideas into successful firms. This environment has similarities to the ecological approach Aldrich (1990) outlines in which the market place and current population of firms provide information to would be entrants. In this case the speakers, mentors, and coaches brought onto campus, into classes, and into the NVC process ensure that information from the marketplace is flowing. The quality and networks of the people that the school, entrepreneurship center and the broader university can access ensures that participants are getting leading edge information. Though the information is available, it is up to the would be high growth founder and their team to figure out how to process and

apply it. Again, this is where constant interaction and communication provide value to NVC participants.

While discussing the NVC, Steven Kaplan stated that the program is basically an accelerator and it is a model that Booth kind of “stumbled into before others such as Y Combinator, Tech Stars and eXclerate Labs discovered it years later and commercialized it,” (S Kaplan, 2011). The NVC, like an accelerator, starts off with a pool applicants and attempts to whittle it down to a small group of teams to work with over a short, intense period of time. The NVC connects with the through events, course, and other programs working with them as they sift and develop ideas. Eventually, as mentioned above, 100 will apply. When 30 are chosen, the teams are brought in and resources (time, human capital, intellectual property, networks, presentation skills) are thrown at them over a very short period of time. Of the 30, 10 are chosen to present publicly to a world class panel of judges who question them after their pitches.

Though intense and working with presumably high quality inputs, the process doesn't always work. “At the end of the three months some of the businesses will be dead on arrival and others will find a market,” acknowledged Kaplan (2011). According to Kaplan (2011), the New Venture Challenge/Polsky team has gotten better and better at matching teams and mentors over the years and this is a crucial part to the success that the program and teams have enjoyed.

For the roughly 30 teams that are selected and make it into the NVC class, its a chance to refine their business models and presentations and an opportunity to leverage the incredible networks and resources of the mentors, judges, alumni, faculty and the

Polsky Center. Moreover non-Booth school members of selected teams also get access to the learnings and networks offered during the New Venture Challenge course.

Over the 17 years the NVC has been running, virtually everything about it has grown. The Global New Venture Challenge (GNVC) was introduced in 2008 to bring in students from the multiple, global executive programs that Booth offers. It makes use of an online platform to connect members, teams, faculty, and mentors across the globe. The GNVC winner is invited to present at the NVC each year. The Social New Venture Challenge (SNVC) was introduced in 2011 and works in concert with Booth's Social Enterprise Initiative, a program endowed in 2012.¹⁹

In 2013, after observing that undergraduate students, such as Suyeon Khim and her firm Alltuition,²⁰ were participating in the NVC, the College New Venture Challenge (CNVC) was created for undergraduates at the University of Chicago. Participating students are able to audit the Booth School New Venture Challenge course and as with other tracks, access the network of mentors and resources and opportunities provided.

In addition to the growth in participants and tracks, prize money for the New Venture Challenge has grown with the top prize for the NVC reaching \$30,000 in 2013 and the Social New Venture Challenge awarding \$35,000 in 2013. The Global New Venture Challenge awards \$5,000 and the winner then has the opportunity to participate

¹⁹ The Social Enterprise Initiative was endowed with a \$5 million gift from former Computer Discount Warehouse CEO John Edwadrson, MBA '72

²⁰ In 2008 Suyeon Khim, an undergraduate studying mathematics at the University of Chicago, developed an idea that would help students and their families better understand school loans and find the right financial aid. Khim joined the open processes of the NVC and entered the competition. Khim ended up leaving school, entering xCelerate Labs (now Techstars Chicago), taking investment from Hyde Park Angels and moving to Silicon Valley. To date, according to Crunchbase, the company has raised over \$4 million in financing.

in the NVC finals at the Harper Center (See Table 5.2 and 5.3 for recent finalists of the NVC). Appendix A.6 offers pictures of finalists presenting at the 2012 and 2013 NVC.

It is worth noting that the New Venture Challenge rules changed the prize from a direct cash award to a convertible equity position whereby the prize money from the contest will convert to equity shares at an equal valuation to the next fundraise the firm does,²¹ with any proceeds from the equity position supports Polsky and its programs (Kaplan; 2011; Polsky Center, 2010).

In addition to the financial prizes, finalists are offered space in the on campus incubator sponsored by venture firm Arch Ventures and many entrants earn in kind services donations from alumni and sponsors. Additionally, side events such as app contests, online pitchfests, and innovation showcases have been added over recent years to extend the reach, calendar and networks of the New Venture Challenge. For most of these events Booth and Polsky have partnered with other units at the University of Chicago, local and federal government agencies, and investment firms and accelerators such as Tech Stars Chicago.²² The NVC program fits well with William Rainey Harper's vision of a university engaging the world around it.

²¹ Quote from the rules "As a condition to receive the Prize Money, each winning team must agree to provide Chicago Booth with equity in the Company (that was the subject of its business plan) in an amount equal to its respective award if the company receives funding or otherwise enters into a business combination transaction wherein the surviving entity receives financing or equity in another entity, within three years of the agreement date."

The Social Enterprise Initiative was endowed with a \$5 million dollar gift from former CDW CEO John Edwardson, Booth MBA '72.

²² In Feb 2013 Excelerate Labs joined with Colorado and New York based venture accelerator Tech Stars. <http://gigaom.com/2013/02/01/techstars-takes-chicago-merges-with-excelerate-labs-incubator-program/>. The accelerator continues to work with the University of Chicago and Polsky on various programs.

The clear strength of the New Venture Challenge is the potential to rapidly accelerate and validate potential ideas and entrepreneurs through an extensive network of people and events. In analyzing data on firms that have come through the New Venture Challenge, a key metric of success is the ability of participants to successfully raise equity investment from accelerators, angels, and premier venture funds. In one year, between 2010-2011, Chicago student created firms raised over \$85 million in equity capital, including \$34 million to Braintree Financial, over \$30 million to GrubHub, and millions more to EduLender, Bump Technologies, and Benchprep (Pletz, 2011).

In 2011, Benchprep, an online test preparation firm and winner of the 2010 NVC, received funding from Lightbank Ventures, a venture fund managed by Groupon co-founders and Booth School instructors Eric Lefkowsky and Brad Keywell (Pletz, 2011). In 2012 Benchprep received an additional \$6 million in investment from Lightbank, New Enterprise Associates, and Revolution LLC, the latter two being two of the larger and more successful venture funds in the industry.

The ability to support the development of fundable business models and startup teams appears to be the goal of the NVC process that strengthens the team, refines the product, and continually engages non-campus partners and institutions. The NVC finals regularly feature startups with products and services in use and in some cases generating revenue by the final presentations in May of each year. The NVC startup processes provide a path through the firm formation processes with repeated opportunities to take tangible actions, iterate, and engage with talented people on and off of the campus. The NVC process further supports the network development conception of successful firm

formation. The data suggests that Chicago students, NVC's processes, the University of Chicago environment and networks have played a role in the creation of multiple high growth student firms. The NVC, combined with the opportunities and assets on campus including coursework (described below), networks, and additional programs (described later), seems to have achieved its recent version of its goals. The 2010-2011 Official Rules and Guidelines for the 15th Annual Edward L. Kaplan New Venture Challenge state:

“the event aims to fulfill two main objectives:

- 1) Provide entrepreneurial services and education to a broad range of students. Along these lines, the Challenge offers a wide range of networking and team building events; and
- 2) Provide financial support for those business plans that are best developed and show the most promise. The prize awards and donated financial services provided to the winner and finalists help fulfill this objective.” (Polsky, 2010 p. 2)

With a broad net cast among a large student body and outside partners, a diverse set of ideas and teams make it through to the finals of the NVC each year. Given the wide range and large number of applicants participating and the growing prize money and successes of entering students and firms, it appears the NVC has provided an open, diverse, and asset filled opportunity for students at the University of Chicago interested in entrepreneurship.

Tables 5.2 and 5.3 provide a summary of the 20 finalists from the 2012 and 2013 New Venture Challenge at the Booth School of Business.

Additional tracks and events engage another 30-50 student firms each year.

Table 5.2: Presenting finalists at 2012 Edward L. Kaplan NVC

FIRM	DESCRIPTION	INDUSTRY
SH2	SH2 is a company that is focused on providing innovative solutions in media advertising for points of sale marketing.	Retail Services
Output Medical	Output Medical seeks to provide a more accurate way of measuring key body fluids using a novel technological approach involving electric sensors.	Medical Supplies
Zipfit.me	Zipfit.me is a virtual personal shopper. It quickly helps customers find clothing in the market that fits their bodies – starting with men’s denim.	Retail Services
Site-Diagnostics	Site-Diagnostics is a biotechnology company focused on veterinary diagnostic applications using gel-drop biochip technology licensed from Argonne National Labs.	Biotech
BloomNation	Bloomnation allows florists across the country to upload and sell their unique designs at their desired price onto a single marketplace.	Retail Services
ArborVita Associates LLC	ArborVita Associates is a biotechnology company that has developed a simpler, faster, and cheaper way to modify DNA using a proprietary and patented enzyme called DRAP (Drosophila Recombination-Associated Protein).	Biotech
MouseHouse*	MouseHouse is developing an iPad and web platform that allows researchers in laboratories and institutions to collaborate on animal experiments, breeding, and health management.	Enterprise / Academic Software / Services / Mobile
Drink Different**	A cider based alcohol beverage for young, urban dwellers in Poland	Consumer Beverages
GradMags Publishing	GradMags Publishing is a cross-media digital publishing platform and enablement service for higher education and nonprofit organizations.	Enterprise Mobile
Aquarius Biotechnologies	Aquarius Biotechnologies uses a proprietary drug delivery technology to improve existing drugs.	Biotech

Table 5.3: Presenting finalists at 2013 Edward L. Kaplan NVC

Firm	Description	Industry Targeted
AEOs	Design, manufacturer, service of solar tracking systems	Solar Enterprise
Arc Mobile	Service enabling restaurant patrons to pay & split bills via mobile devices	Consumer mobile payments
CancerIQ	Enterprise oncology informatics platform supporting cancer centers	Medical data and services
Intelligent Widgets**	Medical devices for Obstructive Sleep Apnea	Medical devices
Khelo	In app purchase based mobile games targeting developing markets	Consumer mobile gaming
Kishr	Hi antioxidant low caffeine beverage made from dried coffee cherries	Consumer beverage
matchist*	Source for software integration developers; partners with tech firms to help customers integrate products and services quickly and easily with APIs	Enterprise Services / Technology Services
Project FixUp	Digital matchmaker fixing up professionals for one-on-one dates	Consumer services
Wit Interactive	Provides virtual interactive programming designed for older adults	Online services
Yella	Cloud based customer experience tool for quick-serve restaurants chains to help them better understand their customers.	Restaurant Software and Service

Source: New Venture Challenge program materials from 2012 and 2013.

*New Venture Challenge Winner

** Global New Venture Challenge Winner

5.4.3 Polsky Center for Entrepreneurship and Innovation

In 1998, just two years after initiating the entrepreneurship program and a year after the first NVC, the Center for Entrepreneurship and Innovation was created at the University of Chicago's Graduate School of Business (Kaplan S, 2011) Additionally, an entrepreneurship concentration was introduced, and Ellen Rudnick (MBA '73) was hired as the Executive Director of the center and a Clinical Faculty member. In 2002, four

years after the center's creation, Michael Polsky (MBA '87) endowed the center with a \$7 million dollar contribution, a contribution he would double in 2012.

The Polsky Center for Entrepreneurship and Innovation boasts impressive statistics when reviewing their annual reports, news coverage and websites. Recent annual reports highlight an array of courses, world class research, and extensive programming.

According to one recent report (2010-11) the Center has four parts to its mission:

- Develop experiential learning programs to complement traditional classroom learning;
- Sponsor and promote cutting-edge research;
- Support students, faculty and alumni who are developing and growing new businesses
- Develop both the local and global entrepreneurial ecosystem. (Polsky Center, 2011a)

It is clear that recent mission is far broader, yet precise, and more aspirational than that which Professor Kaplan, Edward L. Kaplan and Dean Hamada envisioned in their early work and public statements about the program they were planning and building. The early goals being institutionalizing courses and experiential aspects of entrepreneurship as well as private equity education and supporting faculty via chairs and research and programming support (Holyroyd, 1998; S Kaplan, 2011).

In 1998, the year the center was introduced, the school offered 4 courses in entrepreneurship with two additional courses planned. Ten years later, in 2008, 24

courses were being offered and by 2012 there were 27 classes available (Holroyd 1998; Polsky Center 2008; Polsky Center 2012). Staying true to the original goal and current goals of experiential pedagogy for entrepreneurship, Booth offerings include the following courses: *New Venture Lab*, *Private Equity and Venture Capital Lab*, *Social Enterprise Lab*, *Clean Tech Lab*, *New Venture Challenge*, and *Entrepreneurial Internship Seminar* (Polsky Center, 2012).²³ For many of these courses (the ones with the name Lab in the title and others), students are matched with startups, scientists, and senior leaders of corporations and social ventures for the quarter. Each year, hundreds of students engage with hundreds of leading organizations in the experiential coursework (Polsky, 2008; Polsky, 2009; Polsky, 2010; Polsky, 2011a). Further, many of these courses demand students go through a competitive application process before being offered a seat and a laboratory placement.

The expansion of the courses has been important to creating a landscape full of entrepreneurial opportunity that is hands on in a business school that had been oriented to traditional business school careers such as sales and trading, investment banking, and consulting. Moreover, the laboratory courses, including *New Venture Challenge* and the *Entrepreneurial Internship Program* have students performing the functions of entrepreneurs and interacting in real entrepreneurial ecosystems while working on their academic programs.

For example, the *Entrepreneurship Internship Program* provides students with stipends to either work for an entrepreneurial venture or work on their own idea for a

²³ For a full list of the courses and labs that Chicago offers for students interested in studying entrepreneurship visit: <http://www.ChicagoBooth.edu/entrepreneurship/curriculum>

period of time (Weiss, 2011). In the course meetings, which take place after the students' entrepreneurial summer experiences have occurred, the participants come together and share their experience and provide feedback and support to one another as they attempt to build their venture or chart their paths in the entrepreneurial segment of the economy (Weiss, 2011). This builds up the students skillsets and portfolios and also builds their networks and direct sources for information on the new ventures, investing, and related opportunities.

By expanding the courses dramatically and allowing certain courses to fulfill various concentrations, in less than 10 years entrepreneurship has become the second most popular concentration (behind finance) with more than 50% of all students at Booth students earning an entrepreneurship concentration (Polsky, 2008; Kaplan S, 2011). There are currently 14 concentrations at Booth so it is quite dramatic for this new concentration to grab such market share so quickly.

The breadth of entrepreneurship and innovation courses allow for many points of entry for the students to choose to become part of the school's entrepreneurship ecosystem. In addition, the experiential nature of the courses allows students interact with a diverse set of people on campus and off and to gain entrepreneurial experience while they are in school -- serving more like a medical residency or apprenticeship.

With such course offerings, Booth brings over twenty faculty members to its entrepreneurship and innovation coursework. In reviewing the course instructors it is evident that many of the listed instructors are adjuncts or 'Clinical' faculty, underscoring the experiential nature of the programming and field in the eyes of the students and

leaders at the University of Chicago. For example, Groupon Founders Brad Keywell and Eric Lefkowsky, who first hired Andrew Mason (before he attended the Harris School of Public Policy at the University of Chicago), serve as faculty and as noted, their investment firm has a record of investing in University of Chicago startups.

In addition to the NVC and extensive coursework, the Polsky Center coordinates other opportunities and resources for students interested in hands on experiences in entrepreneurship. Booth participates in the Kauffman Entrepreneurial Internship Program, supports students entering off-campus business plan contests, offers multiple student groups that present impressive conferences such as SeedCon: Annual Chicago Booth Entrepreneurship and Venture Capital Conference, the Midwest Energy Forum and Clean Energy Challenge, and the Innovation Showcase (Polsky, 2009; Polsky, 2010, Kaplan S, 2011). Many of these programs are run in concert with related groups such as UChicago Tech and Hyde Park Angels, off campus partners including the Chicagoland Entrepreneurial Center, 1871 (an innovation hub in downtown Chicago), and various investment firms and funds from throughout the U.S. (Weiss, 2011; Polsky, 2012; Polsky, 2013). These outside partners and networks are the subject of the next section.

As mentioned earlier, hundreds of guest speakers, judges, and mentors fill out the notes at the back of the Polsky Center's annual reports (2009, 2010, 2011, 2012, 2013), highlighting a core strength of Chicago's entrepreneurial frontier much just as the notes in a corporate annual report often present secrets not exposed in the bold font and glossy images up front. The ability to bring talented and connected people to entrepreneurship programs, classes and events for the campus community allows student founders to

leverage these diverse people, talent, and networks in building a high growth firm. While many of the speakers and donors are alumni, it is clear that there are many ‘friends’ of the school in the local business, financial, professional services, and entrepreneurial ecosystem that must value the opportunity to engage with Chicago students and faculty members. This direct relationship with the broader community stays true to the ideals that Harper and are congruent with the literature on firm formation processes. It is evident in from the data collected via interviews and observations that it is this talent pool, from a broad range of industries and sectors, that provides serious value to the student entrepreneurs, through the various opportunities available on campus.

The steady barrage of courses, participatory activities, speakers, and networking opportunities combined with connections to the local venture system and the third largest metro economy in the US, presents would be students founders at the University of Chicago with a wealth of choices, assets, and diverse peoples to engage in pursuing entrepreneurship.

5.4.4 UChicago Tech and Intellectual Property

As one of the elite research universities in the US and the world, from Slosson’s time on, the University of Chicago has decades of research experience, been home to 89 Nobel Prize winners, and received billions in funding from federal, corporate, and other sources.²⁴

²⁴ The University of Chicago consistently ranks as a top global university. In 2013-2014 Times Higher Education’s World University rankings (<http://www.timeshighereducation.co.uk/world-university-rankings/>) had the University of Chicago as #9 globally while the QS rankings have placed Chicago at number 8 globally for the past 4 years (<http://www.topuniversities.com/qs-world-university-rankings>). Each of these rankings is based on an index of variables.

