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Thank you for your interest in The Journal of Entrepreneurship Education.

Ismet Anitsal
Tennessee Tech University

ENTREPRENEURIAL CULTURE IN INSTITUTIONS OF HIGHER EDUCATION: IMPACT ON ACADEMIC ENTREPRENEURSHIP

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Margaret M. McCarty, Washington State University
Leonard Jessup, University of Arizona

ABSTRACT

As universities promote and implement technology transfer activities, it has become increasingly important for universities to pinpoint university-, college-, and department-specific factors that enable academic technology transfer activities. We prose that within academic institutions a culture of entrepreneurship is the most important factor in generating economic gains from university entrepreneurial activities. We posit that differences in entrepreneurial culture across universities partially accounts for the variations in entrepreneurship outcomes between universities. We further proposed several factors which, when combined, create a culture of entrepreneurship which other universities could model in order to promote academic entrepreneurship.

INTRODUCTION

The challenging task of converting academic research into useful products and services within markets has been the domain of industrial and commercial sectors until recently. It is argued that fostering the culture of willingness to accept risk is crucial for economic advancement (Wonglimpiyarat, 2006). The Bayh-Doyle Act of 1980 spurred growth in academic entrepreneurship activities in universities across the United States (United States Patent and Trademark Office, 2010). In response to such government pressure and industry solicitations, research universities, with those in the United States leading the way, have assumed the additional role of promoting economic development; in pursuit of this goal, intellectual property (IP) from universities is exploited to create high technology companies (Etzkowitz, 2003; Rogers, 1986). This phenomenon is a characteristic of academic entrepreneurship (AE). To be successful in AE, institutions (I) must first possess the capacity to generate IP, (II) should have a technology transfer office (TTO), or a unit that facilitates the technology transfer process, (III) should have at least one entrepreneurship expert to offer functional business knowledge, (IV) should create an *entrepreneurial culture* (EC) and (V) academic entrepreneurs should have access to financial capital. Even though the number of start-ups has been used as a proxy for performance in academic entrepreneurship (Powers & McDougall, 2005), AE is not simply about

the outcome of launching start-ups; it involves activities like invention disclosures and patent filings as precursors, and includes other outcomes such as licensing, joint ventures, consortiums, pooled IP bundling, and so on, that may result from the exploitation of IP. There is evidence that university patenting is growing, but it is heterogeneous across countries and disciplines (Geuna & Nesta, 2006). Differences in EC may account for these variations at the university level; the immense success of the Massachusetts Institute of Technology (MIT) supports this position. Historically, MIT has outperformed other universities in AE and successfully began creating spin-off companies even before the adoption of the Bayh-Doyle Act – a law passed by the U.S. Congress in 1980 that gave control of IP to U.S. universities and small businesses that produced them using government funding.

MIT is thought to have created more spin-offs and contributed to the regional and global economy more than any other university. The reason(s) for MIT's superior performance cannot be attributed solely to their capacity to generate IP, or individually to Criteria I – III and V highlighted above. While MIT is a highly ranked academic institution, there are other universities that surpass it in ranking and unquestionably possess comparable capacity to generate IP. However, MIT had utmost success in converting more of its IP into useful products and processes, using spin-off companies as vehicles to commercialize new technologies. We attribute this success to the EC at MIT which is lacking or underdeveloped at other universities. This EC serves as a source of unparalleled competitive advantage. By definition, any source of competitive advantage should be valuable, rare, inimitable, and non-substitutable (VRIN). The culture of entrepreneurship at MIT has in fact been VRIN, which bestowed it a source of advantage over other academic institutions. Today, other universities have begun to emulate MIT in the area of AE, and while tremendous progress has been made, universities still struggle in this regard, especially in their effort to create an environment that fosters AE; that is, one where the culture of entrepreneurship runs throughout the fabric of the university, creating an environment where entrepreneurial success is simultaneously encouraged and celebrated.

Culture can seriously impact the performance of an organization in industrial sectors. For example, an organization's culture of innovativeness and entrepreneurship has been linked to the development of flexible manufacturing (Gupta & Cawthon, 1996). If a university possesses the necessary resources to successfully create new academic spin-offs but lacks the EC, which is vital to effectively harness the resources for value or venture creation, then it would struggle to create new ventures or realize the other benefits of AE outcomes. Typically, AE begins with faculty members disclosing their invention to the TTO. The disclosures may then be patented, after which it is licensed, sold for cash, exploited to start a company, etcetera. However, scientists must first be stimulated and encouraged to think about how their research might be translatable to markets and then must actively disclose and help to codify their tacit knowledge into valuable patents in order for the benefits of AE to be realized (Sapsalis, van Pottelsberghe de la Potterie, & Navon, 2006). We propose that EC creates the right environment for AE, thus lowering the barrier for value or venture creation in academic institutions as shown in Figure 1 and encouraging professors to invest time into entrepreneurial activities. Unfortunately, measuring EC at any organization is difficult for obvious reasons: EC is complex – it is the resultant of multiple factors, some of which are intangible and not easily identifiable. This paper proposes a multiplexed method to effectively gauge the EC at any academic institution: Does the

institution and/or its units have policies that support AE? Does the institution celebrate its achievements in AE? Has it invested in infrastructure and programs that facilitate AE?

Figure 1

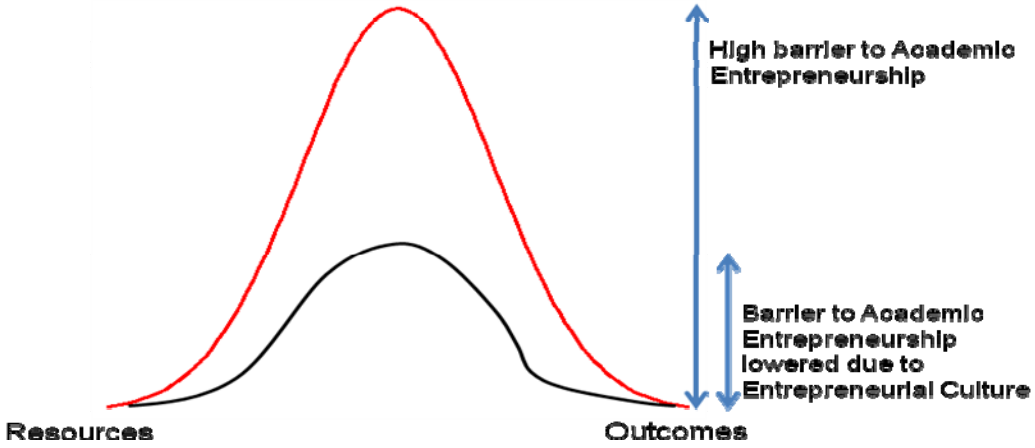


Figure 1: A schematic representation of the barriers to academic entrepreneurship (AE). A high barrier to AE (red) means that more effort would be required to harness resources and convert them into positive (entrepreneurial) outcomes. A lower barrier to AE (black) means that less effort would be required to harness resources and convert them into positive (entrepreneurial) outcomes. A lower barrier should be observed in the presence of entrepreneurial culture.

WHAT IS ENTREPRENEURIAL CULTURE?

EC can be observed at national, regional, and organizational levels. The U.S. has an unparallel EC which provides protection of ideas through patenting and, through bankruptcy law, permission to fail with limited penalty and to try again until success is achieved (Merrifield, 1987). That EC was thought to have led to a national economy driven by innovation that observable nowhere else in the world (Merrifield, 1987). For example, Silicon Valley, California, has become a premier district of technological breakthroughs and advancements. It is populated with venture capitalists as well as both young and seasoned entrepreneurs working in some of the most profitable high technological companies in the world. The energy at Silicon Valley is so unique and inspiring that other governments are trying to "duplicate" the Silicon Valley culture in their countries (English-Lueck, 2002). Silicon Valley is to regions what MIT is to universities; they both share a proud culture of innovation and entrepreneurship.

Culture is a set of shared attitudes, values, goals, and practices which characterizes a group of people. Let us consider the important aspects of this definition and how they relate to the concept of EC. (I) Since it is shared among a group of individuals, culture is a *unifier*. Based on the definition, EC is a culture in which entrepreneurship is embraced by most, if not all, of the members or units within a group; therefore, values pertaining to AE must be shared by people at different levels of the institution's hierarchy. (II) Culture can be *implicit* or *explicit*. Attitudes and values can be implicit; for example, inaction is a non-verbal, passive way of communicating

disinterest, fear, incapacitation, or inability. The implicit aspect of culture makes it elusive for scholars to capture and measure. On the other hand, culture can be assessed based on the practices of the members of a group as well as by analyzing written and verbal communication. (III) Lastly, culture is an *identifier;* both organizations and groups can be characterized by it. In as much as the underlying precursors of culture may be obscured, the explicit actions, on the other hand, can be observed and used to characterize the group in question. Because these expressed "features" occur as a result of the culture within the group, they can be categorized as *indicators of culture*. Some precursory factors, such as geographical location and worldview can cause a group of people to adopt certain values and practices, which in turn may lead to a set of unique actions (or inactions) that could be used to identify the group. Figure 2 is an illustration of the process of evolution of cultural norms, from its precursors to its indicators.

Precursors of EC at an academic institution include internal forces, such as university leadership and faculty willingness to try something new (or faculty orientation), as well as external forces such as government inducements and industry solicitations. These forces can influence any existing culture and may alter the values and practices within the institution, and elicit actions (or inactions) that come to characterize the institution from its members. This paper seeks to identify key indicators of EC within academic institutions that would enable policy makers and investors to readily decipher the level of AE in institutions of higher learning.