Like many other research universities, responding to the Bayh-Dole act, the school set about trying to commercialize its technology in 1987 through a partnership and under the banner of Arch Development Corporation -- a private venture firm developed to commercialize research from the University and also Argonne and Fermi National Laboratories.²⁵ A few years later, aware that venture funding was crucial to success, Arch developed a fund and then in 1995, split into a venture arm (that University of Chicago held a small piece of) and Arch Development Corporation, an organization that was tasked with commercializing university and lab research.²⁶ By including Argonne in the arrangement, ARCH was the first Laboratory-University Partnership under Bayh-Dole and became the principal agent for commercial review of University of Chicago Research and Development efforts (Holl, 1997). It must be noted that the Founder and CEO of ARCH, Steven Lazarus was given a joint appointment as Associate Dean of the Graduate School of Business when ARCH was formed (Holl, 1997; Brandscomb et al, 1999)

In 2001, the University of Chicago reorganized its approach to intellectual property and created the Office of Technology and Intellectual Property, also known as UChicagoTech (UChicagoTech, 2006). According to a 2006 report analyzing the 5 years since taking intellectual property in house from ARCH, UChicagoTech Director Alan Thomas wrote, “The 2001 reorganization was motivated by the insight that an effective capability to develop discoveries with market potential was a not a peripheral activity, but core to the University’s duty to disseminate knowledge to the world and to provide the

²⁵ http://www.rcr.emich.edu/module9/i9_arch.html

²⁶ See Arch Ventures About Us ...http://www.archventure.com/about_facts.html

best possible resources to those of its faculty with inventive and entrepreneurial energies,”(UChicagoTech, 2011, p.1). Additionally, according to Brandscomb et al (1999) Lazarus and others running the fund felt constrained by the university relationship and were compensated as employees of the University rather than as general partners of the firm -- a serious divergent from venture industry compensation models.

While various students (especially graduate researchers and postdoc fellows) play a role in UChicagoTech and its successes, UChicagoTech is a traditional faculty/lab focused tech transfer operation. The model, as highlighted in a whitepaper by the Director of the Office of Technology and Intellectual Property for the University posits that research leads to disclosures, leading to patents, leading to licenses and then eventually to dollars (Thomas, 2007). This model is a traditional model and holds few expectations of students or innovative models that do not depend on patentable intellectual property. That said, UChicagoTech has a record of working across the campus and has counted multiple successes working with Booth Students in the New Venture Challenge. For example, Midway Pharmaceuticals, won the 2005 New Venture Challenge, raised over \$5 million in financing and continues to work on drug development (UChicagoTech, 2011).

The intellectual property arm of the school counts a broad range of success, from the formation of companies using intellectual property in skin and tissue care (Avocent Polymer Technologies) to the production of a math curriculum used by millions of students across the US (UChicagoTech, 2006). According to a recent report, UChicago Tech, since its inception has brought in 109 million in total revenue, started 51

companies, and has paid over \$50 million to faculty, labs, departments, and divisions of the University. In recent years, the University has been bringing in roughly \$8 million per year in revenue from its intellectual property (UChicago Tech, 2011a).

While the University of Chicago can count successes that through its intellectual property arms -- whether ARCH or UChicagoTech -- these have been modest relative to other schools with similar rankings or research dollars (Lederman 2010, 2012). In most ways, the University of Chicago's intellectual property experience is representative of the industry where modest returns and the covering of costs is a challenge for most research universities (Graff et al, 2003). Additionally, high growth student created firms with ties to the school's intellectual property arm are not a regular occurrence on the campus, focus of the venture community, or subject of the business press.

5.4.5 Entrepreneurial Networks

Reminiscent of the early days of the University of Chicago, the growth of Chicago's entrepreneurial program has been connected to the city of Chicago and in the less than 20 years since the Booth committed to the field, the school, the university, its people and its companies have become a regular feature in Chicago's economy.²⁷

In addition to creating pedagogy such as lab courses and the NVC course that connect students directly to entrepreneurs, financiers and firms in the Chicago area, the school has created strong and evolving relationships off of campus.

²⁷ According to the most recent Bureau of Economic Analysis Report (Fall 2013) Chicago continues to be the 3rd largest Metropolitan region in the U.S. behind New York and Los Angeles and ahead of Houston and Washington D.C. GDP by Metropolitan Division. BEA 13-42. 17 September 2013. <http://www.bea.gov/regional/index.htm>

In 2006, Hyde Park Angels, an angel investing group, was formed for investors in the Hyde Park area or with ties to Hyde Park. Staying true to the idea of student focused entrepreneurship and experiential learning, the group was created by Booth Executive MBA students (Weiss, 2011). The managing partner of Hyde Park Angels is Booth Accounting Professor Ira Weiss and the members of the group have invested in multiple Chicago student startups including AllTuition, Power2Switch, and FeeFighters. Hyde Park Angels also works into the curriculum by engaging MBA students to work on due diligence, deal sourcing and other activities related to new venture investing (Weiss 2011).

Overall, the leadership and students at Booth and Polsky Center have an outward facing approach and partner with organizations in and around Chicago regularly in order to achieve opportunities for engagement. Not all programs are home runs or reach the level of impact of the New Venture Challenge with regard to high growth student startups, but they continue to engage people and students from across the school, university, city and globe and bring them into the University of Chicago entrepreneurship and innovation ecosystem. These partnerships across the city and region provide additional opportunities, diverse networks, and access to human, technical, and economic assets for students interested in pursuing entrepreneurial endeavors (Stopper, 2011; Kaplan, 2011; Krall, 2011; Khokar, 2013)

5.5 Student Entrepreneurs on Rockefeller and Harper's Frontier

This section provides mini-cases of high growth student startups created at the University of Chicago in recent years. These serve to highlight how different students

have taken advantage of the diversity, opportunities (liberty), and assets available at the University of Chicago for students interested in entrepreneurship and new venture creations. (Additional University of Chicago high growth student entrepreneurs and firms appear in Chapter 6).

5.5.1 Fee Fighters and matchist

When Joshua Krall entered the Booth School of Business in 2008 he left behind a small media business he had built on the West Coast. Krall explained that he enjoyed the experience of running a business, but came to Chicago's business school in order to work for someone else and leave behind the daily challenges of running his own business (Krall, 2011). Little did Krall know he was going to enter Chicago's entrepreneurial ecosystem and end up launching a new firm with Sean Harper, a fellow student he would meet at Booth.

Fee Fighters, the firm that the two launched, tackled a problem both cofounders had experienced -- being small online retailers trying to get the best deal available on credit card processing fees. The cofounders met during an early New Venture Challenge event where Harper explained what the concept had in mind (Krall, 2011). Over the ensuing months, the two worked together on the business and feasibility study and got to know one another. Krall (2011) described this as a 'dating period' for the two of them and said it was beneficial in seeing if they would work well. The two did and they took their idea through the New Venture Challenge. Krall did mention that at one point in the early days of Fee Fighters there was a third cofounder but that person's 'dating period'

did not work out well and left the team before any equity commitments were made (Krall, 2011).

While Fee Fighters did enroll in the NVC course, the startup was not chosen as a presenting finalist. However, the NVC process and their time at Chicago helped the team and firm network and raise its profile in the Chicagoland venture community. Krall and Harper eventually took an investment from Hyde Park Angels and Sandox Industries (a venture investor in Chicago) and Fee Fighters participated in the 2010 class at startup accelerator Excelebrate Labs -- now Tech Stars Chicago (Krall 2011; Henikoff 2011; Perez 2012). Moreover, in 2012, Fee Fighters was purchased at a profit, by Groupon, the startup created by University of Chicago Harris School of Public Policy graduate Student Andrew Mason and funded by Booth faculty members, entrepreneurs and investors Eric Lefkowsky and Brad Keywell (Harper, 2013; Perez, 2012; Chicago Magazine, 2011).

FeeFighters first employee, Stella Fayam, was a recent graduate of Northwestern University when she went with Josh and Sean. Fast forward to 2013 and Stella is an MBA student at Booth and a presenting finalist the NVC with her startup, matchist. matchist connects computer developers that work with API protocols with businesses needing those specific features developed into their websites and applications.²⁸

In her pitch during the NVC finals in May 2013 Fayman began by explaining that matchist “has facilitated over \$40,000 in development work in just 4 months,” (Fayam, 2013). Later Fayam would explain the diverse backgrounds of the team (4 Booth

²⁸ API's or application programming interface guides the communications between two software systems. For example, Facebook API's allow web publishers to Facebook usernames and passwords as log in credentials for their websites though they are independent of Facebook.

Students and 2 non-Booth members), their mentors, including Troy Henikoff of TechStars Chicago, and the proprietary algorithm her team developed to match developers and clients (Fayman, 2013). The pitch for matchist during the NVC finals made it clear that multiple elements of the startup process (e.g. organization building, development, production and delivery of products, engagement with external parties, expansion and layering of networks) described in the entrepreneurship literature were experienced by Fayman and matchist while at the University of Chicago. matchist won the 2013 NVC and was awarded \$30,000 and multiple in-kind-services.

The experiences of Josh Krall and Sean Harper of FeeFighters and Stella Fayam of matchist highlight many attributes of the ecosystem that the Booth School, the Polsky Center have developed for the University of Chicago and the broader entrepreneurship and innovation ecosystem in and around Chicago. Its evident that both teams and groups of founders were able to choose and engage various assets, populations, and opportunities via the University of Chicago in order to begin building firms.

5.7.2 MouseHouse

After his first two years of medical school at the University of Chicago, Umar Khohkar, in pursuit of his M.D./Ph.D., moved into a diabetes research lab to begin the research side of his degree (Khohkar, 2013). He planned to be a practicing physician that spent time in the labs and he believed many in the University of Chicago medical ecosystem had done just that (Khokhar, 2013). When Umar realized part of his lab work included managing over 200 mice, he couldn't believe the "archaic" tools used to manage and track of lab animals (Khokhar, 2012; Khokhar, 2013). The standard procedure relied

on excel spreadsheets and notecards, with researchers taking notes while with the animals then inputting the information into their computers later (Khokhar, 2012). To Umar, this seemed completely out of step with the advanced nature of the research being done in the laboratory (Khokhar, 2012).

Khokhar, a programmer and tinker at heart, started working to solve this problem, a problem that his lab and thousands of others faced on a daily basis (Khokhar; 2012, 2013). The methods in use were slow, less efficient, and didn't allow researchers to optimize their knowledge on important issues such as breeding, population management, and health management. Khokhar believed retail inventory was managed much more efficiently than lab animals and further that basic, standard methods were keeping lab managers from gaining insights into breeding, a crucial factor in the the long-term success and costs of much of the science reliant on animals and labs (Khokhar 2012, 2013).

Khokhar found two undergraduate students to help him build a database and software system hoping to improve the efficiency of lab work through better breeding and cost savings (Khokhar, 2013). The two undergrads couldn't make a long-term commitment to Khokhar so development slowed, but one day in late 2011, Umar ran into an old friend, Imran Ahmad on the campus of the University of Chicago (Khokhar, 2013).

Ahmad was a first year Booth Student and he and Khokhar knew one another from their days in the Muslim Students Association as undergraduate days at the University of Chicago (Khokhar, 2013; VanderMey, 2013). While Khokhar had gone on to pursue his M.D./Ph.D., Ahmad worked in private equity and launched an IT healthcare

firm he sold to Johns Hopkins University before coming back to the University of Chicago to pursue his M.B.A. (Khokhar, 2013). The two agreed to work together on Khokhar's project and entered the 2012 NVC. Jeegar Shah, a Booth Student, joined the team and over time and through the NVC process and working with the University of Chicago research community and others, the database concept evolved to become an iPad app allowing researchers to collect and input data while in the lab with their animals (Khokhar 2012, 2013).

By the 2012 finals of the NVC, MouseHouse, as the product was called, had paying customers using their app in research labs in the US (Khokhar, 2012; VanderMey, 2013). Mouse House had accelerated quickly through 2011-2012 and ended up winning the the 2012 NVC, taking home the \$30,000 prize and additional in-kind services.

In April of 2013, after further refining their product and working with more customers, Khokhar and Ahmad presented MouseHouse at the 2013 Million Dollar Rice Business Plan Competition hosted by Rice University (VanderMey, 2013). Competing with 42 teams from around the world and using a live mouse in their pitch (something they did not do during the 2012 NVC Finals) the team took sixth place, netting \$3,000 cash. Additionally, MouseHouse received commitments for another \$99,000 in financing from other awards at the event (Hodges 2013; VanderMey 2013; Khokar, 2013).

For founders Khokar and Ahmad, their different by merged academic tracks at the University of Chicago, from meeting in a religious co-curricular student group and doing hands on research in a lab to hiring short-term undergraduate programmers for prototypes

and participating in the NVC, highlight the opportunities, diversity of people and liberties that each faced and exploited in order begin growing Mouse House on campus.

5.6 Conclusions and Analysis

Since the mid-1990s, the University of Chicago, led by its business school, has developed many assets, platforms, and networks that appear to have supported the emergence of high growth student entrepreneurs on campus. In collecting data on the University, its student founders, and their firm formation processes, a number of themes emerged. These themes and potential meanings will be presented in this final section of the chapter.

From the beginning, the building of the entrepreneurship program at the Booth School of Business was focused on students and their actions and demands. This demand that the program be student focused came from the top and was evident in the early, modest goals of a curriculum providing tools and opportunities for student participation (Kaplan S, 2011).

Additionally, as the school's leadership realized that the students were launching firms and interested in broader entrepreneurship offerings, the programming grew faster and in the direction of supporting entrepreneurs on campus. Fortunately for Chicago, multiple alumni wanted to fund such student focused programming and even more wanted to support students with their time and opportunities to engage with their firms through various courses and programs. The expansion of courses and programs (many of which reach non-Booth students and non students) provided access, opportunities, networks with diverse backgrounds and skillsets and resources to those interested in

engaging in entrepreneurship on the University of Chicago's campus. The growth of the NVC to four tracks represents the expansion of students, ventures, and partners exposed to the entrepreneurial opportunities at the University of Chicago.

The student focus, in lieu of research, where many of the Booth's faculty and centers are focused, appears to be central to the regular student creation of high growth firms at the University of Chicago. This student focus, a result of student action and demand and leadership is congruent with Chicago's history and that of success in US higher education more generally.

As was pointed out earlier in this chapter, from its birth and rearing under the leadership of William Rainey Harper, the University of Chicago has reached out to the world around it and the entrepreneurship program at the Booth School began doing this early on. The appointment of Ellen Rudnick, an MBA alumni with a background in innovation, as Co-Director of the Entrepreneurship Center in 1998, was an important action that provided leadership adept at navigating the off campus world, not faculty lounges and senates. Steven Kaplan and Rudnick have been co-directors of the program since her arrival.

As with much of higher education, successful entrepreneurs and business leaders supported the entrepreneurship program with Edward L. Kaplan and Joseph Neubauer taking the lead in the early days just as Rockefeller and other wealthy benefactors stepped in the fund the unknown in the 1890s. The engagement of philanthropists continues as core feature, including Michael Polsky funding the establishment of the entrepreneurship center and John Edwardson, former CEO of Computer Discount Warehouse, supporting

the creation of the social enterprise initiative. All of the major supporters, as Chicago graduates, have had high expectations of the school leadership and the students in putting their support to work (Kaplan E, 2013).

The money from philanthropists has been important to the growing of the entrepreneurship programs at Booth and across campus, but the strength of the program has been its much broader engagement of individuals, institutions and processes off campus in the creation of an open culture with multiple platforms and countless classes to support high growth student entrepreneurs on campus. For example, because the NVC has engaged the broader Chicago community in team building, mentoring/coaching, judging, and prizes/in-kind-benefits throughout the entire year-long competition, the value created for the student participants grows exponentially greater than what the school could provide on its own and increases the likelihood of high growth firms emerging at the end of the NVC or later. Professor Steven Kaplan admitted that the coach and mentor matching portion of the process took many years to get right, but are a key part of the success of University of Chicago's entrepreneurship program and entrepreneurs (Kaplan S, 2011; Kaplan S, 2013). Recent results highlight that the school's ability to engage the outside world of campus, to connect those assets to campus – from entrepreneurship faculty such as Keywell and Lefkowsky to institutions such as 1871 and Techstars Chicago -- entrepreneurial connections to the broader world have stayed true to the tradition of Harper, but more importantly have brought great assets and diverse people to campus to work with student entrepreneurs.

As the early leaders and funders of the entrepreneurship program at the University of Chicago realized the demand for offerings and the interest in creating high growth firms was greater than expected, they responded by growing the programs, courses, and people engaged. By dramatically expanding course work, bringing in more faculty, coaches and mentors, adding tracks to the NVC, partnering with other schools and regional institutions, and producing more events, Chicago began meeting its students needs and creating many points of entry to its entrepreneurial ecosystem. With already very high standards for entry, the University of Chicago ecosystem began casting a wider net to pull in. With course, clubs, laboratories, extensive NVC programs and off-campus opportunities, the likelihood of high growth student entrepreneurs emerging became more likely. The most central and recurring pathway to high growth on campus is the New Venture Challenge. While not all high growth firms out of Chicago have participated (Groupon is a notable example), many entrepreneurs have chosen to participate in the program and process. It is impossible, as Gartner (1985) warned, to know what part of a firm's success can be attributed to the process, but it is clear that many founders at the University of Chicago (including undergraduates) have chosen to participate in the NVC and make it part of their firm formation process.

With a process available, support and connections off campus, and a student focus, the University of Chicago has developed many entrepreneurship assets for students. And though Chicago has a rich history of excellence the University of Chicago does not have a school of engineering.

The lack of an engineering school is a crucial point to note as conventional wisdom and many studies and policy papers claim that engineering schools are the key movers and shakers in entrepreneurship on US campuses in the entrepreneurial economy. From Bush's *Endless Frontier* (1945) and Saxenian's writings (1990, 1996) to Roberts and Eesely (2009) on MIT and Etzkowitz triple helix, engineering and laboratory science is often presented as the key to developing high growth startups on university campus in the form of spin-offs. University leaders, policy makers, philanthropists and others hear that conventional wisdom, construct a mental image of Google, Microsoft, Genentech, and others and then attempt to build an engineering driven model like Stanford and MIT.

The University of Chicago has not attempted this approach. Its high growth firms and university leaders have supported the students in an agnostic way, offering experiential learning and engagement with the world outside of the campus regardless of field of study or industry being entered.

The case presented in this chapter makes it clear that the leadership of Chicago's entrepreneurship program never had a model of another school in mind, let alone one dominated by engineering students, faculty, or research labs. The immediate connection to and guidance from the world outside of campus harkens back to the early ideas and actions of Charles Rainey Harper. While the business school has an extensive tradition of engaging the world through employment and world class research, the entrepreneurship program appears to have unleashed students directly into the world off campus in a bid to provide them with entrepreneurial opportunities and choices, useful and readily available resources, and access to a diverse group of talented people. The

structures around those attributes have grown and evolved in many directions, something that Turner did not think possible as he watched the industrial era begin, but at their core, offer the three basic Turnerian frontier attributes.