Figure 2

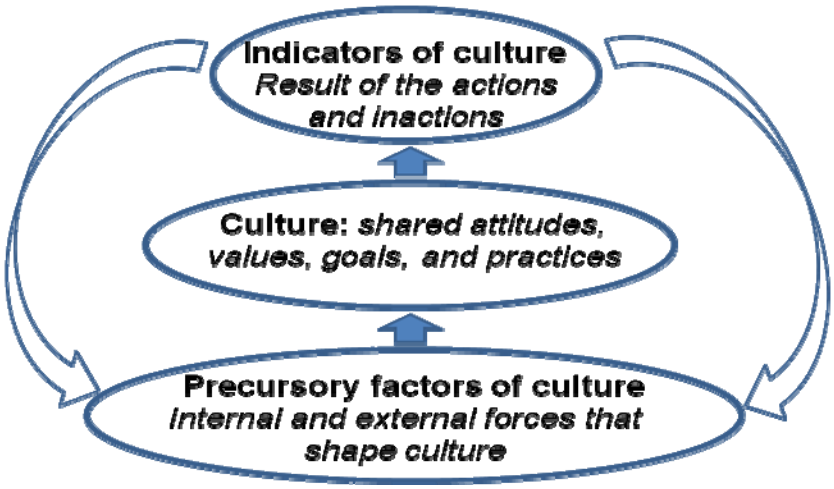


Figure 2:A schematic representation of the evolution of cultural norms, which begins with precursory factors (bottom) that shape the culture of a group. The culture may elicit actions and inactions, which characterizes the group. The actions and inactions, which are indicative of the culture that created them, can feedback into system to serve as precursors, thus reinforcing the culture.

LITERATURE CONTRIBUTION

Identifying the unit of study in AE research is an important first step since scholars can investigate AE at the university, departmental, research group or individual faculty level. However, our literature review discovered no empirical research on the subject of EC at the university level; however, some authors have hinted the importance of EC; notably, Etzkowitz, Webster, Gebhardt, and Terra (2000) coined the term *entrepreneurial university* to describe a university that engages in regional economic development through company and job creation. Others have reported that resources and capacities, as well as institutional, financial, commercial, and human capital differences explained why some universities have more success with spin-off ventures (O'Shea, Allen, Chevalier, & Roche, 2005).

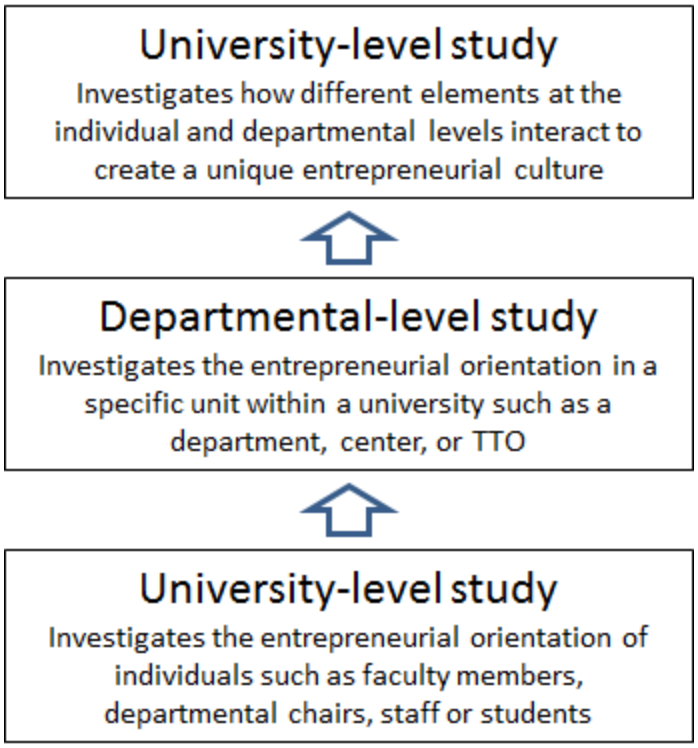
A scale, ENTREP-U, was developed to measure entrepreneurial orientation within a specific department. According to the authors, ENTRE-U consists of four dimensions – research mobilization, unconventionality, industry collaboration, and perception of university policies – that successfully predict department involvement in commercialization activities (Todorovic, McNaughton, & Guild, 2011). Furthermore, research groups within university departments have been likened to 'quasi-firms' because they operate almost as autonomous enterprises within their universities (Etzkowitz, 2003).

At the individual faculty level, investigating the psychology of faculty members helps improve our understanding of the dynamics involved in successful AE. Recently, the concept of academic-entrepreneurial intentions emerged and has been explored to address specific determinants and processes that characterize the emergence of an academic's entrepreneurial intentions (Prodan & Drnovsek, 2010). A longitudinal study of success and failure among scientist-started ventures showed that personal motives of scientists, among other factors, contributed to their success or failure (Gurdon & Samson, 2010). Individuals who single-mindedly focused on financial outcomes were more successful than those who experienced a more intense conflict between business of technology commercialization and their personal view of the role of innovation in society (Gurdon & Samsom, 2010). Clearly, psychological aspects of faculty members, such as personal motivations, have an important impact on the success of AE.

Besides academic units (i.e., research groups and departments) and faculty members, other facets that can contribute to the EC within an academic institution are: administrative support groups, technology transfer specialists, university leadership, and other ancillary units such as centers as shown in Figure 3; studies can be tailored to investigate the presence and strength of EC in all of the aforementioned sectors. Several organizational arrangements have been found to have a significant positive impact on patent activity and royalty deals including the presence of prompt administrative procedures, a university's commitment to exploit inventions and the availability of a TTO (Baldini, 2010). This, however, brings up the issue of control because "too much" management might in fact encumber EC; therefore, appropriate balance between centralization and decentralization within each university is important to foster an effective commercialization of academic research (Debackere & Veugelers, 2005). Based upon the aforementioned need for balance, a holistic approach that attempts to stimulate the EC of the entire university is advisable. This paper identifies two indicators that can be used to capture EC at the university level: (1) communications that convey commitment to AE and (2) the presence

of a support backbone to facilitate AE. We conjecture that factors that capture EC would positively correlate the number of university start-ups.

Figure 3: A representation of different university units where entrepreneurial culture can be studied. These are units are the individual level, the department level and the university level.



The propositions developed herein were based on extensive literature review, which relied heavily on three sources; namely, *Research Policy, Journal of Business Venturing (JBV),* and *Technovation.* The process through which these three journals were selected went as follows: on April 6, 2011, the key words "entrepreneurial," "culture," and "academic" were sequentially entered into the SciVerse (Science Direct) database. This search returned 204 articles in *Research Policy*, 190 in *JBV*, 167 in *Technovation*, 148 in *Long Range Planning*, 104 in *European Management Journal*, 100 in *Industrial Marketinig Management*, 82 in *World Development*, 70 in *Technological Forecasting and Social Change*, 67 in *Geoforum*, 64 in *Journal of Business Research*, 63 in *Accounting, Organizations and Society*, 62 in *International Business Review*, 62 in *Tourism management*, 60 in *Social Science & Medicine*, 57 in *Annals of Tourism Research*, 54 in *Business Horizons*, 54 in *Journal of Rural Studies*, 53 in *Futures*, 52 in *Technology in Society*, and 51 in *Journal of World Business*. Of all the journal outlets, only *JBV* and *Technovation* focus on entrepreneurship. Even though *Research Policy* is not an entrepreneurship journal, its intense policy focus on entrepreneurship makes it a suitable journal to include in our literature review. Moreover, we found many AE-related articles in this journal.

Consequently, a total of 561 articles (204 from *Research Policy*, 190 from *JBV*, and 167 from *Technovation*) were reviewed. The articles spanned a period of 28 years from 1983 to 2011. Not every article was included in this study - many were irrelevant to this specific topic and, therefore, excluded. However, for the purpose of our work, we believe that the articles reviewed herein are a representative set of scholarly work in the study of entrepreneurial culture.

THEORETICAL PERSPECTIVE AND HYPOTHESES

Communications that Convey Commitment to Academic Entrepreneurship

Commitment to AE can be demonstrated by the formulation of policies that are favorable to AE. In a cross-country analysis, scholars noted that the EC, as well as the prevalence of venture capitalists, stimulated new technology firm formation in the U.S. Conversely, in France, Britain, and Canada, public policy compensates for the relative lack of an EC and private finance (Walsh, Niosi, & Mustar, 1995). Public policy can also stimulate the acceptance of new technology (Rothwell & Wissema, 1986). However, governmental action in promoting a commitment to innovation must be tampered to prevent the development of bureaucracy that stifles entrepreneurial actions as has been an issue historically. For example, the creation of bureaucracy in order to promote science in Russia presented an array of vast challenges to successful entrepreneurship (Fortescue, 1985). The creation of policies which do not hinder the entrepreneurial process will encourage successful AC and the development of EC.