The high growth founders and firms from Chicago included in the database, the interviews with faculty, staff, students, alumni, and investors, and the ethnographic observations of Chicago entrepreneurial events and sites offer data that support the notion that the University of Chicago presents frontier like attributes of liberty (opportunity/choice), assets, and diversity that student entrepreneurs have used in building high growth firms. While each founder and firm uncovered in the data from the University of Chicago experienced the school in a unique way, it is clear that the landscape emanating from the Booth School of Business has many elements that can be combined by teams and entrepreneurs into a process. It is also clear a mindset or culture around entrepreneurship has emerged (evidenced by the growing number of students choosing the concentration and experiential opportunities), just as Turner often viewed the frontier as something qualitative rather than quantitative. However, in complete contrast to Turner's closed frontier, the campus frontier can expand without the wide open spaces that Turner's Frontier Thesis demanded.

CHAPTER 6: PATHWAYS TO SUCCESS: 5 ARCHETYPES OF HIGH GROWTH STUDENT ENTREPRENEURS

6.1 Introduction

In collecting, organizing and analyzing the data for constructing the database and the case study on the University of Chicago, various themes emerged around high impact student entrepreneurs, their firms, and universities, including common pathways or campus experiences through the opportunity identification and firm formation process. For example, the theme of family business and parent's work experience was heard often as founders described the opportunity identification process their firm followed. This theme was repeated during pitch events, in document and media analysis, and during unstructured interviews.

These campus pathways were not an initial goal of the research, but emerged during data collection and analysis. Attempts to capture career decisions of students, such as Stanford's NSF funded Academic Pathways Study are typically longitudinal and intentional in design study using surveys and interviews focused on career decisions and self-efficacy (Winters et al, 2011; Carrico et al, 2012). The Academic Pathways Study focused on changing goals for students post campus, often alternating between entering the workforce or continuing with education (Carrico et al, 2012). The pathways suggested below are 'real time' for the students in the data as their entrepreneurial careers are in process while on campus.

Various paths will be presented, with an attempt, however rudimentary to name and define each. For each campus pathway suggested, supporting examples from the data collected will be presented. It should be noted that this is not a personality or traits based approach towards understanding entrepreneurs.

The paths offered have been uncovered based on the behavior and choices of entrepreneur(s) on campus as they identified opportunities and began the firm formation process. For a vast majority of the high growth student startups, their greatest growth and acceleration came when they left campus. However, these firms were birthed on campus and the crucial early stages of the startup process, including team formation and opportunity identification, the iterative business model development process, the creation and set-up of production, and for many, actual revenue generation, occurred on the campus (Gartner 1985, 1988; Bhav, 1994; Bhide, 2000).

The pathways, when viewed with basic frameworks from social psychology, “the scientific study of the personal and situational factors that affect individual social behavior,” (Shaver, 1989, p.18), provide insights into the various impacts the campus can have on students. These pathways investigate and present simple examples of the influence that campus assets, liberty and diversity have on students and teams of students exploring entrepreneurship on campus.

Kreider (1958) argues that behaviors is a simple function of a person and their environment. In each of the pathways presented, this simple function can be observed, though the relative impact of the person and the campus (environment) on the emergence of a high growth firm varies greatly. No attempt to quantify or measure the two parts of

Kreider's function have been made in this research, though semi-structured and unstructured interviews with founders included questions related to plans upon arrival on campus, changes in perceptions, and interactions with professors, curriculum, and other students. For example, the three founders of G3Box, a social venture that converts shipping containers into medical clinics for women and delivers them to developing countries, all discussed the importance of their experiential coursework and faculty in the firm formation process (Palermo, 2012; Tyler, 2012; Walters, 2012). Additionally, documents and media assets often offered data into the pathways.

Also worth noting in the five pathways presented are the changes in self-perception and attitude that occurs for various student entrepreneurs as they experience the opportunity identification and/or firm formation process. The theory of *total planned behavior* posits that intentions combined with social pressures and norms will determine an individual's behavior in given situations (Ajzen, 1991, 1996). As the pathway discussion will suggest, the campus environment, including structures and norms, have some role in students' creation of high growth firms.

Additionally the norms and social environment of campus appear to impact the self-conception of some of the entrepreneurs in the data collected and presented in this chapter. Again, no attempt has been made to quantify or measure this impact, but social psychologist have pointed to various impacts the social environments will have on an individual's self-perception, including potential different selves (eg material, spiritual) (Shaver, 2010). The pathways suggest that the campus environment does alter

perceptions of self among student entrepreneurs just as it did among those venturing to the frontier (Turner, 1896).

6.2 Campus Pathways

In this chapter, 5 common campus paths traveled by high growth student entrepreneurs will be offered. Each path has a rudimentary description and examples of the students, firms, and university that fit within the observed theme. No attempt has been made to classify all of the entrepreneurs in the database or all engaged during interviews and field work. The data included in the database is not comprehensive enough to know major details of the earliest stages of all of the startups included in the database. The qualitative portion of this work did provide a great amount of data on the earliest days of select high growth student startups and is included in some the pathways described. The qualitative data collection techniques, as described earlier, included interviews, participant observation and site visits, and document and multimedia analysis. These sources provided details on the actions and behaviors of student founders as they identified opportunities and began the firm formation process on campus. The remainder of this chapter will suggest 5 pathways that students appear to travel on campus to high growth, impactful firms.

6.2.1 Big Man on Campus (BMOC)

From teaching assistants and resident advisors in dorms to student government leadership and athletic teams, the first path students travel to high growth entrepreneurship is the *Big Man on Campus (BMOC)*. This person has their mind, time, and networks spread across campus and while their new high growth startup has brought

them into this research, their activities span multiple segments of campus life and most could just as easily achieve campus notoriety through non-entrepreneurial endeavors.

The BMOC is outward facing and has the ability to connect, bring together and persuade others to work with and support their vision of the future. They use their multiple roles on campus and off to learn leadership and budgeting skills and source resources, people, customers and partners for their startup (Weinblatt, 2011).

The Big Man on Campus (BMOC) has been a stereotype of US colleges and universities for quite some time and took on great cultural significance in the early 20th century when the idea of higher education and many of the activities there began to capture the public's imagination (Rudolph, 1990; Thelin, 2004). The rise of college football at the turn of the century made celebrities of college athletes, but broadened the experience with bands, cheerleaders and homecoming pageantry. As was pointed out in the University of Chicago case study, college football was a national pastime at the turn of the century and brought many Americans into contact with college life for the first time. This created a cultural ideal of the engaged BMOC, whether a football star or editor of the newspaper.

While it was not until the early 20th century that college life captured the public's attention, US institutions of higher education would provide freedom to achieve in the classroom and well beyond (Rudolph 1990; Thelin 2004, Kamenetz 2010). A classic example of the Big Man On Campus during the first half of the 20th century would be Byron White, a poor farm boy that became an All-American football player in the 1930s at the University of Colorado, before becoming a Rhodes scholar, a top professional

football player, a decorated WWII soldier, a lawyer and eventually a US Supreme Court Justice (Thelin, 2004). While it would take until the mid-twentieth century for the masses to attend higher education, campus institutions such fraternities, literary societies, secret societies, student government and athletics have deep roots and continue to this day to provide opportunities for students to move ahead in an egalitarian way (Horowitz, 1988). This fluid culture, similar to the frontier, allows for new members of the campus community to engage across a diverse range of activities or create their own (Thelin, 2004).

In modern research universities or multiversities (Kerr, 2001), such as the ones that make up a vast majority of the host institutions for the high growth student startups in the study, the opportunities for student participation are diverse and continue to grow based on evolving student demand and interests. As relayed earlier, many of the programs, events, and classes that make up the University of Chicago's entrepreneurship ecosystem were created by students, are managed and led by students or were offered in response to student demand. This student leadership was observed at additional campuses visited and communicated in multiple interviews. As a reminder, the first business plan competitions were student created and managed activities at Babson University and the University of Texas (Cadenhead, 2002).

Micha Weinblatt, Founder and CEO of Crooked Monkey, a t-shirt design and marketing firm, was a BMOC at the University of Maryland when he and some friends decided to launch their company. Micha was a fourth year student at the University of Maryland in 2004 when he conceived of a launched Crooked Monkey (Weinblatt, 2011).

He was taking graduate level courses as he was participating in a five year BA/MPP degree program and Crooked Monkey began as a website focusing on college humor. T-shirt sales and a parties at local bars were offered in order to fund the website, but within a few months it was clear that the humorous t-shirts were the real business (Weinblatt, 2011). Spurred on by good t-shirts, Micha decided to pursue Crooked Monkey full-time and leave behind his original goal of earning an MPP degree (Weinblatt, 2011).

In describing how his firm was able to reach profitability and scale so quickly (Crooked Monkey generated \$160,000 in revenue in 2006, its first full year of operations). Weinblatt explained that his participation in multiple extracurricular activities on campus provided him with extensive skillsets – from budgeting, fundraising and leadership to marketing and creativity. According to Weinblatt (2011) his “business acumen” was built up at such a fast pace through his leadership roles in student government and at the University’s Hillel that he dropped his major in business after taking just 3 courses at the Smith School of Business. It is interesting to note that while Weinblatt did not stay in the Smith School of Business, he continued to work with the school’s entrepreneurship center, participating in the Cupid’s Cup Business Competition multiple times and developing important relationships with the director of the center and with alumni, Under Armour founder, and business competition funder Kevin Plank (Weinblatt, 2011). In described his able to scale and expand distribution, Weinblatt (2011) pointed to the industry specific mentorship and connection to Kevin Plank with saving his firm from making costly mistakes during their growth. Its interesting to note

that what started as an information industry business evolved into more traditional manufacturing and retail.

Ryan Durkin, founder of DailyBreak (previously known as CampusLive.com) arrived at the University of Massachusetts Amherst as a student-athlete on a four-year scholarship in the sport of Track & Field. In his four years on campus, Durkin won more than 10 awards and scholarships across a range of activities (Durkin, 2013). Durkin won awards and funding from the Honors Program, the UMass Athletic Department, the Isenberg School of Management, and the university itself. His awards were based on his leadership skills on the field and off, his work in finance, his challenging honors course load, and his ‘exemplary motivation to succeed.’ Moreover, Durkin, who graduated in 2008, was the Captain of both the UMass Cross Country and Track and Field Teams and was named to the Atlantic-10 Academic All-Conference Cross Country and Track and Field Teams (Durkin, 2013).

While engaged and leading on the field and in the classroom, Durkin worked with two other students to launch Dailybreak Media, a social engagement platform targeting students and focused on the delivery of promotions, contests and interactive experiences (Crunchbase, 2012). Since its founding Dailybreak raised \$10.5 million in venture capital from leading firms such as Highland Capital Partners, Charles River Partners, and Global Silicon Valley Capital (Crunchbase, 2012). It worth noting that Boris Revslin, one of Durkin’s co-founders dropped out of UMass-Amherst, while Durkin and their third co-founder, Jared Stenquist completed their undergraduate degrees (Rosenberg, 2011; Durkin, 2013).

The database included in this research and the qualitative data offer multiple additional examples, including music major and wordpress founder Mullenweg, of high growth founders that took their participation in campus life in an entrepreneurial direction.

While today's BMOC may not have the broad shoulders of the early football greats, the opportunities, resources, and diverse choices in collegiate life continue to provide opportunities for students to explore their interests and distinguish themselves. The rise of entrepreneurship programs on campus along with the rise of the entrepreneurial economy appears have provided a path towards network building and skill development supporting high growth entrepreneurship.

6.2.2 Born Hustler

In exploring the social phenomena of high growth firms created by students, a path best described as the *Born Hustler* began to emerge. This person sees opportunity virtually everywhere they turn, but are discerning in which they choose to pursue. They know there are multiple routes to the same destination and because of that they typically create their own rather than following the tried and true path laid out for them. The Born Hustler pathway is a new way for students to make their way across a campus.

While Sam Zell, CEO of multiple publicly traded real estate firms and with a networth of \$4.3 billion, didn't earn the nickname the Grave Dancer (based his ability to create value out of the skeletons of other investor's failed deals)²⁹ until the mid-70s, he arrived at the University of Michigan in the early 1960s with his eyes wide open. He

²⁹ Brennan, Morgan: The Investment Zen of Sam Zell: Bloomberg.

wouldn't start out in real estate in Ann Arbor, but by the time he left campus 7 years later (Zell earned a law degree as well as his BA), Zell and his partner/fraternity brother, Bob Lurie had nearly 7,000 residential units of real estate under management and owned at least 10 rental properties (Zell, 2011).

While classes didn't hold his interest, from the moment Zell arrived in Ann Arbor he was selling "stuff" to students and organizations across campus (Zell, 2011). He started by selling party favors to fraternity and other campus organizations, Zell (2011) explained, "I created a business to provide party favors for fraternity and sorority proms. And so I sold stuff animals, and lighters, and all kinds of crap."

Business pursuits kept Zell active from the start and during his sophomore year Zell, came across an opportunity that would lead him become one of the wealthiest men in the world. While serving on the planning committee for his fraternity sophomore show, Zell visited with the chairman of the committee and learned that the property the chairman lived in and the one next to it were going to be knocked down and a new 15 unit apartment building was going to be built (Zell, 2011). In recounting his reaction to hearing about the new apartment complex, Zell (2011) stated, "I told my friend, 'Gee. We're students, we know more about what students want than anybody else, why don't we go pitch him and we'll manage the building for him.' And that's what we did and that started our property management company."

By time Zell graduated from the University of Michigan Law School his firm was established as a leading property management firm in Southeastern Michigan and had already begun buying and rehabbing property in and around Ann Arbor to rent to the

student market (Zell, 2011). In looking back over his early years Zell explained (2011), “I believed what I was doing was nothing more than common sense. I bought a 3 unit, threw out furniture, painted and then doubled rent. My business is the only thing that kept my sanity while going through law school – very boring, but beneficial.”

Like Sam Zell at the University of Michigan, Bryan Johnson, arrived at the University of Chicago Booth School with a history of spotting opportunities. As an undergraduate at Brigham Young University Johnson paid his tuition by setting up a distribution channels for a local mobile phone provider (Johnson, 2011). Johnson employed fellow students for distribution at a time (late 1990s) when cellular technology was growing rapidly and undertook the business as Johnson knew he could not control his debt levels by working a normal student wage job (Johnson, 2011). While still at BYU Johnson later raised angel funding and started a voice over IP (VOIP) company, but it crashed after the events of 9/11, next tried his hand in real estate development while at BYU, eventually getting out because he real estate to move too slow (Johnson, 2011). After leaving real estate, Johnson took a job selling credit card processing services to retailers and others and quickly became the number one sales person at the firm.

Looking for more, Johnson moved to Chicago in 2005 to attend the University of Chicago’s business school (Johnson, 2011). In explaining why he wanted to come to Booth when he found BYU and coursework too slow Johnson explained, “The real reason is I read a book by Gary Becker called Economics of Life back in 2003. He just framed the world out in terms of economics and supply and demand. That you could explain life in terms of economics. He was the predecessor to the *Freakonomics* guys.

When I found out he was a professor there, I decided I needed to move to Chicago and go to Booth,” (Kravitz, 2010 p.4).

In coming to Chicago Johnson gave up on the processing work he was doing in Utah and took a strategy position with Chicago based retailer Sears as it was trying to recreate itself under CEO Eddie Lambert (Johnson, 2011; Kravitz, 2010). Johnson quickly realized that he “would rather be poor and hungry than work at a big company” and that he, “wanted the freedom to create and do as I saw best,” (Johnson, 2011).

Johnson reached out to his previous processing clients in Utah to see if they’d come back to him if he launched his own firm, they agreed and Johnson knew immediately he could bring in more than enough to cover his expenses and continue at Booth. This new credit card processing firm was Braintree Financial.

While Braintree did not focus on tech firms initially, one of its early clients, Opentable (an online restaurant reservation service) needed custom work done and Braintree agreed to complete it (Johnson, 2011). Johnson realized that other tech firms would need similar products and services and there was no firm delivering an end-to-end solution for high-tech companies (Kravitz, 2010). This led to Braintree creating its own payment system that was far more advanced than the decades old systems in use. From there, leading high tech firms were lining up to work with Braintree Financial (Kravitz, 2010).

In 2007, Johnson and Braintree Financial won the New Venture Challenge. His firm was profitable and had been bootstrapped and in fact did not need the \$25,000 that was part of the first place prize (Johnson, 2011). It would not be until 2011, more than

four years after winning NVC, that Braintree would take in a \$34 million dollar investment in order to scale. One year later, the firm would take in another \$35 million and in Fall 2013, Braintree was acquired by eBay's PayPal unit for \$800 million in cash (Financial Times, 2013). It is important to note that a cash sale is not common (more often than not the acquirer's stock is a major part of the transaction) and underscores the strength of the business that Johnson built while studying at the University of Chicago.

Johnson's path from selling cell phones as a freshman at BYU to coming to Booth to work with Gary Becker and then launching Braintree is defined by hustle and the ability to spot and exploit large opportunities and put the right people (employees, partners, and customers) in place.

The *Born Hustler*, like the *BMOC*, could choose from countless arena's on campus to spend their time and resources. Both Zell and Johnson found coursework too slow and the work on their business activities more engaging (Zell, 2011; Johnson, 2011). When queried as to why he stuck around Ann Arbor to complete a JD if he found coursework slow and boring, Zell explained that he always finishes what he starts and that not a day has passed that he hasn't use his legal education (Zell, 2011).

Additionally, consistent with historic themes in US higher education history and the case of the University of Chicago's entrepreneurial ecosystem, Zell has donated millions to the University of Michigan, investing his wealth across the campus. From the Samuel Zell and Robert H. Lurie Institute for Entrepreneurial Studies at the Ross School of Business (founded in 1999 with a \$10 million commitment; an additional \$60 was given by Zell in 2015) and the Zell Entrepreneurship and Law Program (endowed with \$5

million in 2011) to the Robert H. Lurie Engineering Center (\$12 million in 1993), the real estate firm begun in Ann Arbor by undergrads has now extended opportunity and entrepreneurial choice to another generation of students. According to the Zell Lurie Institute website, Lurie's widow Ann Lurie, recently committed \$25 million to build the Ann and Robert H. Lurie Biomedical Engineering Building and the Robert H. Lurie Nanofabrication Facility at the University of Chicago.³⁰ Lurie was an engineering student at the University of Michigan when he attended and began working with Zell.

The Born Hustler pathway is represented throughout the data in this research, with such notable entrepreneurs as Under Armour's Kevin Plank, he sold roses at the University of Maryland for three years before focusing in on athletic apparel, and Underground Printing founders Rishi Narayan and Ryan Gregg, whose first business on campus was building dorm room lofts (Plank, 2012; Briggs, 2010). While some of the entrepreneurs that travel this pathway make use of specific academic structures and offerings, their opportunity recognition skills appear to scan the entire campus innovation and impact. The Born Hustlers observed seem to live by the old frontier, gold rush maxim that to get rich one has to forget gold and "mine the miners."