Institutions of higher education can promote the development of EC and successful AE through their written communications. AE goals can be reflected in the mission statements of universities, departments and/or other units of the university, such as the TTOs. Commitment to AE can also be extracted from the written communications, press releases, announcements, and speeches within or about the institution. Bray and Lee (2000) noted that a wide spectrum of attitudes towards creating equity spin-offs exists among university administration; while some universities pursued this strategy, others developed firm policies against it. Scholars have explored the impact of such diversity among university policies and mission statements on AE with some concluding that university policy combined with a variety of institutional mechanisms directly contributed to the formation and the development of spin-off companies (Smilor, Gibson, & Dietrich, 1990). Furthermore, another report illustrates that in regards to technology incubation both university missions, as well as how thoroughly the missions are supported by staff choices and actions, work together in the AE process (Mian, 1997). In light of the aforementioned evidence, we propose that:

P1 *The number of written communications that celebrate and show commitment to AE will positively correlate with the number of university start-ups*

The Presence of Support Backbone to Facilitate Academic Entrepreneurship

A supportive infrastructure which provides tools to enable entrepreneurs is often only the first step towards creating an environment where entrepreneurship can thrive. This was certainly

the case in India where construction of scientific infrastructures began immediately after independence in 1947, even though policy makers only began to act in support technology development and commercialization in the 1980's (Kumar & Jain, 2003). Creating facilities and offices where members of the academic community can obtain professional counseling and advice pertaining to AE efforts, or where external parties interested in exploiting university's IP can go to, has become part of the mainstay in facilitating AE. Therefore, a university that values a culture of entrepreneurship will adopt policies that create an infrastructure which nurtures the entrepreneurial process in order to foster growth.

Places such as science parks, incubators, and/or TTOs, which also function as boundary spanners by linking commercial enterprises and academic research, provide support for start-ups from inception to launch, thereby promoting innovation and entrepreneurship. The propensity for high technology business firms to make effective use of university science park incubator's resources and support increases as the lifecycle stage of the company increases (M. McAdam & R. McAdam, 2008). Even though considerable resources are being devoted to establish these types of support facilities, it has been suggested that the science park model itself is problematic (Quintas, Wield, & Massey, 1992); however, using incentive systems can enhance TTO productivity. Environmental and institutional factors, such as university policies, accounted for some of the variations in TTO performance and that productivity may depend on organizational practices, such as faculty reward systems and TTO staffing/compensation practices (Siegel, Waldman, & Link, 2003).

In one of the earliest publications on academic technology transfer, scholars emphasized the importance of having TTO agents to facilitate the process of technology transfer (Goldhor & Lund, 1983). Academic TTOs have been shown to improve industry links, especially when appropriate decision and monitoring processes are implemented within the TTO (Debackere & Veugelers., 2005); therefore, recruiting and training of TTO officers with a broad base of commercial skills is essential to build an EC which aids the creation of academic spin-offs. The number of spin-offs created with equity investment was found to be positively related with the business development capabilities of TTOs (Lockett & Wright, 2005). Another study reported that TTOs which could quickly commercialize patent-protected technologies were associated with greater licensing revenues streams and more spin-offs. Innovation speed - the time it takes to commercialize a technology – depended upon TTO resources, competency in identifying licensees, and the participation of faculty-inventors in the licensing process (Markman, Gianiodis, Phan, & Balkin, 2005). In light of the aforementioned evidence, we propose the following:

P2 *The age and the number of technology transfer programs and facilities will positively correlate with the number of university start-ups.*

P3 *The number of technology transfer facilitators will positively correlate with the number of university start-ups.*

CONCLUSION

Since the number of university start-ups is greatly affected by the policies, procedures and organizational constraints, institutions of higher education must cultivate a deeply entrenched EC in order to increase the success of AE within their institutions. EC is a shared set of attitudes, values, goals and practices which encourages and rewards entrepreneurship. Cultivating an EC which serve as a unifying force throughout the institutional hierarchy is not a formulaic process which can be broadly applied due to the numerous internal and external forces shaping the institutional culture in addition to the highly implicit nature of a cultural system. Therefore, each university must strive to transform their current infrastructure, policies, goals and institutional culture in order to create and communicate their commitment to maintaining a strong EC in order to subsequently stimulate AE.

This paper seeks to identify specific markets of EC and to understand their impact on the success of AE ventures. In order to create an EC the mission statements of the university, departments and other university organizations must demonstrate widespread support and encouragement for AC. Additionally, administrators must be chosen who will encourage and reward AE. However, even if the communication within an institution supports AE, failing to generate an infrastructure which aids in the AE process will hinder the ability of researchers to generate successful spin-off ventures. However, institutions cannot merely develop such an infrastructure; they must continue to invest in talented personnel to ensure that researchers are given both effective and knowledgeable help in aiding in the complex process of AE. Additionally, university policies must remain robust and adaptive in order to allow administrators to consider solid evidence and /or sound theories which will ensure policy makers do not lapse in utilizing scholarly insights in policy formation or lack solid bases for developing and measuring programs for stimulating entrepreneurship (Gilsing van Burg, & Romme, 2010).

Understanding the forces constraining AE is particularly important in today's economic and academic climate. AE provides many important benefits for universities such as offsetting cuts in funding from governmental sources and increased reputational status (Wood, 2011). AE also provides benefits for society as a whole. For instance, AE can stimulate the economy by creating new jobs and aid in solving some of the most difficult problems facing a society (Wood, 2011).The theoretical foundations outlaid in this paper identify indicators of EC can enable scholars and institutional policy makers to critically consider if their institution is hindering the development of an EC or if changes to policy or the institutional culture as a whole could further stimulate AE. Additionally, outlining the markers of EC will allow policy makers and investors to readily decipher the level of AE in institutions of higher education. Given the vast benefits of such knowledge and general lack of insights into EC within academic institutions, further investigation is necessary to prove our hypotheses and further illustrate the process of constructing an EC.

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GRASPING CHANGE: VISUALIZING INTERNATIONAL TECHNOLOGY ADOPTION FOR ENTREPRENEURSHIP EDUCATION

Erik Noyes, Babson College
Leonidas Deligiannidis, Wentworth Institute of Technology

ABSTRACT

A central challenge in entrepreneurship education is conveying the dynamism of industries and innovation. Students of entrepreneurial management must appreciate the waves of creative destruction which birth industries, redistribute wealth and alter the basis of competition. Core to this objective is understanding patterns of innovation and technology adoption in the global economy. This includes grasping the diffusion of innovation in one's own industry in order to make accurate business assumptions about the risks and timing of entrepreneurial opportunities, competition, return on investment and the chances of venture success.

This research exploited the largest known international database on technology adoption to develop and test innovative teaching tools for entrepreneurship education. The overarching goal was to create interactive visual interfaces to improve teaching on technology adoption and the diffusion of innovation with the aim of improving new venture planning. In entrepreneurship education, technology adoption (also known as the S-curve) is generally taught qualitatively as a cornerstone concept in innovation, competitive analysis and new venture planning. Yet students are rarely, if ever, provided rich data to examine the tempo, implications and varying patterns of technology adoption.

Creating an interactive visual interface, we enabled entrepreneurship students to browse and compare international technology adoption data across the leading 25 industrialized countries from 1788-2001 (e.g. for telegraphs, private cars, mobile phones, and industrial robots). Our head-to-head evaluation of our visual interface, called Prism, versus an Excel spreadsheet with identical data showed that entrepreneurship students make more accurate reflections and future forecasts about technology adoption for a wide range of technologies with our tool. We initiated this research to examine ways visual knowledge discovery can improve learning outcomes in entrepreneurship education, including both content delivered face-to-face and in online environments. Our findings suggest data-rich, interactive visual interfaces can strengthen entrepreneurship students' conception of innovation dynamics when planning for and launching a new technology venture.

Key Words*— entrepreneurship education, new pedagogical methods, visual knowledge discovery, information visualization*

INTRODUCTION & BACKGROUND

A central challenge in entrepreneurship education is conveying the dynamism of industries and innovation. Students of entrepreneurial management must appreciate the waves of creative destruction which birth industries, redistribute wealth and alter the basis of competition (Schumpeter, 1934; Christensen, 2001; Chesbrough, 2003; Nagji and Tuff, 2012). Core to this objective is understanding patterns of innovation and technology adoption in the global economy. Namely, an accurate historical grasp of the diffusion of innovation in one's own industry is central to making accurate business assumptions about the risks and timing of entrepreneurial opportunities, competition, return on investment and the chances of venture success (Rogers, 1962; Shane and Venkataraman, 2000; Wejnert, 2002; Solomon, 2007; Bygrave and Zacharakis, 2010).

In entrepreneurship education, the canonical pattern of technology adoption (also known as the S-curve) is generally taught qualitatively as a cornerstone concept in innovation management, competitive analysis and new venture planning (Rogers, 1962). Nonetheless, students are rarely, if ever, provided rich data to examine the tempo, implications and varying patterns of technology adoption for different products and industries (e.g. patterns of adoption for AM radios versus VCRs versus iPods). Entrepreneurship professors commonly teach the point "innovate or die", but often give little guidance about exact rates of innovation in a competitive space, nor do they provide analytical tools to estimate the rough window for entrepreneurial opportunities for a radical new technology venture. Moreover, students are not shown how varying rates of technology adoption and industry growth influence cash flow management, financing strategies and inventory management. Entrepreneurship students know innovation is critically important but are rarely given specific data to contextualize the rates at which new technologies are launched and adopted in different markets.

Developing a feel for innovation-based competition and innovation patterns in one's own industry and across industries is critical to venture timing and venture success. This includes deciding on the timing of market entry as well as future innovation investments needed to compete in the industry. As such, it is essential that students of entrepreneurial management appreciate rates of innovation and technology adoption in different industries. Change is the backdrop in which new technology ventures compete to gain market acceptance and create new venture capabilities and wealth.

While most undergraduate and graduate business students are reasonably adept with basic spreadsheet operations (e.g., Excel or Google's spreadsheet application), the richness of this dialogue between the external environment and firms' resource planning efforts has not been realized in management education, let alone in the innovation-focused area of entrepreneurship education. In entrepreneurship education, like in most analytical and creative pursuits, there are deep problems and challenges in human problem-solving itself (Newell & Simon, 1972) including the usability of knowledge, its access and share-ability and its application to new or

novel settings or challenges. Despite the growing legitimacy of the young field of information visualization (Schneiderman, 1998; Card, Mackinlay and Schneiderman, 1999; Chen, 2004; Mazza, 2009; Rosenberg and Grafton, 2010; Ware, 2012), rarely is the best knowledge about visual knowledge discovery, human-computer interaction, and cognitive ergonomics brought to education on innovation, where industry knowledge, idea generation and entrepreneurial alertness can impact entrepreneurial opportunity recognition and new venture planning and success (Kirzner, 1973; Kirzner, 1997; Noyes and Deligiannidis, 2011; Deligiannidis and Noyes, 2010; Rosenberg and Grafton, 2010). Moreover, the varied visual representations which drive cognition in the "wild" (Hutchins, 1995) in entrepreneurship and entrepreneurship education are rarely pinned down and examined to evaluate more user-friendly, interactive and empowering knowledge discovery tools for entrepreneurship students. This study starts with these precise pedagogical needs in entrepreneurship education—to have students develop a firm grasp of technology adoption dynamics—and tests two methods to accomplish this goal.

Entrepreneurship Education Research

Fayolle (2008) observes that "limited research addresses educational or pedagogical issues in the field of entrepreneurship" (pg. 334), a view echoed widely by other entrepreneurship researchers (Kuratko, 2005; Green & Rice, 2007; Carrier, 2007; Edelman, Manolova and Brush, 2008). Similarly, Greene and Rice (2007) lament that there is an overreliance on "traditional" entrepreneurship pedagogies, generally including lectures, case studies, business plans, videos and simulations. Entrepreneurship textbooks particularly are concerning as a platform for entrepreneurship education because researchers have shown that that there is little correspondence between textbook prescriptions for success and the actual practices of nascent entrepreneurs (Edelman, Manolova & Brush, 2008).

Almost three decades ago, Upton (1984) asserted that programs in entrepreneurship should present "problems that require a novel solution under conditions of ambiguity and risk". This includes, several argue, exposure to technology innovation concepts to empower entrepreneurial leaders in the face of uncertainty, risk and the need to marshal and manage different venture resources (McMullen and Long, 1987; Vesper and McMullen, 1988; Kuratko, 2005). Even recently, however, Kyro and Tapani (2010) argue that the dynamics of risk-taking have been largely neglected in entrepreneurship education. This is concerning because, despite the common opinion that entrepreneurs are risk-loving, entrepreneurs take a range of creative actions to de-risk investments based on their analysis of entrepreneurial opportunities.

Research on entrepreneurship education shows that business plan writing is the centerpiece of most undergraduate and graduate entrepreneurship programs, comprising over seventy percent of all entrepreneurship courses offered (Katz, 2003; Honig, 2004). Although writing a business plan is offered as a "complete" entrepreneurial planning experience, much is undoubtedly missed in terms of quantitatively assessing the timing and demands of projected

entrepreneurial opportunities. We contend that the patterns of innovation and technology adoption from other, historical industries can serve as a guide to calibrate the assumptions and expectations of entrepreneurship students in their planning efforts. Moreover, such data-driven discussions can drive rich debate in entrepreneurship courses, either face-to-face with faculty or in online environments.

Other entrepreneurship researchers suggest that entrepreneurship education should highlight the challenges associated with each stage of venture development which are inextricably tied to the state of the external environment, including competitive dynamics and the industry life cycle (McMullen and Long, 1987; Plaschka and Welsh, 1990). Focusing on the individual entrepreneur Fayolle (2008) argue that the point of entrepreneurship education is to develop "entrepreneurial competencies", particularly those that deal with opportunity and risk assessment, market timing, industry dynamics and resource planning. Consistent with this perspective on entrepreneurial competencies, Detienne and Chandler (2004) provide empirical evidence that opportunity discovery is a trainable skill that can be taught in entrepreneurship programs.

Greene and Rice (2007) argue that the objective of entrepreneurship education is to help students *know what, know how, know who* and *know when.* To know what – what one has to do in order to decide and act in a given situation. To know how – how to deal with any given situation. To know who – who are the useful people and which are the useful networks in a given context. And to know when – when is the right time to go ahead? Knowing when and knowing how, we argue, can come from understanding repeating patterns in the adoption of innovations and not treating new industries and new ventures as activities without prior precedent.

Finally, slow-moving innovation in entrepreneurship pedagogy is troubling because today's students invest extensive time interacting with digital media and technology, suggesting either a burgeoning problem or potential opportunity for entrepreneurship faculty. Prensky (2003) found that college freshman by the time they have entered college have spent on average approximately 10,000 hours playing video games and an additional 10,000 hours spent communicating on mobile devises. Relatedly, Kurtako (2005) argues that entrepreneurship education "cannot be a field that succumbs to stagnation. It must recognize and apply technologies in the educational setting" (pg. 13). While entrepreneurship educators may choose not to tailor their pedagogies to students' experiences, these experiences should at least serve as a backdrop to consider students' abilities and preferences for learning and sharing entrepreneurship content (Ulrich, 2009; Lane, Hunt and Farris, 2011). Like many other fields, entrepreneurship education must face and exploit an array of new technologies to achieve its objectives (Obligner, 2004).

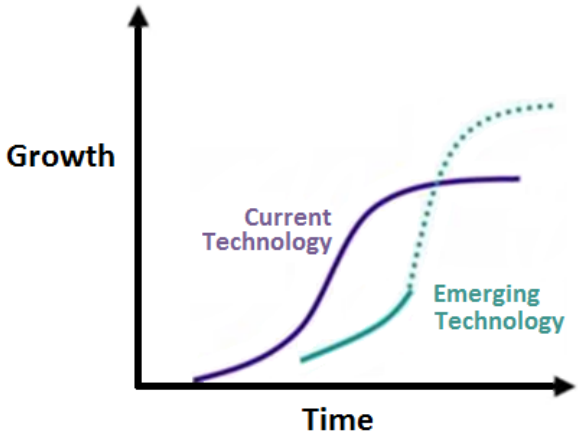
In summary, there is a persuasive need to explore alternate entrepreneurship pedagogies and technologies. The role of educational technology has received very little attention in entrepreneurship education despite calls for more innovative teaching methods, particularly those exploiting information technology (Kuratko, 2005; Green and Rice, 2007; Lane, Hunt and Farris,

2011). Moreover, traditional entrepreneurship pedagogies such as readings, lectures and case studies may be a poor match with the learning preferences of entrepreneurship students born in the digital age (Lane, Hunt and Farris, 2011). Additionally, existing entrepreneurship teaching materials—which commonly examine the adoption of innovations qualitatively—may impede students in venture planning, particularly with respect to financial and operational strategies in new, forming industries.

UNPACKING THE S-CURVE: A CORNERSTONE INNOVATION CONCEPT IN ENTREPRENEURSHIP EDUCATION

The graphic below shows the critical relationship between Rogers' (1962) diffusion of innovation curve and market penetration for a single innovation. The x-axis represents time elapsed and the y-axis captures the overall percentage of a target market that has adopted a given innovation. The dark line shows how new technologies (e.g., AM radios, DVD technology, the Internet) are adopted slowly at first (by innovators, roughly 2.5% of a target market). Innovators are then followed by early adopters and the early majority (comprising roughly 13.5% and 34%, respectively, of the target market). Finally, once a technology has "peaked" its rate of adoption slows as the late majority (34%) and laggards (16%) adopt the new technology. These five different sub-populations in the target market and their different adoption behaviors underlie the shape of the S-curve which shows the relationship between time, sub-population adoption behavior and the overall pattern of adoption.

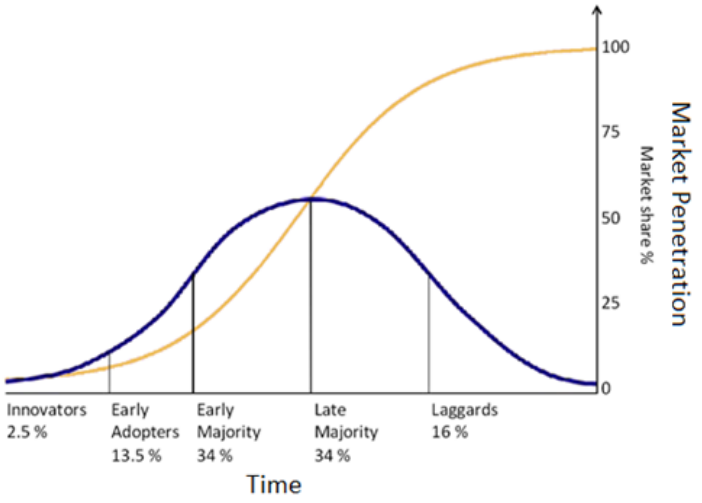
Figure 1: The diffusion of innovation and market penetration.