6.2.3 Wunderkind

Perhaps the most familiar pathway of high growth student entrepreneurs is the Wunderkind on campus. This wunderkind is likely interested in the engineering, the

³⁰ The Zell-Lurie Institute website offers an extensive biography of Ann Lurie and her role as a philanthropist since Robert H. Lurie's passing in 1990. In addition to the philanthropic support mentioned in the text above, Ann Lurie has supported nursing at the University of Michigan, arts and culture throughout Chicagoland, endowed multiple chairs and fellowships and pledged \$100 million for the construction of the Ann and Robert H. Lurie Children's Hospital in Chicago.
http://www.zli.bus.umich.edu/meet_zell_lurie/bios_lurie.asp

sciences or computers and is often, but not always, a prized pupil that elite schools have gone out of their way to attract – like top student athletes. In recent years, many of these *Wunderkind* have been earning money with their skills before coming to campus, been offered jobs by high powered firms and government agencies, and many consider not attending college.

Popular media have lionized *Wunderkind* entrepreneurs such as Michael Dell, Mark Zuckerberg, Bill Gates, and Paul Allen and movies such as *Pirates of Silicon Valley*, *Revenge of the Nerds* and *The Social Network* have created a caricature of this pathway as one riddled with socially awkward, but brilliant, witty, and often revenge fueled entrepreneurs.

When Bill Gates arrived in Cambridge, MA to attend Harvard University in 1970, his programming work was known as he had written a traffic counting program in high school and sold it and had scored a 1590 on his SATs. As a sophomore, Gates created an algorithm for an unsolved problem in his mathematics class that would be formalized in a paper by a Harvard computer scientist and whose speed and effectiveness in solving the problem would not be beaten for more than 30 years (Kestenbaum, 2008). Gates, with the help fellow *Wunderkind* and childhood friend Paul Allen, would work from Harvard and employ Gates' classmates to develop their earliest versions of DOS computer language (Allen, 2011). This of course would lead to Microsoft, dropping out and a move to New Mexico. Eventually Gates, Allen and Microsoft would return to Seattle, the hometown of Gates and Allen.

Similar to Gates at Harvard University, Brian Ruby entered Columbia University in New York City with a passion that he has discovered years earlier while working as an intern at IBM (Leiber, 2009). At the age of 15, Ruby's fascination with nano carbons would lead to him winning science fairs and an internship in the pharmaceutical industry working on an HIV vaccine (Armstrong, 2011). It was during this time that Ruby began wondering capturing images of small things, such as the HIV virus, and he carried this quest with him to Columbia where he discovered an approach to the problem and launched his company, Carbon Nanoprobes during his sophomore year (Leiber, 2009).

Ruby raised millions for his company, finished his degree, participated in business contests, and even used University of Washington Seattle facilities in developing his advanced nanotechnology imaging science and product line (Cooper, 2009). In describing his work at the University of Washington Seattle facilities in an interview Ruby stated, "We've been able to stay at the cutting technological edge. Without entrance to the state- and-university subsidized facilities, we'd have no way of doing that," (Cooper, 2009).

Ruby with his science, patents, and vision was able to garner substantial financial and institutional support in a short period of time in an attempt to do something never done before. In the end, Carbon Nanoprobes failed and declared bankruptcy in late 2010, less than a 18 months after taking a large equity investment from a Pennsylvania based fund and moving into a tobacco settlement funded biotech facility for university and medical center based researchers and technologies (Armstrong, 2011; Life Sciences Greenhouse of PA, 2014).

Avenues for excellence and impact, such as graduate school, government services, corporate employment and beyond, have always existed for *Wunderkind*, the entrepreneurial pathway that Ruby, Gates, and others (eg Sean Parker of Napster, Marc Andreessen of Netscape) have taken highlight that a research campus filled with diverse people, opportunities, and available resources provides some *Wunderkind* the freedom to choose high growth entrepreneurship.

6.2.4 Class Project Gone Good

Great teachers, academic leaders, and the growth of experiential programs provide learning opportunities that give students a taste of the world outside of the classroom; an opportunity to sample from reality while learning. As covered in the University of Chicago case, affirmed by the literature on entrepreneurship and validated by other data collected, experiential learning opportunities a regular activity of high growth student entrepreneurs. The *Class Project Gone Good* is another pathway that emerged from the data collected in answering the research problem and question.

Jake Crampton, a 1998 graduate of Chicago's Booth School of Business, won the New Venture Challenge that year with his startup, a health care transportation solutions provider. Crampton had built and sold a company before coming to Chicago and he had no intentions of following an entrepreneurial path when he arrived on campus, in fact, Jake completed a traditional consulting internship with Bain and Company between his first and second year. Crampton then took New Venture Strategy with Professor James Shrager and everything changed, "The term project my group developed for it was MedSpeed. Professor Schrager said, 'This looks like it might be something real. I think

you guys need to enter this into the New Venture Challenge.’ And off we went” (Houlihan 2006, p. 23).

“MedSpeed began as an idea in Professor Schrager’s New Venture Strategy course. My team and I saw a void in health care – the absence of industry-focused transportation – and decided we could turn that opportunity into a business. The NVC is a program that bridges the gap between the academic and real worlds. It helped us develop a business plan, and gave us confidence in our business and access to funding. In short, MedSpeed would not be where it is if it weren’t for the NVC” (Polsky Center 2010, p. 27).

After the NVC, Crampton went out to raise money for his firm and in the end most of the funding for MedSpeed came from alumni of the school (Russell, 2000). According to Crampton (Houlihan, 2006, p.23), his NVC experience and its judges prepared him for fundraising, “The process of going through the ringer got us ready to go out there. It gave me the confidence to say, ‘This is worth a million dollars of your money.’ That’s a big deal,” said Crampton. In June of 1999 MedSpeed closed its financing round and began business providing courier services to diagnostic labs in Chicago. Medspeed has achieved nationwide coverage, employs 300 people and earns nearly \$30 million a year in revenue (Dunn and Bradstreet, 2014). The pull of the University of Chicago entrepreneurial ecosystem, with its courses and students, supportive talent and rigorous NVC process, derailed Crampton’s plans for a career in consulting and an opportunity in high growth entrepreneurship arrived.

A graduate student like Crampton, Nanda Gauri, studied at the MIT Media Lab and was working her way through her degree program when curriculum pushed her onto the *Class Project Gone Good* path to high growth entrepreneurship.

Gauri's parents' were entrepreneurs and she was wary of their long work hours and chose to pursue a Master's degree in order get a good job with reasonable hours (Chafkin, 2007). In 2004, Gauri was enrolled in an industrial design class and needed to come up with a project when she settled on an alarm clock that would run away when the alarm went off – forcing the user to get out of bed to turn it off. The clock was cute and funny and worked, relying on wheels and stabilizers to jump of a night stand and move around the room, hiding from its groggy owner (Nobel, 2011).

After the class ended, Gauri threw the clock in the back of her closet and got on with her studies (Chafkin, 2007). A short time later, some bloggers saw photos and descriptions of the device on an MIT website and by early 2005, Gauri's phone began to ring as members of the press and public wanted to know more about her runaway clock. She quickly fixed the bugs in her prototype and showed the world her shag carpet covered Clocky on *Good Morning America*. An image of a recent version of Clocky is in Appendix A.7.

After graduating in 2005, Nanda used the Chinese business to business website Alibaba.com to find production partners in China and the first run of 500 sold out immediately (Chafkin, 2007). Gauri initially raised \$80,000 from her family to fund the company and her high growth company, Nanda Home, was on its way to bringing in revenue of \$2.2 million by 2007 (Ofek, 2011). The challenge for Gauri became, and

continues to be, how to continue to grow beyond the one product that she developed in her industrial design class. Nanda Home continues to sell the Clocky, and also offers Tocky, a runaway alarm clock without wheels.

Like millions of other students heading to campus each year, Crampton and Gauri chose their schools in order to further their careers. In both cases and others in this research, including social venture Teach For America and footwear giant Nike, a class assignment altered their life plans and high growth firms were created (Krentzman, 1997; Tan, 2001). Class projects, often not entrepreneurship or business related, bring the student through important phases of the firm formation process such as prototyping and sharing the concept with ‘outsiders,’ and appear to pathway in the creation of high growth student ventures.

6.2.5 Daddy’s IP

Going into the family business is an old path for college graduates and others, but high growth student entrepreneurs have put a new spin on this old strategy. This pathway of the high growth campus entrepreneurship involves the student employing their parents’ intellectual property or assets and reconfiguring them while on campus to create an innovative, new a high growth startup. The mixing of familial intellectual property and campus resources is a theme that emerged in the data compiled in this research.

The Dingman Center for Entrepreneurship at the Smith School of Business at the University of Maryland College Park has put on the Cupid’s Cup Business Competition since 2006. The competition is named after the rose delivery business that Kevin Plank, Under Armour founder, used to run each Valentine’s Day while a student athlete at

Maryland (Plank, 2012; Thomas, 2010). As a student athlete Plank was not allowed to have a job. As a hybrid *Born Hustler* and *Big Man on Campus* (he was a walk on football player that rose to become a captain), Plank created his rose delivery service and then as he headed towards graduation he began working on Under Armour with the funds from his rose delivery service (Plank, 2012; Thomas, 2010).

Plank continually gives back the UMD, including mentoring young entrepreneurs (such as Micha Weinblatt) and sponsoring various activities and programs, including the Cupid Cup, which is now national and hosts one of its rounds at the Under Armour headquarters in Baltimore. Dingman differs from many entrepreneurship competitions in that it demands that entrants have revenue at the time of the competition, as opposed to just a business plan.³¹

The winner of the 2011 Cupid's Cup Business Competition was MyFridgeRental.com, a dorm room appliance rental firm founded by twin brothers Eric VanWagner and Adam VanWagner. The VanWagners grew up in Maryland not far from UMD and their family was in the general rental and appliance rental business as they grew up (VanWagner, 2014).

Adam entered UMD as a freshman in 2010 and participated in the Hinman CEOs program, a living-learning entrepreneurship program for first and second year students at UMD run by the Maryland Technology Enterprise Institute (MTECH), part of UMD's A. James Clark School of Engineering. Eric VanWagner was planning to be a teacher when

³¹ The Cupid's Cup finals hosts more audience members than the NVC at the University of Chicago, but has fewer finalists and the time allotted for presentations and question and answer from the judges is a lot shorter.

he entered college, starting his education at Montgomery College in Maryland and helping out with his family's rental firm (VanWagner, 2014). In 2010, after seeing the potential of the appliance rental segment of his family's firm, King Rentals, Eric transferred to the Smith School of Business to major in marketing (VanWagner, 2014).

Eric and Adam spent hours thinking about their family's time in the rental business and made use of Hinman resources and their courses in order to find opportunities for growth in the rental industry, with a specific focus on the potential of college campuses. While King Rentals had rented refrigerators to students in the past, it had limited infrastructure specific to the segment and students received their refrigerators from the back of a truck in a parking lot (VanWagner, 2014). The VanWagners had something more focused and innovative in mind for the campus market and in 2010 launched MyFridgeRental.com with the goal of improving convenience, product, and maintenance opportunities (VanWagner, 2011).

The VanWagner twins made use of their industry relationships and knowledge in order to source used refrigerators and set out to form strong relationships with colleges and universities in Maryland so that the service would be marketed to students directly via university channels such as welcome weekends, housing forms and materials, and new student orientations (VanWagner, 2011). By partnering with the schools, MyFridgeRental.com offers a more convenient option for students by delivering the appliance before move and taking the hassle of purchasing, transporting, and carrying the unit up stairs to the dorm room (VanWagner, 2011). For the universities, the partnership with MyFridgeRental.com is an improvement over the existing options as there is a

revenue share for participating schools and the units are 30% more energy efficient than the standard mini-fridge, ‘greening the dorm’ and saving money for the housing department (VanWagner, 2011, 2014). Lastly, according to MyFridgeRental.com units are safer as they are microwave/refrigerator combos, thus lowering fire hazards when compared to students plugging separate appliances in in their dorm rooms (VanWagner, 2011).

In 2010, its first year of operations, MyFridgeRental.com, brought in \$373,000 in revenue with a profit of more than \$100,000 (VanWagner, 2011). Since that time the firm has grown every year, adding more campuses and new products and features for both end users and university partners (VanWagner, 2014). According to Eric (2014), starting up while taking classes was a benefit as it allowed the brothers to immediately apply new materials and tools to their new venture and it put the founders close to the customers – both the universities and the students – allowing them to better tailor offerings and communications.

Beyond classes, customer engagement, and student labor, the VanWagners also made direct use of entrepreneurship structures and assets at UMD. As previously mentioned, Adam VanWagner participated in the Hinman CEOs entrepreneurship program. The twins also participated in *Pitch Dingman*, a small pitch series that the Dingman Center offers that allows student entrepreneurs to present during the school year with small cash prizes granted and outside judges from the local venture community. While MyFridgeRental.com did not win any prizes at the Pitch Dingman event, the feedback they received forced them to adjust their focus when presenting their business

(VanWagner, 2014). The changes recommended during Pitch Dingman were effective and the following year, 2011, MyFridgeRental.com went on to win the \$15,000 grand prize at Cupid's Cup. While the prize money was helpful for the self-funded company, Eric VanWagner explained that one of the biggest benefits of winning Cupid's Cup was the relationship the company formed with BB&T Bank, one of the sponsors of the event (VanWagner, 2014). Since the event, MyFridgeRental.com and BB&T, have formed a banking relationship and the regional bank provides debt financing for the company when it needs to purchase inventory (VanWagner, 2014). While the terms of the agreement were not disclosed, Eric explained that their loans are for a 5-year term, while the payback from the rentals only takes 2 years (VanWagner, 2014).

The VanWagner twins began their higher education at different schools with different planned career paths. However, their understanding of their family's business intersected with the opportunities, people, and diverse networks of the University of Maryland and they soon had a high growth firm and important connections within the regional ecosystem.

Sean Whalen grew up as the child of a NASA scientist as his dad, Dr. Robert Whalen, worked at Stanford and NASA's AMES Research Center researching the physical effects of space on the human body and developing equipment to counteract physiological space challenges such as the loss of bone health and muscle strength (Greenemeir, 2010). Robert Whalen began working on a treadmill for use in space that used harnesses to hold astronauts on the treadmill deck as treadmill air pressure was employed to counteract gravity giving astronauts the opportunity to run on a treadmill in

space (Whalen, 2012). In order to use Robert Whalen's 'space treadmill,' users step onto the treadmill deck and from the waist down the runner's body is enclosed in a large air tight "bag" that covers the entire area where the runner's legs stride. In space, the air would be sucked out of the bag and the effects of gravity would return, allowing astronauts to exercise more easily than when tethered by harnesses (Whalen, 2010). According to Whalen (2012), his father began work on this in the 1990s when Sean was less than 10 years old and the treadmill designed for astronauts eventually sat in the family's garage for years.

Fast forward to 2004 and Sean is a Master's degree student in Engineering and Entrepreneurship at Stanford and looking for a product to work on, a way of "figuring out what it's like to start a company," (Carey, 2009). Sean Whalen remembered the years he watched his dad tinker with the treadmill in their garage and realized that he had a new application for his dad's project. Instead of sucking the air out of the treadmill as his father attempted to counteract gravity, Sean's treadmill would do the opposite, pumping air to the runner, lowering gravity, and providing the feeling of being weightless or at least taking some of the weight off for the runner. Sean believed that his version of the treadmill might have applications for various populations including patients with knee, hip, and other medical issues (Whalen, 2012). A recent version of Whalen's AltergG treadmill is pictured in Appendix A.7.

Whalen licensed the technology from his father, and through some friends was introduced to Olympic runner and coach Alberto Salazar (Whalen, 2012). Salazar quickly realized the benefits this gravity altering treadmill might have for Olympic and

professional athletes recovering from injuries or trying to lessen the effects of intense training regimens. In fact, Salazar quickly invested in the company and Whalen raised \$300,000 from friends and family and 18 months later, the treadmill was ready to be tested. Salazar purchased three for the athletes he was training and the Washington Wizards, a professional basketball team, also purchased one (Fenn, 2010). Soon other professional sports teams were buying the \$75,000 treadmills in order to protect the hundreds of millions they were investing in their athletes.

By 2010, Whalen's company, AlterG, sold 30 machines and was developing a lower cost model for rehabilitation and medical facilities (Greenemeier, 2010). AlterG has attracted the attention of investors and has taken over \$10 million in venture capital (Crunchbase, 2014). It is interesting to note that Robert Whalen never had any intention of commercializing his invention, even after NASA mothballed their research on the space treadmill.

For Sean Whalen, the VanWagner brothers, and others such as the founders of College Hunks Hauling Junk and Krave Jerky, combining family knowledge and assets, whether patentable or not, with the campus talent, resources, and opportunities can lead to innovative new business models radically different from their family's previous efforts. The data collected suggests that much like Turner's Frontier, campuses in the US allow students to take knowledge, methods, and assets from the past and put them to work in new ways to meet new needs. In the case of the *Daddy's IP* pathway, student founders are doing just that with their parent's businesses and life experiences.

6.3 Conclusion

The five basic pathways that many high growth student founders appear to traverse are offered in order to better understand the impact, if any, that US universities have on the development of high growth firms created by students.

As the founders and universities in this chapter suggest, high growth student founders at US colleges and universities have diverse experiences, attend school for different reasons, study different fields at a variety of institutions and enter a range of industries. The pathways suggested and traveled by various student entrepreneurs can be seen through Heider's (1958) framework as function of the external environment and the person in question.

While the campus (or external environment) varies by entrepreneur and pathway, it is obvious that as many students travel these pathways, they experience changes in attitudes and self-perception which in turn impact their actions during the firm formation process (Shaver, 2010). Business plan competitions, class projects, support of peers in extra-curriculars, and piloting products on campus were pathway events for many entrepreneurs in data collected and in many cases changed the attitudes and self-perceptions of the student entrepreneurs. The pathways highlight different mechanism through which the campus environment may impacts the behaviors, self-perception, attitudes and actions of students. In some cases the campus environment is crucial moving a person from being a student to being a student founder.

It must be noted that the pathways offered are rudimentary and boundaries between pathways are permeable and some founders will have traveled more than one of these routes on their way to high growth entrepreneurship on campus.

More research needs to be completed, but the qualitative and quantitative data collected for this research have suggested the varied ways, processes, influences, and environments in which some students become high growth founders. From the campus classics such as the *Big Man on Campus*, the *Wunderkind* and the *Born Hustler* to founders that use class projects or family knowledge to launch firms, the campus appears to offer the assets, choice, and diversity that alters the attitudes, behaviors, decisions and self-perception of students just as the frontier changed those who ventured to it.