While Figure 1 above shows only one S-curve, industries in fact are comprised of several successive S-curves which displace prior innovations, creating new wealth and destroying old sources of wealth (e.g., the rise of DVD technology forever displaced the VCR). As shown in Figure 2 below, entrepreneurship students must understand successive S-curves in context and

specifically how the introduction of new innovations in an industry hasten the maturity and decline of prior innovations. For example, the accelerated adoption of mobile phones (an industry in a growth stage, but now reaching saturation) has contributed to the active decline of land-based phone lines (an industry in active decline in the United States and throughout the world). While only two S-curves are shown in Figure 2, there may be dozens, or even hundreds, of particular innovations and S-curves over time depending on the particular industry.

Figure 2: The diffusion of innovation and market penetration



Core ideas which underlie technology adoption and the S-curve are:

- technology adoption occurs in a relatively distinct and predictable manner, where innovators adopt new technologies first, followed by early adopters, the early majority, the late majority and laggards
- innovation is an unceasing process which both creates and destroys wealth
- new industries are born constantly and outdated industries often die as a result of the introduction of new industries
- entrepreneurial leaders can often choose the timing to launch entrepreneurial ventures thus courting a particular, hopefully advantageous, moment in competition and overlapping S-curves
- Correspondingly, even "excellent" technology ventures can fail simply due to market timing and disfavoring overall patterns of technology adoption including slow adoption in the market space
- Finally, the recognition and comprehension of an entrepreneurial opportunity often necessitates understanding the time dimension of that opportunity; entrepreneurial opportunities only exist within defined time frames and target markets.

Creating an interactive visual interface, we enabled entrepreneurship students to browse and compare international technology adoption data across the leading 25 industrialized countries from 1788-2001. This included national trends in the adoption of *telegraphs, AM radios, private cars, televisions, personal computers, mobile phones* and *even industrial robots*. Our head-to-head evaluation of our visual interface, called Prism, versus an Excel spreadsheet with identical data showed that entrepreneurship students make more accurate reflections and future forecasts about technology adoption for a wide range of technologies with our tool. We created an easy-to-use tool to give an overview first, filtering, and then details on demand for the data structure (Schneiderman, 1998; Card, Mackinlay and Schneiderman, 1999). Nearly all functions were achievable with the Excel tool (e.g., through data graphing and/or pivot tables), however visualization capabilities and speed in Excel were limited by the users existing expertise with Excel. Across a set of 10 closed-ended questions, where students were asked to draw conclusions about the technology adoption data, users of Prism drastically outperformed Excel users in the number of correct answers given in a set time period and, just as interestingly, on average completed the task much more quickly.

What follows is a deeper description of the data source, the Prism tool and its basic capabilities, and a discussion of its results in a head-to-head timed comparison with Excel. The paper ends by discussing future research and potential implications for entrepreneurs and entrepreneurship education.

DATA SOURCE

Data come from the Historical Cross-Country Technology Adoption Dataset published by the U.S. National Bureau of Economic Research. The data set captures major technologies introduced in the last 200+ years (1788-2001) across the leading 25 industrialized countries, including the United States, the United Kingdom, Germany, France, Finland and 20 other North American, European and Scandinavian countries each with their own native economic and industrial profile. For example, Finland is home to Nokia the world's leading producer of mobile phones and also one of the countries with the highest rates of mobile phone adoption per capita. Based on the authors' knowledge, this is the largest longitudinal data set on technology adoption in existence.

We include the following historical technology adoption figures in our final data set:

Technology Adoption

- Telegraphs (thousands)
- Radios (thousands of radios owned)
- Televisions (thousands)
- Private cars (thousands of privately owned vehicles)
- Commercial cars (thousands)

- Phones (thousands of land lines)
- Personal computers (thousands of PCs)
- Mobile phones (thousands of mobile phones owned)
- Industrial robots (thousands)

Additionally, we included several national statistics from the same data set to provide broader context (e.g., thousands of mobile phones adopted per capita), some of which were included for future uses and evaluations.

National Statistics

- Population (thousands of persons)
- Real GDP (based on 1990 dollars)
- Total trade (in US dollars)
- Energy output (10 MWhrs)
- Total shipping tonnage (of registered merchant ships)
- Length of railway line open (kilometers)
- Passenger traffic on railways (millions of passengers)
- Freight traffic on railways (million metric tons)
- Aviation (million passenger kilometers)
- Aviation (million freight ton kilometers)
- Mail (million units handled)
- Newspapers

VISUALIZATION

PRISM is designed entirely in Java and deployed as a WebStart application. It consists of two windows: a) The Visualizer and b) the "Query". The query window is used to query the data by selecting which countries are to be visualized and which technologies and national statistics as shown in figure 3 below.

The "Visualizer" window, shown in figure 4 below, consists of the main visualization area and some control widgets at the bottom of the window that interactively control the way the data is visualized, scaled, and compared.

Figure 3: The "Query" window in Prism is used to select the parameters to be visualized.

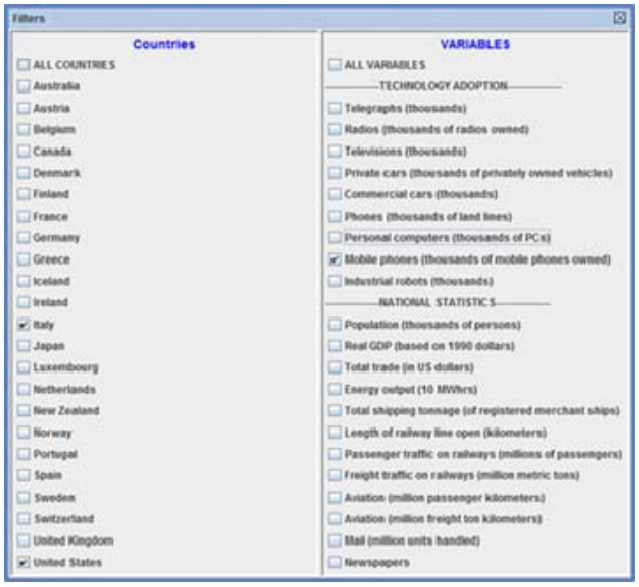
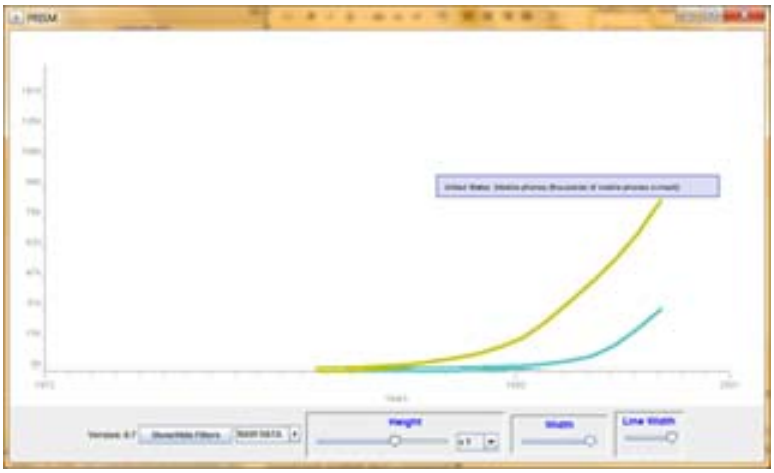
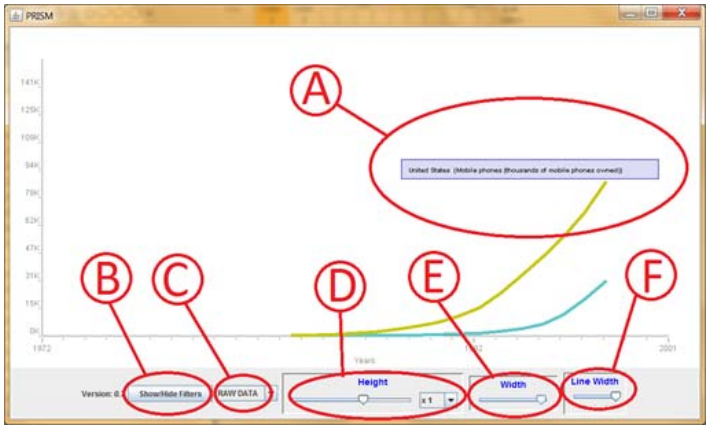


Figure 4: The "Visualizer" window in Prism that displays the visualizations and its controls. In this example we visualize the adoption rate of mobile phones (in thousands of mobile phones owned) in US and Italy.



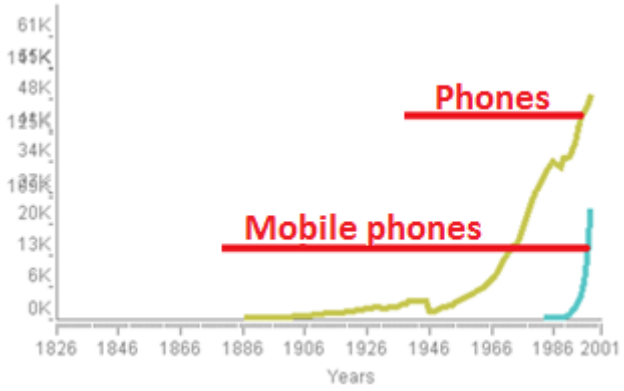
Instead of using labels next to the lines in the graph, we used a single label widget as show in figure 5 (A). This widget can be moved by dragging it to any place in the window. It displays metadata information about the graph. The user simply moves the mouse over a line, and its metadata information is displayed in the widget. We achieved this by encoding a unique RGB color to every data variable that Prism visualizes.

Figure 5: Prism's control widgets.



When visualizing the data, it is convenient to maximize the "Visualizer" window and as a result the "Filter" window goes into the background. The button (B) shown in figure 5 enables a user to send the "Filter" window to the foreground or background. The pull-down menu, marked as (C) in figure 5, changes the mode of visualization and is described later. The sliders marked as (D) and (E) scale the Y and X axis respectively, which are key controls for exploring different views and scales of the data. These are used as a single axis zoom mechanisms and enable the user to explore or represent different views of the data. The axis labels and tick-marks are adjusted automatically. The slider marked as (F) simply changes the width of the lines in the graph for easier viewing.

Figure. 6: Adoption rates of "Phones" and "Mobile phones" in Germany.

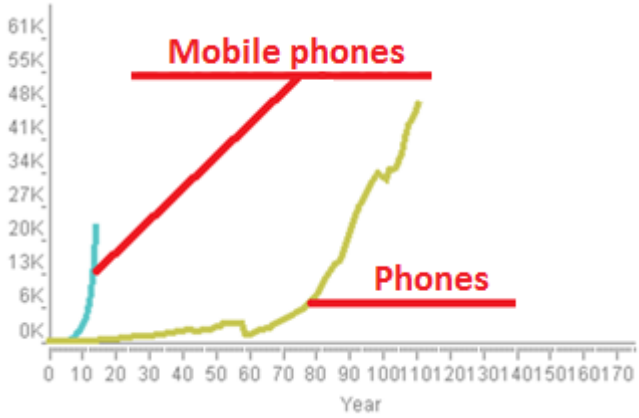


The pull-down menu shown as (C) in figure 5 above changes the mode of visualization. Prism has three modes of visualization: a) Raw Data, b) Year Zero, and c) Per Capita. In the "Raw Data" mode, we visualize the data as it is stored in our data-store which produces lines

based on x-y values. When the user selects the "Year Zero" we move the line graphs to year zero (to coordinates x=0, y=0, so that a user can compare the S-curves. The moving of the S-curves is not static. The S-curves are animated from their current position to the coordinates x=0, y=0 by accelerating initially their move, and near the end, decelerate to a full stop. As an example, in figure 6 above we visualize adoption rates of "Phones" (i.e., land-line phones) and "Mobile phones" in Germany.

By changing mode to "Year Zero" a short animation thread moves the two S-curves to the same origin so they can be compared and see which technology was adopted at a higher rate, as shown in figure 7.

Figure. 7: "Year Zero" mode where all graphs are begin at the same origin, (year zero) to compare the S-curves.



The "Per Capita" mode shows the percentage of a population adopting a particular technology. As an example, we show the per capital adoption of mobile phones in Greece versus Sweden – mobile phones are more pervasive in Sweden. In the "Raw Data" mode we can see when a technology was adopted, as shown in figure 6. In the "Year Zero" mode we can compare the rates of adoption, shown in figure 7, and in the "Per Capita" mode we can see the percentage of population that adopted a particular technology, shown in figure 8 below.

Comparing the graphs in figures 6, 7 and 8 we can see that the Mobile Phone technology was adopted first in Sweden (figure 6), but Greece adopted this technology at a higher rate (figure 7). However, a greater percentage of the population adopted this technology in Sweden (figure 9).

Figure. 8: Comparing rate of technology adoption.

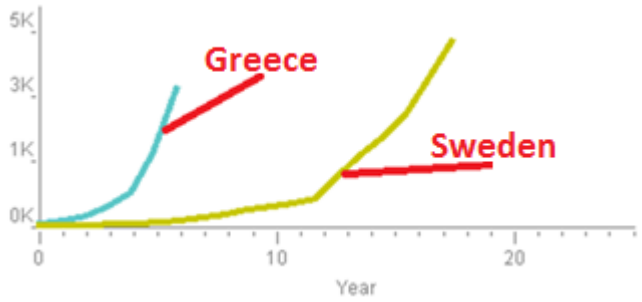
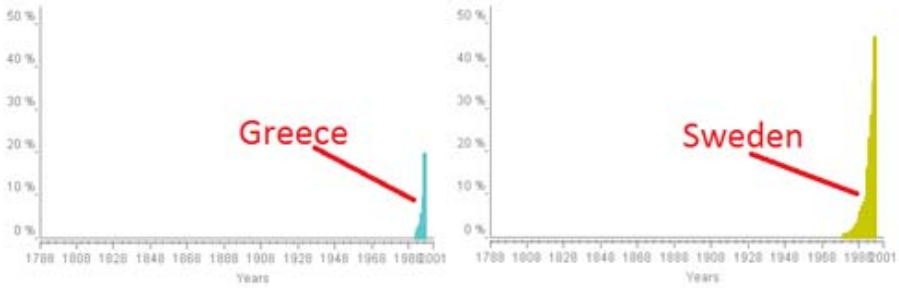


Figure 9: Percentage of population adopting a technology.



EVALUATION

Fifty two subjects volunteered to participate in the evaluation of Prism. Subjects were randomly assigned into two groups. The subjects were undergraduate entrepreneurship students and their average age was 18.5. We performed the evaluation in a classroom that could accommodate at least 60 students. At the beginning of the evaluation we spent 5 minutes explaining where the data came from, the format of the data, and the task-- to answer a set of questions while keeping track of time. We also told them that it is better to spend more time on a question and getting it right, than finishing quickly and getting a question wrong.

We divided our subjects equally into two groups. Both groups answered the same set of questions. The total number of questions was 10. For these 10 questions, the subjects had to record the "start", "middle" and "finish" times. The subjects were asked to write the current time before reading the first question ("start" time). Then, after answering question 5, they had to record the current time again ("middle" time). Finally, when they finished answering the tenth question, they were asked to record the final time ("finish" time). These 10 questions are shown in table 1. Some of the questions contain sub-questions. We scored the sub-questions as individual questions, thus totaling to 21 responses for these ten questions as shown in table 1.

Table 1: Questionnaire's Timed Questions.		
Question#	Acronym	Questionnaire Questions
1	Q1	Overall, which technology was adopted at a faster rate among the "Top 25" industrialized countries: **personal computers** or **mobile phones** ? (circle the correct answer)
2	Q2a	In approximately what year were there 10 million total mobile phone users in a) Italy?
	Q2b	b) The UK?
	Q2c	c) Germany?
3	Q3a	In approximately what year were there 20 million total mobile phone users in a) The US?
	Q3b	b) Japan?
4	Q4	Excluding televisions, between 1780 and 2001, which technology was adopted at the fastest rate in the U.S.?
5	Q5a	Looking at ALL the technologies in the U.S., which technology is most commonly used, based on the last year of available data for each technology (**top 5** in order from most to least)? a)
	Q5b	b)
	Q5c	c)
	Q5d	d)
	Q5e	e)
6	Q6	Considering all of the top 25 industrialized countries, in roughly what decade did the telegraph fade out as a technology?
7	Q7	Based on available data, in which country is the number of users of private cars the third highest?
8	Q8	Based on available data, in which country is the number of users personal computers currently the second highest?
9	Q9a	Looking at national statistics, based on most recent available data, which countries are most active in world trade (**top 5** in order from most to least)? a)
	Q9b	b)
	Q9c	c)
	Q9d	d)
	Q9e	e)
10	Q10	Which county, at one time, showed explosive growth in passenger traffic on railways?

At the end of the questionnaire we asked the students to provide to us their gender and their age. Additionally, we asked them to answer the following 2 questions, shown in table 2, in order to see if a) they understood the instructions and b) if they were familiar with Excel. Their responses were based on a 5-point Likert scale.

Table 2: Validation Questions	
Acronym	Question: (1. Strongly disagree … 5. Strongly agree)
Qa	"The instructions were clear and sufficient to answer all the questions in this questionnaire"
Qb	"I have a high level of ability with Excel."

Some of the questionnaires were unusable because of missing data; some students did not record the three times for the 10 questions. Thus, we removed these questionnaires and we were left with two groups of subject each of 21 students.

The first group (GroupPRISM) used the Prism and the second group (GroupEXCEL) used Microsoft Excel as a visualization and analysis platform to answer the questionnaire. The data were identical in both groups, only the method of interacting with and querying the information was different (Prism vs Excel). There were 11 Males and 10 Females in GroupPRISM, and 6 Males and 15 Females in GroupEXCEL.

The subjects seemed to understand the instructions according to their answers in the question Qa in table 2 ("The instructions were clear and sufficient to answer all the questions in this questionnaire"), as shown in table 3. The subjects also appeared to be familiar enough with Excel to answer the questions in the questionnaire (question Qb from table 2), as shown in table 3.

Table 3. Validation Questions		
	M	SD
Clear Instructions	3.95	0.7
Familiar with Excel	3.02	1
M and SD represent the mean and standard deviation respectively Responses were based on a 5-point Likert scale (1. Strongly disagree … 5. Strongly agree)		

RESULTS

We used a between-subject experimental design where our independent variable was the visualization tool ("Prism" and "Excel"). The dependent variables were the ten questions (21 questions when we scored sub-questions as individual questions). Table 4 shows the descriptive statistics for our measurements. We compared the means of the pooled performance scores using one-way analysis of variance (ANOVA). The score for each question was either "1" if the question was answered correctly or zero otherwise.