CHAPTER 7: POLICY IMPLICATIONS

7.1 Introduction

Higher education in the US has been defined by evolution and growth over the almost 400 years since Harvard's founding in 1636 (Bok, 2013; Rudolph, 1990). US higher education continues its core mission of education and research, but its breadth of activities and stature in society and economy put it at the center of countless policy debates (Thelin, 2004; Bok, 2013). The success of US colleges and universities and their historical responsiveness to societal demands is a reason the sector has grown and the demands are so high across many policy areas.

The data collected and analyzed in exploring the impact, if any, that US campuses have on students that create high growth firms, has direct implications for policymakers and leaders interested in the role of higher education in the entrepreneurial era.

This chapter will explore specific policy implications at the intersection of higher education and entrepreneurship and will use the data collected and analyzed in this research to suggest various alternatives to the policies employed by universities and policy makers in the US in attempting to integrate higher education into the entrepreneurial economy.

As the University of Chicago case suggests, policy actions and leadership, both recent and historic, have created an environment supportive of innovation and high

growth student entrepreneurs. The Chicago case and the database suggest the massive potential economic impact the campus holds within its student body in the entrepreneurial economy. This chapter will present various themes uncovered in the research and their connections to policy areas of concern to multiple stakeholders.

7.2 Bush, Science and the Roots of US Innovation and Entrepreneurship Policy

The contemporary demands for commercial productivity and output from higher education is not unprecedented. Colleges such as Jefferson's University of Virginia began to teach practical subjects to while German modeled research universities, pushed by the Morrill and Hatch Acts, have provided human capital and innovation for growing cities, regions, and industries for well over a century.

The stated policy idea of employing universities for economic innovation in the US was crystallized by Vannevar Bush in the mid-20th century (Cole, 2009). Bush, an MIT trained engineer, former MIT engineering Dean, and founder of Raytheon, was summoned from Boston to Washington DC by Franklin Roosevelt during World War II and managed over 6,000 scientists in applying science, often university based, to the war effort (Thelin, 2004; Cole, 2009). Bush, along with a handful of other university scientists, became the public face of American science and was introduced to the general public by *Life* and *Time* magazines as the brains behind the 'arsenal of democracy.' The success of US science during WWII would grow citizens and policymakers' faith in scientists and the university science (Cole, 2009).

Near the war's end, Bush released *Science: the Endless Frontier*, a blueprint for a national science and technology innovation system that contained direct commercial and

economic implications. Bush argued for unleashing the ‘creative and productive energies of the American people as a key asset in producing ‘new and more attractive and cheaper products’ (Bush, 1945, chapter 3, p. 2). Bush wondered in the report:

Where will these new products come from? How will we find ways to make better products at lower cost? The answer is clear. There must be a stream of new scientific knowledge to turn the wheels of private and public enterprise. There must be plenty of men and women trained in science and technology for upon them depend both the creation of new knowledge and its application to practical purposes. More and better scientific research is essential to the achievement of our goal of full employment.”

Much of Bush’s blueprint would eventually be implemented to build a scientific innovation system of federal grants, peer review and competition as the drivers for knowledge creation at the university level (Cole, 2009). Global rankings of US research, the migration of foreign scientists and students to American research universities, and the volume of international academic prizes awarded to US based and trained researchers is exceptional and shows that Bush’s system has been successful from scientific research perspective (Economist, 2005; Cole, 2009; Thorp and Goldstein, 2010).

However, Bush’s system represents the industrial age that birthed it, and WWII and the Cold War positioned the US federal government at the head of innovation policy. By the 1970s, the entrepreneurial era was rearing its head and serious global competitors were eating at many large US firms and industries. Decades of federal funded research had flowed, yet the federal effort did not appear to unleash the economic impact that Bush and other national and regional leaders envisioned in their blueprint.

7.3 Bayh-Dole act and Technology Transfer

In 1980, the Bayh-Dole act was passed and the fruits of federal largesse were expected to finally be harvested. In the decades following World War II the federal control over intellectual property came to be seen by many as a bottleneck to profitable commercialization of research (Etzkowitz, 2008; Cole, 2009). The Bayh-Dole act would allow universities, nonprofits, small businesses, and inventors control over intellectual property supported by federal funds.

Bayh-Dole was meant to be a watershed change in policy that would unleash the commercial potential articulated by Bush. In the years following Bayh-Dole a large majority of US universities have chosen to keep the commercialization responsibility inside of the university, empowering university administrators and staff to lead commercialization efforts, though other options were available (Markham et al, 2005). University technology transfer offices (TTOs) existed before Bayh- Dole, but passage of the act clarified practices and provided certainty surrounding intellectual property rights.

Many technology commercialization and transfer offices and staff would be established in the United States as regional and university leaders drove for innovation and sustainable economic growth; the results would be mixed (Etzkowitz, 2008; Markham et al, 2005). A few universities, such as Stanford and MIT that have consistently performed well through this federal system and its various metrics (patents, license revenue and spin- offs) and set a high, technically led bar for employing university assets and human capital to support regional wealth creation.

Table 7.1 includes selected information for technology transfer office revenue leaders from readily available AUTM data as well as select data on student startups.

Table 7.1: Top 10 universities by license income with research expenditures 2011

School	Research Expenditures 2011	License Income 2011	2011 Return
Northwestern University	\$484 million	\$192 million	39.6%
U of California System	\$5,418 million	\$182 million	3.3%
Columbia University	\$714 million	\$146 million	20.4%
New York University	\$430 million	\$142 million	33.0 %
Princeton University	\$192 million	\$115 million	59.9%
Massachusetts Institute of Technology	\$1,490 million	\$76 million	5.1%
University of Washington/Foundation	\$967	\$67 million	6.9%
Stanford University	N/A	\$67	N/A
University of Texas System	\$2,547	\$64	2.5%
University of Wisconsin/WARF	\$1,112	\$58	5.2%

Source: AUTM, 2011.

According to AUTM, for the FY 2011 total income for the 157 universities in the survey was \$2,500 million (AUTM, 2011). This means that the top 10 schools in Table 7.1 had a total income of \$1,105 million, nearly 45% of the total. The returns vary among the top schools and the presence of blockbusters is obvious and these big wins cover

mediocrity of most schools. Many of the top license income universities would not match conventional wisdom regarding entrepreneurial universities.

It is clear, with some investigation, that many of top performing universities are reliant on one or two big wins and in most cases these wins include licensing, not new venture creation. Northwestern University held the number 1 spot from 2008-2011 due to a single molecule developed a chemist Richard Silverman the 1980s that would eventually become Lyrica, a blockbuster drug for the New York-based Pfizer Inc. (Wang, 2012).

The University of Florida is still a top 20 license income school because of the success of Gatorade, dating back to 1965 when a football coach approached a University of Florida kidney specialist about weight loss and kidney functioning during periods of heavy exertion (games and practices).

The leading successes in technology transfer and commercialization revenues must be put into context as in most cases a singular discovery such as the Lyrica example or singular leaders such as Vannevar Bush at MIT and Frederick Terman at Stanford lay the groundwork for today's successes in Silicon Valley and Boston (Saxenian, 1996; Florida et al, 2006; O'Shea et al, 2007).

The results of more than three decades of Bayh-Dole have been at best mixed and calls for reform have come from multiple sources. In 2010, *Harvard Business Review* cited the Kauffman Foundation's Robert E. Litan and Lesa Mitchell's call for intellectual property reform a 'breakthrough idea,' Litan and Mitchell argue for 'free agency' for inventors, allowing them choice in 'licensing' agents beyond the school's organization

centric licensing process (Litan and Mitchell, 2010). “Perhaps it was not a bad idea to centralize their commercialization capabilities and give TTOs control of the process; they gained immediate organizational benefits and economies of scale. But this monopolistic model has since evolved into a major impediment,” argued Litan and Mitchell (2010, p. 53).

It is interesting to note that Stanford Provost John Etchemendy, speaking after Stanford’s IP case against Roche Pharmaceuticals and the court’s support of faculty members’ right to assign IP, played down the importance of technology transfer revenues, minimizing the \$45 million to \$60 million in intellectual property revenue generated annually (Titus, 2010). ‘We’re on the upper end, and that’s on a \$3.5 billion budget. It’s not a major source of revenue,’ stated Etchemendy (Titus, 2010).

In another sign that TTO offices may distort commercialization efforts, Penn State University, *a very high research activity* university in the US, announced that it will no longer demand any intellectual property rights from commercial research partnerships, explaining, “In short we are doing it because we consider the net present value of the interactions and relationships that our faculty and students have with industrial professionals to be very important and therefore greater than the apparent future value of the proceeds from such intellectual property,” stated Hank Foley, vice president for Research at Penn State University (Pennsylvania State University, 2011). The leaders at Penn State University understand the role that individuals and small self directed teams play in the opportunity identification and market entry.

Today, the typical university TTO, muddles along, not even making enough money to cover the costs of TTO (Abrams et al, 2009). The TTO acts as the primary driver of commercialization efforts at most research universities, interacting with professors, institutes, and partners to commercialize the knowledge apparatus of the modular multiversity. Unfortunately, this model, with university centric design and strategies, would seem to be of a past era and thus has not produced as expected in an entrepreneurial age. Open innovation systems, such as wikipedia and github, are acknowledged for their value, and changes such the Penn State IP policy adjustment suggest some university leaders are paying attention.

7.4 Universities in an Entrepreneurial Era

Clark Kerr's concept of the multiversity and Harry Etzkowitz's triple helix provide useful guides for understanding the evolution of research universities in the US and their attempts to commercialize knowledge over the past 60 years. Bayh-Dole was enacted because policy makers, university and regional leaders, and corporate leaders suspected that federal control over intellectual property was not effective in an emerging entrepreneurial economy. The growth of TTO offices in recent years was a direct acknowledgement of the rise of the entrepreneurial economy, and recognition that local, institutional control and ownership might better encourage innovation and entrepreneurship.

This shift from an industrial to an entrepreneurial economy, which the Economist Magazine noted in 1976 in a special survey titled The Coming Entrepreneurial Revolution, has been picked up on by Bell (1999), Drucker (1985), Florida (2002), and

many other social and economic observers. And while multiple authors have commented on this economic shift, university and regional have continued to focus on the commercialization of science for the organizational age. As the Economist noted in 1976, “It is gradually becoming clear that ownership of means of production is no longer a source of economic or political power, and may indeed now be a source of powerlessness,” (Economist, 1976, p. 42). Ownership of the means of production is the position that universities and their regional partners find themselves in today with balance sheets full of economic and scientific assets and portfolios full of patents and licenses that do not cover TTO costs in most cases.

What has been overlooked is that the multiversity and the triple helix were organization centric models, not people centric, putting structures (or means of production) ahead of the human capital that is expected to innovate and create new firms. Building on the modular nature of the modern research university, administrators and their partners have built technology transfer offices and other pieces of the triple helix (incubators, science parks, business development centers, economic development offices, etc.) across the United States with varying models and levels of success (Bercovitz and Feldmann, 2006; Etzkowitz, 2008).

Instead of universities and regions full of entrepreneurs and startups, in most places universities have landscapes full of organizational units engaged in bureaucratic dances that have little or marginal effect on regional development. US universities have creative and innovative individuals (both faculty and students) expected to act entrepreneurially, but forced to interact with the market through institutional methods and

timelines as innovators and entrepreneurs globally use Facebook, LinkedIn, Twitter, texting, Skype and other individually based platforms to connect with the market and make incredible impact.

Policy makers and university leaders must reexamine their past focus and policies regarding higher education in the entrepreneurial economy. The next section will present specific areas of this research that impact policy as well as recommendations for policy options beyond the contemporary focus on the commercialization of funded science.

7.5 Policy Recommendations

7.5.1 Unleashing Individuals and Focusing on Local

Before World War II, the greatest advances in effectiveness of higher education (and therefore demand) were made when leaders such as Jefferson (University of Virginia), Van Hise (University of Wisconsin), and Harper (University of Chicago) focused on providing practical opportunity and choice to individuals. Undergraduates had freedom in classes and extracurricular activities and graduate students in sciences and professional schools were afforded opportunities to chart their own paths. By building institutions and structures, at the undergraduate, research, and regional levels the supported individuals, US higher education would become directly relevant to citizens and regional leaders by the 20th century (Rudolph, 1990; Cole, 2009).

Even in cases where the federal government would direct higher education policy, such as the monumental Morrill Land Grant Act of 1862, great control was left to local leaders and institutions to determine which useful subjects to teach and research and whether to build new universities or expand existing schools (Rudolph, 1990; Thelin,

2004). Not only would this support diversity and local control in higher education in the US, but would hasten the closing of the frontier as lands were sold off to fund institution building.

As discussed above, World War II and Vannevar Bush brought change with federal planning for the achievement of national, not regional and local goals. Silicon Valley, Route 128, and North Carolina's Research Triangle all evolved beyond their early reliance on federal grants over time as leaders focused on connecting local individuals and setting up multiple channels of interaction between people, not just organizations, across and within their regions. The decades old strategy of federal focus is not congruent with the entrepreneurial age and one can only conjecture what the early leaders in Boston, Silicon Valley, and North Carolina would do today if they were just starting out. Its not likely they would build industrial parks over hundreds of acres of empty land and look to the federal government to determine which areas demanded exploration.

The data collected and analyzed in this research points to the vision and actions of students, professional school faculty and leadership, local partners and philanthropists as keys to developing supportive environments for student entrepreneurs in recent years. Policy makers at the local and regional levels should take note that liberty, assets, and diversity on campus have supported student entrepreneurs spotting opportunities and solving problems, while creating wealth and opportunity for cities and regions. As was evident in the University of Chicago case, the development of the university and, a century later, the entrepreneurship program, were focused on regional impact initially.

For policy makers and others, this demands refocusing higher education entrepreneurship policy efforts beyond national science driven visions for innovation and entrepreneurship, to locally, innovator driven insights and efforts.

7.5.2 Engage a Broader Set of Individuals

Traditionally policy efforts towards commercialization and innovation have focused on professors and graduate schools, corporations, and technology commercialization. This target focus supported the rise of tech transfer and its administrative apparatus and methods.

The policy mindshare devoted to scientific, research oriented activities is massive and has been the core underpinning of the university led model from the time Bush wrote the *Endless Frontier* to the current, continued development of research parks and science campuses with corporate partners (Etzkowitz, 2008; Thorp and Goldstein, 2010; Bok, 2014).

As the database and the case of the University of Chicago suggest, non-research oriented professional students and undergraduates make up a vast majority of the students creating high growth firms on college and university campuses. For policy makers on campus and off, going beyond the scientific research apparatus and Bush's frontier is crucial to supporting more potential high impact entrepreneurs on campus.

Student exploring problems they chose and found interesting have led to some innovative and entrepreneurial firms. Michael Dell and his radical pc manufacturing and distribution business model was birthed in a dorm room, not a research lab, at the University of Texas. Frederick W. Smith introduced the concept for an overnight package

delivery system in an undergraduate economics paper at Yale. University of Maryland football player Kevin Plank began exploring performance apparel while an undergraduate and is now CEO of a company worth billions, in a city, Baltimore, that desperately needs innovation and growth. Table 7.2 shows select statistics for select student created firms.

Table 7.2: Select data on select high growth student firms

Firm	Year Founded	2014 Employees	2014 Revenues
Microsoft	1975	128,000	\$87 billion
Teach for America	1989	2,027 ³²	\$360 million
Under Armour	1996	7,800	\$3 billion
Facebook	2004	6,400	\$12.5 billion
Krave Jerky	2009	39 ³³	\$36 million ³⁴
Warby Parker	2010	400 ³⁵	\$70 million ³⁶

The high growth firms discussed above and in Table 7.2 were the result of individuals were working on problems and opportunities they uncovered while on campus, not those offered up by the National Science Foundation or senior faculty members in laboratories.

As the data collected suggests, many schools and universities are providing opportunities for student innovators, but these are likely to be in professional schools or undergraduate schools and with business schools at many institutions being very supportive of the practice of entrepreneurship among students.

³² <http://archive.fortune.com/magazines/fortune/best-companies/2014/list/>

³³ <http://www.forbes.com/companies/krave-pure-foods/>

³⁴ http://www.nytimes.com/2015/01/30/business/hershey-to-buy-krave-a-maker-of-jerky.html?_r=0

³⁵ <http://money.cnn.com/2015/03/05/technology/warby-parker-valuation/>

³⁶ <http://www.usatoday.com/story/money/business/2014/11/30/warby-parker-selling-stylish-eyewear-cheaper/70060670/>

The growth of the New Venture Challenge at the University of Chicago and the diverse firms launched on campus highlights the demand and importance of moving beyond not only research driven science, but also beyond traditional professional schools and their graduate students. Moreover, campuses visited such as Arizona State University and the University of Maryland have also taken specific actions to expand offerings across their campus; from coursework and student incubators to campuswide competitions and interdisciplinary programs.

Policy makers should consider Jefferson's radical idea of offering choice for undergraduates in 1819 or Van Hise's plan to provide educational resources to fishermen in Minocqua, Wisconsin as well as researchers in Madison at the main campus of University of Wisconsin. In both historical examples, leaders attempted to bring the assets and opportunities of the universities to individuals, allowing them to make the university work for them and their problems.

The challenge for policymakers is to craft policies and structures supporting small scale projects by non-research oriented innovators such as MBA candidates and undergraduate music majors, instead of targeting their attention and resources on faculty winning federal grants as the center of their efforts. There is no doubt that Bush's shadow is long and wide and emerging from it will take concerted efforts for university and policy leaders.

Policy makers should note the small number of female founders present in the data collected on high growth student founders as a majority of the activity in this research occurred at large, research universities where female participation at all levels is

expected, do not appear to be participating in this phenomena of high growth student entrepreneurship.

Policy debate, action, and funding related to women in the workplace, women in higher education and women in science, technology, and math (STEM) are ongoing. Public debate has picked up in recent years around women in technology. Sheryl Sandberg, COO of Facebook and a 2014 billionaire, stepped into the fray with a book and public tour on women and leadership. The appointment of former Google engineer, Marissa Mayer, as CEO of Yahoo! in 2012 is also viewed as a key moment in gender issues related to high growth startups and innovation.

Women in STEM as a policy issue has received a great deal of attention in recent years. This research suggests that participation rates for women are likely lower in entrepreneurship on campus than rates for STEM, general business, law, medicine, and other fields that are the focus of various public policy. Engagement in entrepreneurship on campus is a self-selecting activity like many, yet it is not clear why women, who represent majorities or near majorities in many fields on campus, are not engaged in high growth entrepreneurship at the rate men engage.