Table 4: Performance Measurement Based on Visualization Tool.						
	GroupPRISM		GroupEXCEL			
	M	SD	M	SD	F(1,40)	p
Q1	0.033	0.48	0.71	0.46	6.81	<0.05
Q2a	0.86	0.36	0.71	0.46	1.25	0.27
Q2b	0.57	0.51	0.24	0.44	5.21	<0.05

Table 4: Performance Measurement Based on Visualization Tool.						
	GroupPRISM		GroupEXCEL			
	M	SD	M	SD	F(1,40)	p
Q2c	0.67	0.49	0.24	0.44	9.1	<0.01
Q3a	0.76	0.44	0.23	0.44	15.13	<0.001
Q3b	0.81	0.4	0.1	0.3	42.45	<0.001
Q4	0.24	0.44	0.24	0.44	0	1
Q5a	0.71	0.46	0.52	0.51	1.6	0.21
Q5b	0.52	0.51	0.19	0.4	5.51	<0.05
Q5c	0.52	0.51	0.19	0.4	5.51	<0.05
Q5d	0.38	0.5	0.14	0.36	3.16	0.083
Q5e	0.52	0.51	0.19	0.4	5.51	<0.05
Q6	0.1	0.3	0.19	0.4	0.75	0.39
Q7	0.81	0.4	0.24	0.44	19.46	<0.001
Q8	0.95	0.22	0.52	0.51	12.46	<0.01
Q9a	0.86	0.36	0.57	0.51	4.44	<0.05
Q9b	0.71	0.46	0.57	0.51	0.91	0.35
Q9c	0.81	0.4	0.52	0.51	4.04	0.05
Q9d	0.9	0.3	0.52	0.51	8.65	<0.01
Q9e	0.86	0.36	0.29	0.46	20	<0.001
Q10	0.57	0.51	0.19	0.4	7.27	<0.05
M and SD represent the mean and standard deviation respectively. F and p are from the ANOVA analyses that compare the means of the answers in "GroupPRISM" and "GroupEXCEL".						

From the last column of table 4, we see that there are differences between the tools and that these differences are statistically significant. Looking at the means of all the questions where the difference is statistically significant, GroupExcel outperformed GroupPrism only in Q1 $F[1,40]=6.81$ with $p<0.05$. GroupPRISM outperformed GroupExcel in 13 questions (Q2b, Q2c, Q3a, Q3b Q5b, Q5c, Q5e, Q7, Q8, Q9a, Q9d, Q9e, and Q10) and in 7 questions the p value was less than 0.01. For the rest of the questions (Q2a, Q4, Q5a, Q5d, Q6, Q9b, and Q9c) we did not find any differences in performance that was statistically important. However, we should note that in questions Q4, Q5d, and Q6 none of the two groups performed well (mean values: 0.24 and 0.24, 0.38 and 0.14, 0.1 and 0.19 GroupPrism/GroupExcel respectively). GroupPrism did worse than GroupExcel in Q1 ($F[1,40]=6.81$, $p<0.05$) because the rate of personal computer adoption changes over time and the subjects, relying solely on visual representation of the data, might have misinterpreted the graph. In Q2b ($F[1,40]=5.21$, $p<0.05$) and Q2c ($F[1,40]=9.1$, $p<0.01$) GroupPrism outperformed GroupExcel. Q2a both groups did equally well. One of the major strengths of Prism is the query selection (by selecting checkboxes) to visualize the result side by side. The same applies for Q3a ($F[1,40]=15.13$, $p<0.001$) and Q3b ($F[1,40]=42.45$, $p<0.001$). Q4 ($F[1,40]=0$, $p=1$) is a questions where both groups did not perform well and we believe the question should be rephrased. For Q5{a,b,c,d,e} GroupPrism outperformed GroupExcel in general and specifically where ordering of technologies was required. For Q7

($F[1,40]=19.46$, $p<0.001$) GroupPrism clearly outperformed GroupExcel. Graphically, one can visualize easily the first country where the number of users of private cars is the highest. But, to visualize the third country one needs to either analyze the numbers in Excel or use the "Height" adjustment slider in PRISM to the graph in more detail; something like this can be done with Excel graphs but requires considerable effort where in PRISM is a simple action of sliding the "Height" slider to the right a bit. The same applies for Q8 ($F[1,40]=12.46$, $p<0.01$) where it is easy to find the country in which the number of users of personal computers is the highest, it is more difficult to visualize the second, third, etc. And again, using the "Height" and the "Width" adjustment sliders one can zoom in very quickly into the graph see the line graphs side by side. In Q9{a,b,c,d,e} GroupPrism performed very well; GroupExcel did very well in Q9b and Q9c too. But GroupPrism outperformed GroupExcel significantly in the other three questions: Q9a ($F[1,40]=4.44$, $p<0.5$), Q9d ($F[1,40]=0.51$, $p<0.01$) and Q9e($F[1,40]=20$, $p<0.001$). In Q10, again GroupPrism outperformed GroupExcel ($F[1,40]=7.27$, $p<0.05$).

To summarize, there is ample evidence to suggest that Prism significantly outperformed Excel in terms of answering the majority of the questions accurately.

We also wanted to see with which tool the subjects could answer the questions in the *shortest time.* As shown in the tables 5 and 6, GroupPrism was able to answer the questions in half the time required by the GroupExcel. Based on the ANOVA results above and the time performance shown in the tables 5 and 6, we are confident that Prism is a valuable tool for teaching about technology adoption.

Table 5. Time statistics first half

Time1 from "start" to "middle" (minutes)			
GroupPRISM		GroupEXCEL	
M	SD	M	SD
12.62	5.11	22.2	5.61

Table 6. Time statistics second half

Time2 from "middle" to "finish" (minutes)			
GroupPRISM		GroupEXCEL	
M	SD	M	SD
6	2.3	11.95	3.91

FUTURE WORK

While our focus was on completing a head-to-head evaluation, we are nonetheless motivated by the words of visualization researcher Ben Schneiderman (Schneiderman, 1998) who reflects, "visualization gives you answers to questions you didn't know you had". Interactive visualization tools like Prism may provide entrepreneurship educators and

entrepreneurship students alike a visual knowledge discovery tool to ask new questions about innovation dynamics and their impact on entrepreneurial planning for a new technology venture.

We assert that understanding technology diffusion is not an end unto itself, but rather a dynamic context to understand venture strategy, financial and operational planning and scenario thinking. As such, Prism could be especially useful in helping students develop a more intuitive sense of financing strategies, cash flow dynamics, ongoing product development needs and inventory management challenges—all in the context of varying positions in industry life cycles.

As we discuss in the introduction, Prism provides a rich backdrop against which to teach these important entrepreneurship concepts, including the timing of market entry, different go-to-market strategies and different competitive dynamics in new technology-driven industries. Importantly, Prism can facilitate debate and discussion in two broad important areas. First, it can highlight how different external environments can determine venture resource needs during different phases of venture growth, e.g., financial capital, human capital, social capital. Secondly, it can highlight the non-unique, or generally reoccurring, elements of innovation diffusion and technology adoption new industries, possibly meaning fewer "hockey stick" shaped revenue projections in business plans. Specifically, despite students' frequent insistence otherwise, there are usually useful market comparables for the adoption of a new technologies, even in the case of new industries. In a broad sense, Prism can help contextualize what is—and is not—innovative about particular innovation dynamics with a student or student team's entrepreneurial opportunity. Collectively, Prism is a resource to engage in more thoughtful conversation about industry dynamics and entrepreneurial risk as has been called for by entrepreneurship education researchers. Additionally, Prism exploits information technology in an innovative manner to drive entrepreneurial learning as has also been set as a priority but neglected area of entrepreneurship researchers.

We envision that different entrepreneurship faculty can find and exploit other novel uses for Prism. As such, creating a social layer or community within the tool is likely a future opportunity for faculty and students to share their lessons and observations.

CONCLUSION

As discussed, a central challenge in entrepreneurship education is conveying the dynamism of industries and innovation. Understanding the pace and tempo of technology adoption, including patterns of new technology introduction, is critical to make accurate business assumptions about the risks and timing of entrepreneurial opportunities, competition, return on investment and the chances of venture success.

Research on entrepreneurship education has grappled only limitedly with means to present, explore and share this data. There is general agreement about the importance of key concepts in venture planning but the user-friendliness and usability of tools and frameworks is a neglected area of research in entrepreneurship education.

We created Prism, a visual knowledge discovery tool, to put over 200+ years of data for the leading 25 industrialized countries at the fingertips of entrepreneurship students (1788-2001). Moreover, we have shared this beta tool with the entrepreneurship education community. This allows undergraduate or graduate business students to explore the data and make rather sophisticated analyses about: repeating patterns in technology adoption, broader changes in rates of innovation across decades, as well as national commonalities and differences in technology adoption. We found that users of Prism drastically outperformed Excel users in the number of correct answers given in a set time period and, just as interestingly, on average completed key tasks twice as quickly. While much additional research remains, we have directly responded to the call of other entrepreneurship researches to explore new technologies and pedagogies for entrepreneurship education.

Though entrepreneurship students sometimes believe that an innovation they create has no peers, even the most radical new technologies often have strong comparables, or analogues, in the history of technology adoption. Prism offers entrepreneurship students a tool to place their particular innovation between other prior innovations, forming a better basis for business plan assumptions through direct comparison with prior technologies (or a composite or technologies) possibly with underlying market, technology, or operational similarities to the innovation.

This project started with a known and significant challenge in entrepreneurship education and worked backwards to test interactive visual interfaces which can attain a particular pedagogical goal – grounding entrepreneurship students in empirical data and knowledge about technology adoption.