More recently, the debate on women and innovation has exposed a great lack of diversity in Silicon Valley and the technology sector more generally. Technology and entrepreneurship researcher Vivek Wadhwa has questioned the inclusiveness of ‘Silicon Valley’ and its leadership structures as well as the damage these biases cause (Wadhwa, 2013). In recent years high growth firms such as Google, Apple, and Facebook have

begun issuing diversity reports, with women employed as one of the demographics being tracked.

From engaging more women and non-science oriented individuals to offering opportunities to undergraduates and professional students, policymakers and university leaders expecting economic impact and innovation from US higher education must be more opened minded and inclusive when developing policies, structures and incentives. One of the strengths of US higher education and its research universities is the diversity of institutions, teaching and research, and talent, the data in this research suggests policymakers engage a broader set of potential innovators and support .

7.5.3 Importing New Models

Recognizing a broader group of innovators and supporting their opportunity identification and firm formation processes rather than federal and institutional directives will help policymakers and university leaders better respond the entrepreneurial economy. Beyond expanding the diversity of innovators engaged, policymakers must borrow from US higher education history and find and integrate new models for the entrepreneurial era into campus infrastructure.

The criticism and calls for reform of Bayh-Dole highlights just one small area where new models are needed. The new models on campus need to empower individuals as opposed to supporting institutions. For example, in private investing markets, a clear trend among venture investors looking for high impact is towards smaller, quicker startups that succeed or fail in a short period of time with very little investment. In 2005, venture capitalist Paul Graham introduced his innovation accelerator program, Y

Combinator. Through this program his team would invest a small amount of money (initially less than \$20,000) in a group of early stage ventures and take them as a cohort through a 14 week acceleration program and then present them to the broader venture community. In its first 5 years according to reports Y Combinator invested in 316 firms values the top 21 startups in the portfolio at \$4.7 billion dollars (Tsotsis, 2011). In a 2014 blog post on the Y Combinator website, the firm claims to have invested in 716 firms, raised more than \$3 billion in investments and have a market cap of more than \$30 billion.³⁷

In FY 2009, according to the Association of University Technology Managers (AUTM), all participating US universities, hospitals, and research institutes in the survey (181 institutions) created 596 new companies whereas Y Combinator accepted 64 firms in its most recent 14 week program (Association of University Technology Managers, 2010; Tsotsis, 2011). Y Combinator has expanded since the beginning of this research and has more locations, team members, and investments as their model has been deemed successful by their investors. Well known firms that participated in Y Combinator include AirBNB, Dropbox, and Reddit.

Another model for supporting innovators has been put into practice by PayPal founder and billionaire Peter Thiel, a Silicon Valley legend and Stanford Law School Graduate. Thiel's foundation has started awarding up to \$100,000 a year to innovators age 20 or younger to allow them to leave the university structure and have the freedom

³⁷ The statistics are self-reported and valuations are private market valuations based on private market financing valuations. Y Combinator published selected statistics on July 16, 2014 at <http://blog.ycombinator.com/yc-portfolio-stats>.

and flexibility to push their innovation closer to commercialization and impact (MacMillan, 2011).³⁸ Many of these *Thiel Fellows* are students at leading universities and active in coursework and extracurriculars, including many that participated in entrepreneurial activities before leaving and becoming Thiel Fellows. The Thiel Fellows program is small, but provides some data and insight into supporting innovators directly on problems they deem important. It is important to note that university activities are used in selecting Thiel Fellows.

Both the Thiel Fellows and Y Combinator examples, from outside of the academy, highlight how private investors and philanthropists are focusing on fast, small scale innovation, in contrast to the large scale, federally funded path that most universities and regional leaders look to for the commercialization of campus activities. Moreover, as the data in this research and Thiel and Y Combinator suggest, senior, research oriented faculty do not have a monopoly on innovative thinking and cannot be counted on to consistently deliver innovative commercial output from the campus.

Certain schools and regional leaders are picking up on this trend and are experimenting with new entrepreneurial offerings. The University of Texas has recently launched the *1 Semester Startup* program and Harvard Business School has introduced the *Minimum Viable Product Fund*.³⁹ Both are attempts to stand up impactful student founded companies quickly and at low cost—they focus on the individual and small team and quickly finding business models for impact.

³⁸ For more information on the Thiel Fellowships and the recipients visit the Thiel Foundation Website. <http://www.thielfoundation.org/>

³⁹ More information on University of Texas' 1 Semester Startup can be found at <http://www.1semesterstartup.com/> More information on Harvard Business School's Minimum Viable Product Fund can be found at <http://www.hbs.edu/entrepreneurship/resources/services.html>.

The National Science Foundation has also come to support quick startup formation by implementing the I-Corps program in 2010 in order to train researchers and small teams to quickly test the value of their innovations. The NSF brought in Steve Blank, entrepreneurship faculty at UC Berkeley and Stanford University, to lead the I-Corps program and bring the startup curriculum he developed with Berkeley and Stanford students to research scientists that have received NSF grants.

Expanding the policy focus of university entrepreneurship towards models such as Y Combinator's or the Minimum Viable Product Fund—small scale and individually driven—would be a dramatic change for universities and regional leaders, but importing and evolving models from the outside has always been crucial to higher education's relevance in the US. Continuing further, along the model of Harper and other great higher education leaders, policymakers can and should consider alternative mechanism (beyond degree programs) to make university resources, including diverse people, resources, and opportunities, available to greater numbers of entrepreneurs.

University of Chicago's Steven N. Kaplan compared the model the Booth School has developed to that of Y Combinator, the leading accelerator (Kaplan S, 2011). In late 2014, the New Venture Challenge was named one of the 10 ten best accelerators in the world by Seed Accelerator Rankings Project (Hochberg et al, 2015). NVC was the only university based program on the list of 20. Table 7.3 presents select data on select University of Chicago high growth student startups.

Table 7.3: Select high growth student startups from the University of Chicago

Firm name	Year Founded	Founder/school /status	Additional information
Medspeed	1998	Jake Crampton / Booth School of Business / Graduate 1999	Started as class project; won 1998 NVC; early investors were Booth alumni; over \$10 million in revenue annually and 300 employees
Grubhub	2004	Sean Mahoney / Booth School of Business / Graduate 2010 (graduation after launching)	Won 2006 NVC; raised \$34 million in venture financing; completed IPO April 2014
Braintree Financial	2006	Bryan Johnson, Booth School Executive MBA, completed program	Won 2007 NVC; \$85 million in venture funding in 2012, acquired by eBay for \$800 million in cash in 2013
Groupon	2008	Andrew Mason, Harris School of Public Policy, left school	IPO 4 November 2011, Founder, Andrew Mason fired in 2013
Bump Technologies	2008	David Lieb, Jake Mintz / Booth School of Business / Lieb & Mintz both left school	Founders met at Booth, won 2009 business plan competition; participated in Y Combinator accelerator program, Google acquired in 2013
All Tuition (formerly edulender)	2011	Sue Khim / College / Leave of absence 2010	Khim participated in NVC as an undergraduate; raised money; left school and lives in Silicon Valley
MouseHouse	2012	Umar Khokhar MD/PhD and Imran Ahmad MBA (2013)	Won 2013 NVC; won \$100K investment at 2014 Rice Business Competition; raised over \$750K in financing

In Harper's day making campus assets, liberty and diversity to more people meant summer programs, traveling professors, academic press, and correspondence courses; today's leaders have to consider what mechanism and methods will allow more students and others use the assets, liberty and diversity of the campus in pursuing innovative ventures and making an impact.

7.5.4 Expanding the Definition of Commercializable Activities

In an entrepreneurial economy, incredible wealth is and can be created with new scientific knowledge, but not always the patentable, laboratory based knowledge that most policies makers seek to exploit. As TTO supporters and administrators will attest, the work of professors, PhD candidates and research fellows is impressive and can create incredible regional and societal wealth as evidenced by Google and Genentech. The reality however, that consistent revenues are achieved by few schools and one hit wonders top the leaderboard.

However, scientific knowledge is but one of the methods employed by entrepreneurs in unleashing change and creating regional wealth. Student entrepreneurs do innovate with science and technology, but more often with mass market technologies, innovative business models, new products and services.

While there are many firms in the data collected that make use of university technology, few of the firms made use of research based, intellectual property owned by their college or university. In many cases technology was an enabler for the founders (eg lower cost, expanding reach) as they developed new business models, products, and industries (eg Groupon, Facebook, FedEx, Nike, Teach for America).

In an entrepreneurial era, new business models, media services, and content, for example, are of incredible economic value. Groupon, the group buying website founded in 2008, which had revenues over \$600 million dollars in Q1 2011 and has gone from 37 employees to over 7,100 employees in less than 2 years (Steiner, 2010).

Andrew Mason, Groupon's founder, was a first year graduate student at the University of Chicago's Harris School of Public Policy when he began working on the first iterations of a collective action website. While the campus clearly offered Mason the freedom to work on his ideas surrounding technology and social action, the type of innovation and entrepreneurial impact he brought is not congruent with the dominant strategies policymakers employ to engage higher education in the entrepreneurial economy.

Many of the firms in this research entered industries and developed products and services that traditional policy and infrastructure would support -- food manufacturing and services, software, athletic apparel and footwear, and junk removal -- as few those industries demand new laboratories, corporate partners, patent lawyers and administrators, PhD programs, or federal grants.

Those charged with the integration of universities and regional economies must think creatively when analyzing the people and entrepreneurial assets on campus and their potential. Van Hise, Harper, and Franklin all thought broadly when viewing the avenues of impact their institutions could have on regional economies and quality of life. Today's policymakers must do the same as the data suggest students can use campus liberty, diversity, and assets to create great economic impact.

In an entrepreneurial economy it is required that university and regional leaders clearly understand the path from Bush's scientific frontier to Bayh-Dole assumed and demanded laboratory science and corporate partnerships, not entrepreneurial opportunity identification. Industries from media and finance to retail and shipping have seen fundamental reordering in the entrepreneurial era and in many cases student innovators working from campus have played a leading role. Commercialization of university knowledge cannot be insulated from economic realities and policy makers have to adjust accordingly.

7.5.5 Campuses Without Walls

The great university builders of the late 19th century, including Harper at the University of Chicago and Van Hise at the University of Wisconsin, were aware that the purpose of the university was to serve the broader community. The data collected in this research suggests that in order for universities to best serve in the entrepreneurial economy, they must acknowledge and engage existing entrepreneurial ecosystems, talent and assets off of campus.

Engaging in off campus regional and global networks around research, accreditation, and healthcare is something universities have done for years. This is the multiversity concept that was described by Clark Kerr. The University of Chicago case highlights the ability with which contemporary research universities can add programs, form partnerships, and explore entire new areas of activity. It is this modular makeup of the modern research university that has led to its growth, much of its success, some failures, and much criticism for mission creep (Kerr, 2001; Kamenetz, 2010; Bok, 2014).

For policy makers interested in more innovative output from higher education, engaging the entrepreneurial sector off campus is crucial as the Chicago case and the experience of other universities and student startups highlight (Saxenian, 1996; O'Shea et al, 2007). The challenges for engaging with the entrepreneurial sector are likely to be its divergent culture, lack of hierarchical system, and its focus on speed and quick decisions.

While colleges and universities are stacked full of people and assets and high growth firms do emerge, nearly all of the world's knowledge and assets are not on campus. This is, of course, why the firms in this research do leave campus as they scale. The sooner campus innovators and entrepreneurs can tap off campus resources, the better and as the data in the studies suggests, one of the assets and much of the diversity available to student innovators on campus are the channels to both individuals and institutions off of campus.

Additionally, this research suggests that engagement with philanthropists for funding rather than has been an effective route for funding entrepreneurship programs and structures on campus. Chicago and schools such as University of Maryland and the University of Michigan have relied on the financial support of philanthropists, often alumni entrepreneurs such as Edward Kaplan, Kevin Plank and Sam Zell (Kaplan E, 2011; Plank, 2010; Zell, 2011). This off campus financial support, combined with the tuition dollars of students, has supported the growth of entrepreneurial structures supporting students at US colleges and universities.

The case study and database suggest that alumni, mentors, extra-curricular programs, coursework and professors' networks all play central roles in ensuring that

knowledge from off campus is available to student entrepreneurs on campus.

Policymakers must ensure that colleges and universities connect off campus to ensure liberty, diversity and readily available assets are at the disposal of campus entrepreneurs.

7.6 Conclusion

When Frederick Jackson Turner presented his frontier thesis in 1893 he was concerned that the closing of the frontier would end the evolution of the dynamic, innovative, egalitarian society that was created from the frontier experience. The wide open spaces, full of assets, diverse people, and liberty was transitioning to cramped, industrial society. What would the US be without the frontier? Surely Turner knew that academic institutions had always been planted to ‘civilize’ the frontier and that the great research universities of his day were creating knowledge and providing practical education that would support increased density and reliance on mass organization and labor.

By World War II Turner’s theories were largely forgotten and Bush had made science the frontier that the US would explore in driving towards exceptionalism. Policy around innovation and entrepreneurship has taken its lead from Bush’s vision and results have not been as expected regarding the commercial impact of the university and its exploration of the scientific frontier. While technology transfer offices, science parks, and corporate partnerships are the norm for large research universities in the US, policy makers, university leaders, and others have only expected more as the demands and opportunities of the entrepreneurial economy become more evident.

As many universities and policymakers followed traditional strategies in hopes commercial impact based on laboratory science, a few universities have developed frontier like environments for their students. The majority of successful firms in this study were not solving problems based on federal directives or focused on intellectual property. Each venture and founder in this study is unique, but their environments to differing degrees provided liberty, freedom and valuable assets that they could access.

Various regional and local leaders, on and off campus, have and will continue to take innovative steps and experiment with new models in attempting to bring more innovation and entrepreneurship from campus.

The models that achieve success will be replicated with varying levels of success. Like technology transfer offices and Bayh-Dole, followers will likely try to become clones of leaders after the fact, rather than unleashing locally created entrepreneurial and methods for knowledge commercialization and entrepreneurship.

Each frontier was different as America moved west and as Turner pointed out, each new frontier demanded new innovations, mixing old world knowledge with local wisdom and skill to create new offerings (Turner, 1896). The University of Chicago has been able to effectively support student innovators without an engineering school and the University of Maryland has done so without the benefit of a leading technology ecosystem such as those that exist in Silicon Valley and Boston. If innovators and leaders at each of those schools had followed conventional wisdom and the schools that Bush and Terman built, it's unlikely they would have the record of success this research suggests.

The unleashing of students and other individuals through the policy areas outlined in this chapter should lead to firms pursuing important problems and markets. If the problems are substantial and the solutions effective, the campus attributes of choice, diversity, and readily available assets may lead to firms that grow, creating societal wealth and employment. Few could have imagined that suburban moms, Chinese political leaders, and disaster relief agencies would be communicating globally and changing the world on a social platform developed by a 19 year old undergraduate at Harvard University. Policy makers and university leaders must accept their responsibility to develop policies that support a broader array of innovators in a broader array of fields with new structures that are developed locally.

For many of the students and ventures in this research classes, competitions, extracurricular activities and alumni mentors were directly employed in opportunity identification and the firm formation processes. These various campus elements, built on the modern multiversity, were creations of student leaders, faculty, administrators and philanthropists. For policymakers this is great news, for unlike the frontier that Turner explored, the campus frontier is not finite. And unlike the *Endless Frontier* that Bush lionized, the campus frontier and its possibilities are only constrained by the creativity of students and leaders, not the National Science Foundation.

CHAPTER 8: CONCLUSION

8.1 Introduction

This research into the social phenomena of students creating high growth firms at US colleges and universities offers a new concept for viewing the campus as frontier and places the phenomena in its historical concept. This research collected data on a specific group of high growth firms and the environments from which they emerge. Additionally, the University of Chicago case study highlights how one university managed to integrate entrepreneurship into its campus with multiple high growth firms and economic impact resulting. Student pathways traveled on campus offer some insight into the various methods by which students identify opportunities and begin the firm formation process. The frontier concept, case study, and data presented have policy implications calling for alternative views and policies for higher education in the entrepreneurial economy. This chapter will provide a summary of the research.

8.2 Frontier Framework

A ‘frontier framework’ for understanding the environmental conditions for high impact student entrepreneurship was developed when similarities to between Turner’s frontier and the campus, each in its ‘idealized’ state. Both ecosystems are observed to offer assets, liberty, and diversity of populations and both appear to support innovative

people, their ideas and actions, and the products, organizations, and cultural influences they introduce, if they are value producing.

While data was not collected to test the ‘Frontier Framework’, it was proposed as part of this research to provide a conceptual backdrop and organizing principle for understanding the characteristics of environments from which entrepreneurs emerge as well as their interactions with the environment. Portions of the data suggest that a frontier framework may be appropriate but variables targeting the concepts of diversity, liberty (freedom on campus), and available assets are necessary. These opportunities will be discussed in the coming section on future research.

The frontier idea has provided vivid imagery for policy makers, analysts, and the general public for centuries. Its usage, while not always precise and bounded, communicates change, newness, and opportunity. Recognizing and preparing for change is the hallmark of good policy and this framework offers a simple organizational structure intended to help policy makers, investors, students, faculty, and others better understand environments that support innovative people and their efforts.

Table 8.1: Turner's frontier and the modern US college and university

Frontier attribute	Turner's US frontier	Modern US university and college
Available assets	Land, mineral wealth, water, game, burgeoning populations, growing transportation, communication and financial networks	Course, extracurricular, peers, faculty, alumni, networks to other institutions, research, labs and libraries
Liberty (freedom and choice)	No early governments, no established social institutions or conventions, no incumbent economic powers	Dispersed decision making for administration and faculty, freedom of research and field of study, extra-curricular choices, part-time/full-time/executive options, transfer system, egalitarian systems
Diverse populations	Changed over time, nationality and place of birth, wealth, method of arrival, fluid social status	Ethnicity, place of birth, field of study, age, education levels, political ideologies, regenerating youthful populations, visiting scholars and students; full time/part time; adjuncts/research faculty/teaching faculty; networks beyond campus, alumni

8.3 Summary of Research

This research set out to explore the population of high growth student startups and better understand the role, if any, the campus, its assets, and structures played in the firm formation process. This research presents data and exploratory analysis of student founders, firms and host institutions. The growing phenomena of high growth student startups is complex and varied but has produced many of the most impactful organizations and people of the past 50 years. The 2014 *Forbes* billionaires list highlights student entrepreneur abilities and impact and the recent study by Henrekson and Sanandaji (2013) argues that billionaire entrepreneurs are a more reliable indicator of

high impact entrepreneurship than previous measures such as income, self-employment, or indexes like the *Global Entrepreneurship Monitor's Total Entrepreneurial Activity*.⁴⁰

With so many high growth student founders, colleagues, and investors on the *Forbes* list, a fuller understanding of the campus and its potential impact on these founders and firms is of great potential value.

The case study of the University of Chicago provided qualitative data and analysis of a very high research activity university and the growth of entrepreneurship among its student body and programs. The case explored the experiences of the business school and its entrepreneurial programs and processes, the work and paths of student founders and firms, campus connections to individuals and organizations off campus, and the central platform on campus for student entrepreneurship: The New Venture Challenge. The case is not generalizable, but does support a deeper conception of the student startup phenomena and points to various campus features and assets that appear to support student founders.

The case suggests that experiential entrepreneurship curriculum can support the firm formation process of students on campus. The case of the University of Chicago highlights the role of institutional culture and leadership as well as alumni support. Mostly importantly, student demand and leadership is evident in the Chicago case. The

⁴⁰ The Global Entrepreneurship Monitor has attempted to index and compare 'entrepreneurial activity' globally for decades. It collects a variety of statistics from interviews, surveys, and database that attempt to show various elements of each countries entrepreneurial economy. Critics emerge when countries less developed countries such as Zaire come out ahead of developed nations such as the United States. Henreksen and Sanandaji's billionaire entrepreneur approach is an alternative to assessing innovative, high impact entrepreneurship around the world. Acs and Szerb (2011) introduced the Global Entrepreneurship and Development Index, an index intended to improve over GEM's measures by focusing on innovation rather than all new firms and founders.

evolution of processes and tools for founder and firm development and extensive engagement of off-campus human and institutional partners emerged as clear themes in the case. Broad ranging efforts for engaging students, their networks, institutions and venture professionals in the region was a clear theme of this campus and acknowledged as key to the success of many student entrepreneurs.

The case complies with the historic trend of responsive universities in the US. The ability to alter and create new programs and offerings in the face of student and economic demands has been the hallmark of the modern American research university for over a century (Slosson, 1910; Rudolph, 1990; Thelin, 2004; Cole, 2009).

The University of Chicago, its students, its business school, and network of partners support Kerr's (1991) construct of a multiversity and its ability to respond in the face of the multitude of demands placed it. The case presents specific data on the rapid development of assets on campus, expanded choices, and networks of diverse people and organizations for students interested in pursuing entrepreneurship.

The construction and exploratory analysis of a database of student founders, their firms, and schools was completed and presented. While basic, the database provides initial boundaries for defining high growth student firms and a first look at an early sample from a population of firms, founders, and processes researchers and policy makers know little about. The database, with the inclusion of variables attempting to capture founders' and firms' startup processes on campus, suggests that a broad range of assets and resources are used by the founders of high growth student firms. This supports

a ‘frontier’ like environment for the entrepreneurially driven among students at US research campuses.

Different campuses offer different available assets, levels of liberty (choice), and diversity of people and networks, just as each of the US frontiers presented a different environment and set of opportunities. In each environment, different participants with different approaches and skillsets achieve a variety of outcomes. The data collected supports the notion that different campus offer different attributes and are congruent with Gartner’s imagery of entrepreneurship as a kaleidoscope based multiple influences, including the environment.

A modest introduction of five campus pathways based on themes in the data, that some students appear take to high growth entrepreneurship. Qualitative and quantitative data were used for the development of the pathways. Though preliminary and exploratory, the suggested pathways are another tool for understanding startup process of high growth student firms and the impact that the campus environment may have. The data collected suggests that many student founders travel more than one path while on campus.

The quantitative data and exploratory analysis suggest certain homogeneity among the founders and firms that have emerged from the sample of predominantly very high research activity and high research activity universities. The qualitative data, from the case campus and others, highlights that among the schools that have produced multiple high growth firms, differences in approaches, processes and students engaged is apparent. However, professional schools and programs such as business, engineering, and

computer science are the fields of choice for a majority of founders. Institutional history, regional ties, and leadership shape each school's path and output in particular ways.

Overall, both the qualitative and quantitative data suggest that student participation in high growth entrepreneurship is recent and has grown over the past 20 years. On some levels, this suggests that the 'best and brightest' at the top universities have begun to focus on high growth entrepreneurship as a career path rather than more 'traditional' options and merely reflect opportunities for wealth creation in the entrepreneurial economy. This change has large potential implications for higher education, economic growth, and other important policy domains.

The data shows a small role for university owned intellectual property and suggests that women have barely engaged founding high growth firms while on campus and demands more investigation given the growth of entrepreneurship on campus and its role in society more broadly. Social ventures have become a rising part of the phenomena over the past 10 years as has crowdfunding and appearances on television.

Finally, this research proposes a basic university entrepreneurship framework modeled on Frederick Jackson Turner's *Significance of the Frontier in American History*. Turner's 'frontier' ideal of a space full of liberty, resources, and diverse people innovating appears congruent with the data collected in the research, however exploratory. The 'frontier framework' is offered as tool for better understanding and assessing environments that have been supportive of some of the most innovative and impactful entrepreneurs in the world. This research suggests that high growth student founders are impacted by a campus environment of freedom of choice (liberty), diverse

people and networks, and available assets such as those that the campuses of very high research activity and high research activity offer.

8.4 Summary of Contributions

This dissertation makes contributions to the fields of entrepreneurship, economic growth, the evolution of higher education, and entrepreneurship education. First, this research provides qualitative and quantitative data on a specific and little understood segment of high growth firms. The database, however flawed, provides a needed starting point for measuring the population of high growth firms created by students. This work expands our understanding of the startup processes of successful firms including basic information on founders, locations, and industries, but also importantly, data related to their actions, decisions and interactions with their environment.

The quantitative data in this research offers a rich contribution into the behaviors, options and choices of high growth founders and firms begun on campus. This research uses Gartner's (1985, 1988) model for multiple levels of analysis when researching new startup processes and new firm formation. This work provides data and exploratory analysis that impact multiple parts of the startup process literature discussed in chapter 2. Data in the case and the proposed campus pathways highlight and expand different lines for understanding and exploring startup processes of new firms and the potential impact of their environment.

This work expands the body of knowledge on entrepreneurship education, entrepreneurship programs, and entrepreneurship centers by beginning to uncover how student entrepreneurs actually interact with various campus structures, assets, and

opportunities. As discussed in Chapter 2, thousands of colleges and universities now teach entrepreneurship; the limited data in this research suggests only a few consistently support high growth student firms and it's not clear how much impact the programs and offerings have. The data and methods suggest opportunities for a richer understanding and assessment of the effectiveness of recently added entrepreneurship education.

The qualitative and quantitative data improve the literature on the evolution of higher education including a focused look at business and entrepreneurship education, and the choices and decisions made by students on campuses offerings such programs and opportunities.

The database provides a multilevel view of the interaction of individuals, firms, and campuses in order to better understand the role campus assets in the creation of high growth student startups.

The case study provides an in depth look at startup processes developed at the University of Chicago and led by its business school community. The programming appears to have yielded multiple high growth firms and a regular process for supporting founders on campus.

The case study and campus pathways presented offer specific data on how various campus offerings (from classes and student associations to accelerators and alumni) are used or not by high growth founders. The qualitative data provides basic organizing themes for understanding entrepreneurship programs and processes of founders based on the actions and events that led them to high growth entrepreneurship. This dissertation has provided data and exploratory analysis suggesting high growth student founders often

use campus assets during the firm formation process. The quantitative and qualitative data suggest that colleges and universities have provided environments, assets, and in some cases specific processes that support the development of high growth firms by students on campus.

This research extends our understanding of the role US higher education in the entrepreneurial economy where high growth firms are expected to create jobs and broader societal wealth. The case, pathways, and database suggest that for entrepreneurially oriented students, the modern US research university has structures, opportunities, and talent and networks to support the development of high growth firms by students. This limited evidence suggests there continue to be areas of flexibility and responsiveness in modern universities, and governance, leadership, and funding to meet the needs of students and society at large.

Much has been written on the role of universities in the entrepreneurial economy, most often covering technological funding, research parks and incubators, commercialization of intellectual property, and research faculty and university-spinoffs. This research suggests and provides data that it is often undergraduate or professional students with no connections to the *triple helix* or university owned intellectual property and labs that create many of most innovative and impactful in the world, creating incredible societal wealth along the way. Also, by opening a new line of inquiry into student high growth startups, future measures and theories related to higher education, startups and economic development should include student entrepreneurs and the campus structures and assets they engage.

This research supports authors such as Henrekson and Sanandaji (2013) and Acs (2013) that explore the meaning and influence of billionaires, especially entrepreneurs. Given the importance of such wealth creation in their theories, this research is of great importance as it illuminates, the people, processes, and places associated with the birth of so much impactful wealth.

Finally, while data was not collected specifically trying to measure the ‘frontier’ attributes of the campus, the data can be interpreted to suggest that the campus does offer freedom to create innovative ventures, a variety of assets available to support such efforts, and people with different backgrounds, skillsets, and goals engaging in such pursuits.

This research only explores one potential outcome of the university environment in the entrepreneurial economy. It is unclear what positive benefits, if any, accrue to the majority of participants on campus, even those that participate in innovation and entrepreneurship programming but do not participate in the founding of a high growth firm. This issue will be included in the areas for future research section.

8.5 Opportunities for Future Research

This research makes direct and innovative contributions to the academic, policy, and entrepreneurship communities by providing data and exploratory analysis on an impactful, but little studied population of founders, firms and their early startup processes on US campuses. The samples used for this dissertation were limited in reach and scope and a more thorough and systematic collection of data on founders, firms, universities and their interactions is needed and is the next step for this research agenda.

Sources and populations would be broadened in future research and would include a survey component for all institutions classified as 15, 16, and 17 in the Carnegie Classification (all of the research classifications). As of 2010, there are 297 such schools, 107 of which are in the 15, or very high research activity level universities. Among these 107 there is diversity, they range from the ‘elite’ schools such as the University of Chicago and Harvard University to large state universities such as Virginia Commonwealth University and Oregon State University (Carnegie Classification, 2010). There would also have to be an addition of certain special purpose schools such as Babson College.

In addition to collecting additional university, startup and founder observations and expanding the database, variables attempting to measure student interactions with campus assets would be refined and added. Specific variables on founder coursework, business competition participation, clubs and athletic team participation, and relationships with faculty and off campus communities would be included. Additionally, variables would be collected and developed in an attempt to measure the ‘frontier’ climate of university and college campuses. These variables would attempt to capture liberty (freedom/choice), diversity of people and networks, and available assets. Variables such as number of schools and majors offered on a campus, foreign born students and faculty, and research budgets and campus populations could be employed in attempting to measure the ‘frontier’ attributes of US colleges and universities.

Further data collection on the schools and founders would expand our understanding of specific universities, entrepreneurship programs, centers, and

coursework. Moreover it would allow for further understanding and data useful in exploring economic development impact of student entrepreneurs following the lines of inquiry presented in earlier parts of this research.

Additional cases studies are needed as comparative research will better illuminate specific university actions, paradigms and programs that the population of universities in question have or have not put into place in recent years that influence the phenomena of high growth student startups.

The expanded collection of quantitative and qualitative data would also allow for refinement and expansion of the proposed campus pathways and further opportunities for understanding the student startup processes that take place in university environments. Understanding startup processes and environments for high growth entrepreneurship is an important line of inquiry in the field with much debate and continued need for clarity. More data on founders and their actions, decisions, and campus interactions would be beneficial.

With the development of a larger data set, correlations between founders, firms, and universities can be explored. Specific hypotheses could be proposed and tested and theories on universities and entrepreneurship can be further developed. Additionally, relationships between firms, founders, and local regional conditions, from venture funding and total populations to industry representation and immigrant populations will be investigated.

The campus pathways data and themes could form the basis for further research and data collected. For example, a basic hypothesis such as, there are five types of high

growth student startup paths on campus, could be tested. It would also be of interest to track the firms and founders after they depart campus. Do firms stay in the city or region where important parts of the firm formation process began? If the firm moved, what was the reason? This line of inquiry requires further collection of data, would including interviews and surveys.

The question of gender equity on campus and in high growth entrepreneurship was glaring though the data collected was limited. This issue demands further investigation. An expanded sample as outlined above would allow for greater analysis and understanding of the early findings showing few women participate in high growth student entrepreneurship. With more data, including qualitative data, comparisons between entrepreneurship participation and STEM participation on campus can be compared to the broader entrepreneurial economy.

The connection between philanthropy and high growth student firms is also worth further data collection and hypothesis development. The role of alumni funders in the development of entrepreneurship programs is obvious in the data collected and various hypotheses around the campus, high growth firms, and entrepreneurship programs can be developed.

Additionally, while data was not collected, it was clear from the qualitative data and field work that immigrants and children of immigrants are active the world of high growth student startups. There has been a great deal of research on immigrant entrepreneurs and international students attending US institutions of higher education,

and future research would blend these two lines of inquiry and focus on immigrant student entrepreneurs at US colleges and universities.

Finally, further efforts developing the proposed ‘frontier framework’ are worth expending as university leaders, policy makers, and regional leadership continue to have great expectations of the higher education as a key social and economic institution (Cole, 2009; Thorp and Goldstein, 2010; Selingo, 2013). With the expanded dataset and improved variables measuring diversity, openness, and accessible assets on campus, fuller investigations into the ‘frontier’ climate for entrepreneurs and innovators at US colleges and universities can begin. The frontier framework may be also employed to compare and contrast the campus with other ecosystems that appear to support innovation and entrepreneurship.

Many of the potential avenues of research offered above can be developed and pursued through the collection of additional data and the introduction of additional variables. In part or in whole, the opportunities for future research outlined above can offer greater understanding of the complex social phenomena of students creating high growth firms on campus.

8.6 Conclusion

The social phenomena of students creating high growth firms has been impacting US campuses and economy and society more broadly for decades. From Microsoft and Under Armour to FedEx and Teach for America, student founders have contributed greatly across a host of metrics.

This research provides a historical framework that gives context to the phenomena and the quantitative data collected provides data on an important segment of high growth firms. This research also produced a case study to explore how students use campuses to identify opportunities and launch high growth firms as well as highlighting how students, higher education leaders and philanthropists responded to the demands of the entrepreneurial economy. The concept developed and the data collected have important policy implications for job growth and quality of life.

APPENDIX

Appendix A.1: Sources of data included in the database

- AngelList – AngelList is an online platform that connects startups to investors. Similar to Crunchbase, the site makes a great deal of information available to the public. Firms, founders and investors submit information about firms, founders and investors. Similar to many online social networks, AngelList allows registered users to ‘follow’ other users and track their activities.
<http://www.angel.co>
- Crunchbase – Crunchbase on a website that provides data on startups, founders, and investors. The site is ‘crowd sourced,’ meaning that members of the public submit information and the ‘crowd’ confirms or changes the data. Data on financing, founders, education, and accelerator participation is available on Crunchbase. Sources and citations for information are the norm on the Crunchbase listings and led the researcher to SEC filings, company presentations, and media coverage of student founders, their firms, and schools.
<http://www.crunchbase.com>
- Carnegie Classification of Institutions of Higher Education (CF) – Since 1970, the Carnegie Classification has been a standard for “recognizing and describing institutional diversity in U.S. higher education.” The database is based on empirical data on colleges and universities. The Carnegie Foundation funds and manages the project and data. From size and setting to the most recent release and the version used in this study was 2010.
<http://classifications.carnegiefoundation.org/>
- LinkedIn – LinkedIn in a professional social networking site that allows users to post information about their education, professional experience, and skill sets. A vast majority of the founders in the database have LinkedIn profiles that provide information on their schools, fields of study, year of graduation, as well as information on their firms. <http://www.linkedin.com>
- North American Industry Classification System (NAICS) is the standard used by Federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy. NAICS was developed under the auspices of the Office of Management and Budget (OMB), and adopted in 1997 to replace the Standard Industrial Classification (SIC) system. It was developed jointly by the U.S. Economic Classification Policy Committee (ECPC), Statistics Canada, and Mexico's Instituto Nacional de Estadística y Geografía, to allow for a high level of comparability in business statistics among the North American countries. This

official U.S. Government Web site provides the latest information on plans for NAICS revisions, as well as access to various NAICS reference files and tools.

The twenty, two digit sector codes of 2007 NAIC

11	Agriculture, Forestry, Fishing and Hunting
21	Mining, Quarrying, and Oil and Gas Extraction
22	Utilities
23	Construction
31-33	Manufacturing
42	Wholesale Trade
44-45	Retail Trade
48-49	Transportation and Warehousing
51	Information
52	Finance and Insurance
53	Real Estate and Rental and Leasing
54	Professional, Scientific, and Technical Services
55	Management of Companies and Enterprises
56	Administrative and Support and Waste Management and Remediation Services
61	Educational Services
62	Health Care and Social Assistance
71	Arts, Entertainment, and Recreation
72	Accommodation and Food Services
81	Other Services (except Public Administration)
92	Public Administration

- US Department of Education's Integrated Postsecondary Education Data System (IPEDS) – IPEDS is the primary resource for data on colleges, universities, and technical and vocational postsecondary institutions in the United States. IPEDS is managed and provided by the National Center for Education Statistics, part of the United States Department of Education.
- Various Media Outlets – High growth student founders, their firms, universities, and exploits have been featured in outlets ranging the business press (eg Business Week, Entrepreneur, Inc. Magazine) and national media (eg New York Times, Wall Street Journal, Washington Post) to local media and pure online outlets. These sources provide data on everything from founders' schools and fields of study to revenues and financing deals
- Interviews – 32 semi-structured, in depth interviews, lasting between 15 minutes and 2 hours, were completed by the author a part of this research; additionally,

publicly available interviews and presentations by founders and others provided data for this study.

- Participant Observation / Field Work – From business plan competitions and entrepreneurship club meetings to regional entrepreneurship events and accelerator visits, data on high growth student firms, their founders and schools has been gathered through various qualitative methods. Conversations and short interviews with more than 50 informants and collection of data also occurred via these techniques.

Select high growth student startup variable labels

Variable	Description/Label	Source(s)
SOCENT	Binary variable (0=no, 1=yes); attempts to capture whether student founders, teams included social impact in original business model during opportunity identification and new firm formation processes	Various: company website(s), media outlets, blogs, social media, crowd sourced sites, interviews, document analysis, ethnographic observation
CAMPUS ASSET	Binary variable (0=no, 1=yes); attempts to capture whether student founders, teams used campus assets during opportunity identification/firm formation process on campus	Various: company website(s), media outlets, blogs, social media, crowd sourced sites, interviews, document analysis, ethnographic observation
CAMPUS PILOT	Binary variable (0=no, 1=yes); attempts to capture whether student founder/teams completed a pilot version of product/service on campus while students	Various: company website(s), media outlets, blogs, social media, crowd sourced sites, interviews, document analysis, ethnographic observation

Variable	Description/Label	Source(s)
CAMPUS MARKET	Binary variable (0=no, 1=yes); attempts to capture whether student founders, teams targeted campus markets while on campus	Various: company website(s), media outlets, blogs, social media, crowd sourced sites, interviews, document analysis, ethnographic observation
Accelerator	Binary variable (0=no, 1=yes); captures whether student founders/teams participated in an accelerator program, no-matter the sponsor (e.g. university, regional business group, non-profit)	Various: company website(s), media outlets, blogs, social media, crowd sourced sites, interviews, document analysis, ethnographic observation
Angel/Seed	Binary variable (0=no, 1=yes); capture whether student founders, teams received angel or seed financing	Various: company website(s), media outlets, blogs, social media, crowd sourced sites, interviews, document analysis, ethnographic observation
Venture Capital	Binary variable (0=no, 1=yes); attempts to capture whether student founders, teams received venture capital financing	Various: company website(s), media outlets, blogs, social media, crowd sourced sites, interviews, document analysis, ethnographic observation
Sale	Binary variable (0=no, 1=yes); did student founders, teams sell their firm	Various: company website(s), media outlets, blogs, social media, crowd sourced sites, interviews, document analysis, ethnographic observation

Variable	Description/Label	Source(s)
Merger	Binary variable (0=no, 1=yes); did student founders, teams merged their firm with another	Various: company website(s), media outlets, blogs, social media, crowd sourced sites, interviews, document analysis, ethnographic observation
IPO	Binary variable (0=no, 1=yes); did student created firms complete and initial public offering (IPO)	Various: company website(s), media outlets, blogs, social media, crowd sourced sites, interviews, document analysis, ethnographic observation
Govt Grant	Binary variable (0=no, 1=yes); attempts to capture whether student founders, teams received funding in the form of a government grant	Various: company website(s), media outlets, blogs, social media, crowd sourced sites, interviews, document analysis, ethnographic observation

CCBasic2010 – Carnegie Classification – Carnegie Foundation 2010

0	(Not classified)
1	Assoc/Pub-R-S: Associate's--Public Rural-serving Small
2	Assoc/Pub-R-M: Associate's--Public Rural-serving Medium
3	Assoc/Pub-R-L: Associate's--Public Rural-serving Large
4	Assoc/Pub-S-SC: Associate's--Public Suburban-serving Single Campus
5	Assoc/Pub-S-MC: Associate's--Public Suburban-serving Multicampus
6	Assoc/Pub-U-SC: Associate's--Public Urban-serving Single Campus
7	Assoc/Pub-U-MC: Associate's--Public Urban-serving Multicampus
8	Assoc/Pub-Spec: Associate's--Public Special Use
9	Assoc/PrivNFP: Associate's--Private Not-for-profit
10	Assoc/PrivFP: Associate's--Private For-profit
11	Assoc/Pub2in4: Associate's--Public 2-year colleges under 4-year universities
12	Assoc/Pub4: Associate's--Public 4-year Primarily Associate's
13	Assoc/PrivNFP4: Associate's--Private Not-for-profit 4-year Primarily Associate's
15	RU/VH: Research Universities (very high research activity)
16	RU/H: Research Universities (high research activity)

17	DRU: Doctoral/Research Universities	
18	Master's L: Master's Colleges and Universities (larger programs)	
19	Master's M: Master's Colleges and Universities (medium programs)	
20	Master's S: Master's Colleges and Universities (smaller programs)	
21	Bac/A&S: Baccalaureate Colleges--Arts & Sciences	
22	Bac/Diverse: Baccalaureate Colleges--Diverse Fields	
23	Bac/Assoc: Baccalaureate/Associate's Colleges	
24	Spec/Faith: Special Focus Institutions--Theological seminaries, Bible colleges, and other faith-related institutions	
25	Spec/Med: Special Focus Institutions--Medical schools and medical centers	
26	Spec/Health: Special Focus Institutions--Other health professions schools	
27	Spec/Engg: Special Focus Institutions--Schools of engineering	
28	Spec/Tech: Special Focus Institutions--Other technology-related schools	
29	Spec/Bus: Special Focus Institutions--Schools of business and management	
30	Spec/Arts: Special Focus Institutions--Schools of art, music, and design	
31	Spec/Law: Special Focus Institutions--Schools of law	
32	Spec/Other: Special Focus Institutions--Other special-focus institutions	
33	Tribal: Tribal Colleges	

UGPROFILE2010 – Undergraduate Profile 2010 – Carnegie Foundation

-2	(Special focus institution)
-1	(Not applicable)
0	(Not classified)
1	PT2: Higher part-time two-year
2	Mix2: Mixed part/full-time two-year
3	MFT2: Medium full-time two-year
4	FT2: Higher full-time two-year
5	PT4: Higher part-time four-year
6	MFT4/I: Medium full-time four-year, inclusive
7	MFT4/S/LTI: Medium full-time four-year, selective, lower transfer-in
8	MFT4/S/HTI: Medium full-time four-year, selective, higher transfer-in
9	FT4/I: Full-time four-year, inclusive
10	FT4/S/LTI: Full-time four-year, selective, lower transfer-in
11	FT4/S/HTI: Full-time four-year, selective, higher transfer-in
12	FT4/MS/LTI: Full-time four-year, more selective, lower transfer-in
13	FT4/MS/HTI: Full-time four-year, more selective, higher transfer-in

ENROLPROF2010 – Enrollment Profile 2010 – Carnegie Foundation 2010

0	(Not classified)
1	ExU2: Exclusively undergraduate two-year
2	ExU4: Exclusively undergraduate four-year
3	VHU: Very high undergraduate
4	HU: High undergraduate
5	MU: Majority undergraduate
6	MGP: Majority graduate/professional
7	ExGP: Exclusively graduate/professional

CCSIZE SETTING – Size and Setting – Carnegie Foundation

-2	(Special focus institution)
-1	(Not applicable)
0	(Not classified)
1	VS2: Very small two-year
2	S2: Small two-year
3	M2: Medium two-year
4	L2: Large two-year
5	VL2: Very large two-year
6	VS4/NR: Very small four-year, primarily nonresidential
7	VS4/R: Very small four-year, primarily residential
8	VS4/HR: Very small four-year, highly residential
9	S4/NR: Small four-year, primarily nonresidential
10	S4/R: Small four-year, primarily residential
11	S4/HR: Small four-year, highly residential
12	M4/NR: Medium four-year, primarily nonresidential
13	M4/R: Medium four-year, primarily residential
14	M4/HR: Medium four-year, highly residential
15	L4/NR: Large four-year, primarily nonresidential
16	L4/R: Large four-year, primarily residential
17	L4/HR: Large four-year, highly residential
18	ExGP: Exclusively graduate/professional

LOCALE – Degree of Urbanization -- IPEDS

-3	{Not available}
11	City Large
12	City Midsize
13	City Small
21	Suburb Large
22	Suburb Midsize
23	Suburb Small
31	Town Fringe
32	Town Distant
33	Town Remote
41	Rural Fringe
42	Rural Distant
43	Rural Remote

Appendix A.2: Information on Universities and Colleges in the Database**Colleges and universities in database, with number firms**

Name	State	Basic 2010	Firms
University of Arizona	AZ	15	1
Babson College	MA	29	5
Bentley University	MA	18	1
Brandeis University	MA	15	1
Boston College	MA	16	1
Boston University	MA	15	2
Brigham Young University	UT	16	1
University of California-Berkeley	CA	15	2
University of California-Santa Barbara	CA	15	3
Carnegie Mellon University	PA	15	1
Chapman University	CA	18	1
Champlain College	VT	22	1
University of Chicago	IL	15	8
Columbia University in the City of New York	NY	15	4
Colorado State University	CO	15	1
Cornell University	NY	15	4
Dartmouth College	NH	15	1
Duke University	NC	15	4
University of Florida	FL	15	2

Name	State	Basic 2010	Firms
Florida State University	FL	15	1
George Mason University	VA	16	1
Georgetown University	DC	15	1
Harvard University	MA	15	7
University of Houston	TX	15	1
University of Illinois at Urbana-Champaign	IL	15	1
Johns Hopkins University	MD	15	1
Lehigh University	PA	16	1
University of Maryland - College Park	MD	15	9
University of Massachusetts Amherst	MA	15	1
Massachusetts Institute of Technology	MA	15	1
University of Miami	FL	16	1
University of Michigan - Ann Arbor	MI	15	4
University of Missouri - Columbia	MO	15	1
New York University	NY	15	2
University of North Carolina at Chapel Hill	NC	15	1
North Carolina State University at Raleigh	NC	15	1
University of Northern Colorado	CO	17	1
Northeastern University	MA	16	2
University of Notre Dame	IN	15	1
University of Oklahoma Norman Campus	OK	15	1
University of Pennsylvania	PA	15	8
Pennsylvania State University-Main Campus	PA	15	1
Pepperdine University	CA	17	2
Princeton University	NJ	15	2
University of St Thomas	MN	17	1
University of Southern California	CA	15	2
Stanford University	CA	15	6
Stonehill College	MA	21	1
Syracuse University	NY	16	1
Texas Christian University	TX	17	1
The University of Texas at Austin	TX	15	2
Tulane University of Louisiana	LA	15	1
University of Utah	UT	15	1
Vanderbilt University	TN	15	1
University of Virginia - Main Campus	VA	15	1

Name	State	Basic 2010	Firms
Virginia Polytechnic Institute and State University	VA	15	1
Williams College	MA	21	1
Wesleyan University	CT	21	1
University of Wisconsin-Madison	WI	15	1
Yale University	CT	15	7

Appendix A.3: Select Data on Institutions with 3 or more firms in the database

School	Size and Setting	Total Enrollment	Total Faculty	Enrollment Profile	Masters Total	Doctoral Total	Research Doctorate in STEM	STEM Expenditures
University of Pennsylvania	Large 4 year, highly residential	24,599	2,132	Majority Graduate and Professional	3,087	544	272	670,401
University of Chicago	Large 4 year, highly residential	15,094	2,122	Majority Graduate and Professional	2,508	366	149	348,086
Harvard University	Large 4 year, highly residential	27,651	1,991	Majority Graduate and Professional	3,557	646	262	421,725
Yale University	Large 4 year, highly residential	11,593	2,870	Majority Graduate and Professional	1,409	390	164	476,617
University of Maryland	Large 4 year, highly residential	37,195	2,986	High Undergraduate	2,157	577	298	386,483
Stanford University	Large 4 year, highly residential	18,498	1,825	Majority Graduate and Professional	2,004	661	435	663,228
Babson College	Special Focus Institution	3,445	306	Majority Undergraduate	672	0	0	0
Columbia University	Large 4 year, highly residential	24,230	1,991	Majority Graduate and Professional	3,557	646	262	421,725
Cornell University	Large 4 year, highly residential	20,633	1,783	Majority Undergraduate	1,800	516	319	440,013
Duke University	Large 4 year, highly residential	14,350	3,394	Majority Graduate and Professional	1,555	333	167	741,191
University of Michigan	Large 4 year, highly residential	41,674	5,587	Majority Undergraduate	3,479	842	490	755,966
University of California Santa Barbara	Large 4 year, highly residential	22,850	905	High Undergraduate	611	347	176	187,362

Appendix A.4: Semi-structured interview informants

Informant	Date	Method
Benz, EreK	7/26/2011	Face-to-face at firm's offices
Botwick-Ries, David	11/18/2011	Face-to-face on campus
Crapuchettes, Dominic	8/8/2011	Face-to-face at firms offices
Curran, Will	3/23/2012	Face-to-face at campus incubator
Epstein, Asher	8/30/2011	Face-to-face on campus
Goldman, Seth	8/17/2011	Phone
Goozh, Adam	6/28/2011	Face-to-face at informant's home
Friedman, Nick	10/05/2011	Skype
Harper, Sean	07/25/2011	Face-to-face at shared offices of Sandbox Industries
Henikoff, Troy	7/26/2011	Face-to-face at eXcelerate labs, now TechStars Chicago
Johnson, Bryan	7/25/2011	Phone
Kaplan, Edward L.	7/14/2011	Phone
Kaplan, Steven N.	7/27/2011	Face-to-face on campus
Khokar, Umar	6/6/2013	Skype
Labman, Brandon	8/04/2011	Face-to-face at firm offices
Lamone, Rudy	8/20/2011	Face-to-face on campus
Lee, Andrew	4/23/2012	Skype
Moore, Tom	8/04/2011	Face-to-face at firm offices
Nalebluff, Barry	7/20/2011	Phone
Nicholson, Dan	7/26/2011	Face-to-face at firm offices
Palermo, Gabrielle	3/23/2012	Face-to-face at campus incubator
Palimtori, Sattish	8/8/2011	Face-to-face at firm offices
Scwartz, Bob	7/20/2011	Phone
Soliman, Omar	10/21/2011	Skype
Stopper, Avi	8/16/2011	Phone, met at visit to campus incubator
Tyler, Clay	3/23/2012	Face-to-face at campus incubator
VanWagner, Adam	4/02/2014	Phone
Walters, Billy	3/23/2012	Face-to-face at campus incubator
Weinblatt, Micha	8/10/2011	Face-to-face at neutral office
Weiner, Phil	6/14/2013	Skype with informant in co-working space in San Francisco
Weiss, Ira	7/22/2011	Phone

Zell, Sam	7/21/2011	Phone
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Appendix A.5: Ethnographic observation and fieldwork completed

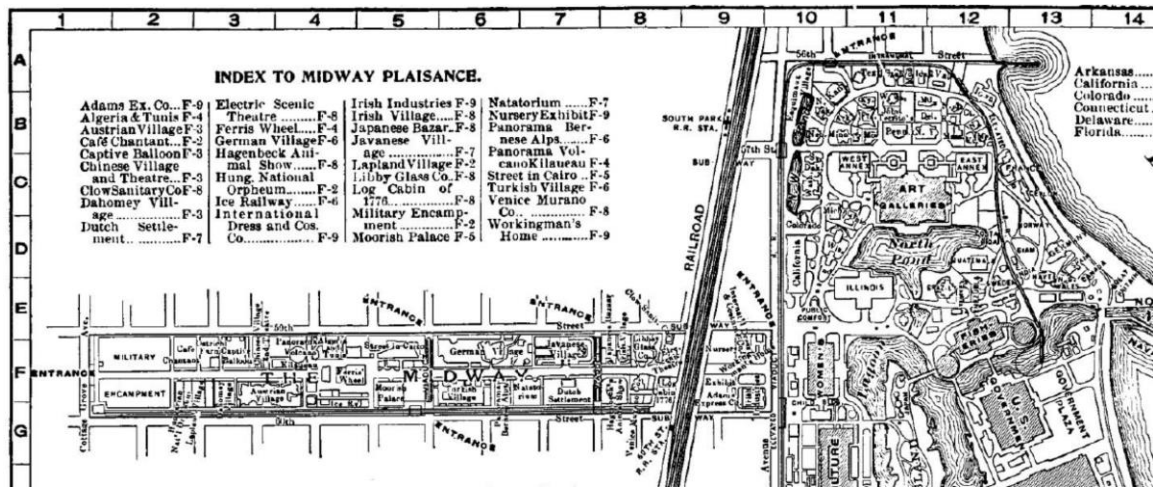
Event	School or University	Dates	Summary
2011 Cupid's Cup Business Competition attendance	University of Maryland – College Park	March 2011	Hosted by Dingman Center for Entrepreneurship, pitches, speeches by Kevin Plank, and others; Showcase of over 30 firms related to UMD
ASU's Skysong Innovation Campus	Arizona State University	March 2012	Visit and tour of 120,000 innovation center managed by ASU; included visit to student accelerator
eXcelerate Labs Chicago	University of Chicago	July 2011	Tour of leading venture accelerator in Midwest, now part of TechStars network; met director, multiple founders, and representatives of various Chicago institutions
Pitch Dingman	University of Maryland	Sept 2011	Watched four pitches from a variety of University of Maryland during each visit. Pitches are followed by question and answer with judges. Cash prizes are awarded, including an audience choice award. Typically standing room only.
Arch Technologies Ventures Student Incubator	University of Chicago	July 2011	Located in Polsky Center for Entrepreneurship and Innovation; space for student firms and NVC winners and participants; met multiple founders/firms and observed workspace/style; met Polsky staff; observed center's physical presence and location within Harper Center and the broader University of Chicago campus

Event	School or University	Dates	Summary
2012 Cupid's Cup Business Competition attendance	University of Maryland-College Park	March 2012	Hosted by Dingman Center for Entrepreneurship; large, sold out event in Stamp Student Union. Features well known speakers, including Steve Case (AOL), Kevin Plank, University President and others. Event also features 30-50 exhibitors from the University of Maryland community.
2012 University of Maryland Business Plan Competition	University of Maryland-College Park	April 2012	Hosted by MTECH and the Clark School of Engineering. Featuring companies pitching ventures with technologies, in some cases IP owned by the university,
2012 Edward L. Kaplan New Venture Challenge	University of Chicago	May 2012	Full day business competition, 10 teams present, over 30 judges, 20 sponsors, Innovation Expo, focus on interaction between judges and teams
2013 Edward L. Kaplan New Venture Challenge	University of Chicago	May 2013	Full day business competition, 10 teams present, over 30 judges, 20 sponsors, Innovation Expo, focus on interaction between judges and teams
2013 Social New Venture Challenge (SNVC)	University of Chicago	May 2013	6 hour event, 6 teams present to 20 judges, focus on interaction between judges and teams

Appendix A.6: Data and Images of the University of Chicago Campus



View of Walker Museum on the University of Chicago Campus in 1893 as world's first Ferris Wheel is being constructed for the 1893 World's Fair.



Part of an 1893 World's Fair Map highlighting the Midway (where the University of Chicago was/is located) and all of the exhibits located there, including the Ferris Wheel, the Turkish Village, and the Log Cabin of 1776.



Stuart Hall, the home of the Booth School of Business before it moved into the Harper Center. 2012.



The Harper Center, home of the Booth School of Business at the University of Chicago. 2012.

Appendix A.7: Data and Images from select founders, firms, and site visits



A judge asks a questions at the 2012 NVC Finals at the University of Chicago's Booth School of Business. More than 30 judges participate in the live finals each year.



Purple Binder, winner of the 2013 Social New Venture Challenge at the University of Chicago. Team members included undergrad liberal arts students and graduate and evening students from the school of social work.



The 2013 Innovation Showcase and New Venture Challenge Awards Ceremony in the atrium of Harper Center of the University of Chicago's Booth School of Business.



Clocky, the Class Project Gone Good, created by Nanda Gauri at MIT. Copyright Nanda Home Inc.



A recent version of Sean Whalen's AlterG Treadmill. Copyright AlterG.

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