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SURVIVAL AND GROWTH MOTIVATIONS AS PREDICTORS OF UNIVERSITY-BIOTECHNOLOGY TECHNOLOGY TRANSFER ACTIVITIES

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ABSTRACT

University knowledge played an active role in the emergence of biotechnology firms. Although the acquisition and use of basic scientific knowledge is the foundation of drug development, it is unclear how university linkages contribute to biotechnology firms continued operations and development. The goal of this paper is to investigate whether a biotechnology firm's survival or growth motives influence its participation in university technology transfer activities. In the current study, survival is conceptualized by a firm's entrepreneurial disposition, and growth options focus on its motivation to secure financial success. Using survey data collected from 198 U.S. biotechnology firms, this study finds significant support for the survival hypotheses and mixed results for those focused on growth.

Key Words: University Technology Transfer, Growth, Survival, Entrepreneurial Orientation

INTRODUCTION

The purpose of this study is to explore how a biotechnology firm's survival or growth motivation influences its participation in university technology transfer activities. In the biotechnology industry, a firm's survival and growth depends on its ability to "establish one or more widely and relatively impregnable 'bases' from which it can adapt and extend its operations in an uncertain, changing, and competitive world." (Penrose, 1995, p. 137) Impregnable bases refer to firms' ability to develop stocks of and gain access to flows of complementary knowledge via inter-firm collaborations. These stocks and flows are important because drug development requires firms to possess multi-disciplinary knowledge and capabilities (Howells, Gagliardi, & Malik, 2008) that exceed the know-how of a single entity (Carayannopoulos & Auster, 2010). Universities have been recognized as a critical source of knowledge for biotechnology firms (George, Zahra, Wheatley, & Khan, 2001; Niosi, 2003). By accessing universities' basic science expertise, biotechnology firms can access and leverage knowledge that will promote their survival and facilitate growth.

An emerging stream of studies draw attention to how knowledge is disseminated from academia to industry by exploring factors such as trust (Santoro & Gopalakrishnan, 2001), absorptive capacity (George et al., 2001; Bierly, Damanpour, & Santoro, 2009), geographic

distance (Santoro & Gopalakrishnan, 2001), alliance management capability (Rothaermel & Deeds, 2006), and technological centrality (Santoro & Chakrabarti, 2002). Despite our growing understanding of how university-industry transfer occurs, limited focus has been dedicated to exploring whether survival and growth motives underlie a firm's participation in the transfer process.

Increasing scholarly attention toward investigating a firm's survival and growth motives for participating in university technology transfer activities is important for two reasons. First, many biotechnology firms emerged to commercialize university inventions (Wright, Birely, & Mosely, 2004). Yet, scant attention has been dedicated to exploring whether universities remain viable partners for biotechnology firms as they develop. Examining whether a firm's entrepreneurial motives influence its participation in university technology transfer activities deepens our knowledge of how these firms develop their alliance portfolios to achieve their entrepreneurial goals and objectives. Second, research describes how university links help firms reduce the risk, uncertainty, and costs associated with drug development (George, Zahra, Woods, 2002; Rothaermel & Deeds, 2004). An implicit assumption is that reduced costs, risks, and uncertainty promotes a firm's survival. This study explicitly examines how a firm's survival motivation, as evidenced by its entrepreneurial disposition, influence a firm's willingness to acquire knowledge from a university to support its continued operations.

The goal of this paper is to examine whether a firm's survival or growth focus influence its participation in university technology transfer activities. Although growth and survival may be closely related, the current study is based on the assumption that these two outcomes are mutually exclusive events. Clearly, firms must survive in order to grow (Delmar, Davidsson, & Gartner, 2003) but survival does not ensure growth, and growth is not necessarily beneficial (Markman & Gartner, 2002).

Survival occurs when a firm does not succumb to involuntary dissolution such as bankruptcy (Phillips & Kirchhoff, 1989). Schumpeter (1934) proposed existing firms use their resources to create entry barriers that limit new and small firms' ability to compete. Small and new firms survive by adopting an entrepreneurial disposition that supports taking risks to exploit opportunities that enable the firms to leverage different resource combinations. Those biotechnology firms operating in a survival mode may need to act entrepreneurially to assemble and use their resources (Barney, 1991) to create value. Acquiring resources is important because many biotechnology firms are small firms that have fewer than 100 employees (U.S. Department of Commerce, 2003) and may suffer from liabilities of newness (Stinchcombe, 1965) and smallness (Bruderl & Schussler, 1990). The former intimates that new firms have a higher death rate than their older peers, and the latter describes how larger firms have a lower risk of death than their smaller peers (Bruderl & Schussler, 1990). One way to overcome these liabilities is to rely on universities as external sources of knowledge.

In the current discussion, survival is a short-term strategy. Firms acquire knowledge that can be used to solve R&D problems (Perkmann & Walsh, 2008) or develop a university

invention (Agrawal, 2006). Yet, many founders and investors want the firm to survive today so they can be compensated tomorrow. Traditionally, growth for most biotechnology firms and other high-technology firms comes in the form of issuing an initial public offering of stock (IPO), which is the holy grail of financial success (Behnke & Hultenschmidt, 2007). However, with a slow market for IPOs and nearly $50 billion in sales of pharmaceutical therapies going off patent in the next five years, there is pressure from pharmaceutical firms to enhance their pipelines (Frantz, 2006). Currently, half of big pharma's new product pipelines are the result of licensing or acquisitions (Behnke & Hultenschmidt, 2007). Given the challenging IPO environment, biotechnology executives view acquisition as a viable option to achieve financial success.

Although being acquired by a pharmaceutical firm and issuing an IPO are often classified as exit strategies. In the biotechnology industry, before the goal of exit can be achieved these firms must grow. Becoming a part of a pharmaceutical firm's acquisitive strategy does not occur by accident. These firms have to develop an R&D strategy that will make them an attractive target (Behnke & Hultenschmidt, 2007). These firms have to grow their R&D pipelines and develop technical capabilities that will complement those possessed by a pharmaceutical firm. When issuing an IPO, a biotechnology firm seeks to transform its tacit assets into those that can be monetarized and evaluated by potential investors. In the biotechnology industry, before founders can exit - their firms must grow.

This paper investigates two growth motives: becoming an acquisition and issuing an initial public offering (IPO) of stock. When considering becoming an acquisition, biotechnology firms can license technologies from universities, develop the invention, and then license it to pharmaceutical firms (Stuart, Ozdemir, & Ding, 2007). Licenses between biotechnology and pharmaceutical firms often pave the way for acquisitions. Regarding issuing an IPO, working closely with university faculty, firms can access their knowledge to develop a technology strategy that is conducive to creating new knowledge, patenting, and IPO valuation. Since new developing new therapies is a knowledge intensive endeavor, participating in technology transfer with universities provide firms the ability to acquire, learn, and replicate cutting edge technologies and knowledge and use these resources to support their survival through licensing and growth via patenting.

In this study, I aim to contribute to the literature in two areas. First, I seek to understand whether universities remain viable collaboration partners beyond those relationships initiated during the firm's founding. Second, IPO studies explain that pre-IPO firms use inter-firm linkages to signal the quality of their knowledge. This study examines whether pre-IPO firms use university links to acquire knowledge as well.

The remainder of the paper proceeds as follows: a literature review presented in the next section, followed by an offering of the hypotheses. The fourth section reviews the research methodology and results, and the final section summarizes the results and suggests implications and areas for future research, while also identifying study limitations.

LITERATURE REVIEW

Resource Acquisition

The resource-based view (RBV) explains how a firm can leverage its resources to develop and sustain a competitive advantage (Wernerfelt, 1984; Barney, 1991). Although RBV typically addresses internal resources, it was adapted to address resource acquisition. Barney's (1986) factor market theory describes how a firm can outsmart its competitors by acquiring resources that the market undervalues. Firms distinguish themselves from their competitors not through the internal workings of the organizations but in their ability to pick resources (Barney, 1986; Makadok, 2001). Firms that have acquired superior value-generating resources have an opportunity to generate above-average rents. Yet, securing any resource is not sufficient to ensure a firm's survival. Some scholars put forth the notion that knowledge is the most important resource (Gupta & Govindarajan, 2000). The knowledge-based view of the firm proposes that firms exist to coordinate and integrate specialized knowledge (Grant, 1996). Universities possess superior scientific knowledge that can be used to create new R&D invention, solve R&D problems, and develop social capital that will enable a firm to gain access to additional resources from collaboration partners.

When partnering with universities, biotechnology firms have access to three types of knowledge: disciplinary, domain, relational. First, universities conduct over 60% of all basic research in the United States (U.S. Department of Commerce, 2003), which contributes to our understanding of basic scientific theories and principles (Gibbons & Johnston, 1974). Disciplinary knowledge (Lim, 2009) emerges from basic research, resides in the mind of scientists, and reflects their depth of knowledge in a specific scientific area (Kachra & White, 2008).

Second, universities possess domain-specific knowledge (Lim, 2009), which underlies the creation of technological inventions in the biotechnology industry (Niosi, 2003). Outcomes from domain-specific knowledge enable university partners to create new products and processes while promoting the successful completion of existing R&D projects. Third, the third type of knowledge is relational knowledge, which is embedded within social capital — the aggregate of resources embedded within, available through, and derived from the network of relationships possessed by an individual or organization (Inkpen & Tsang, 2005, p. 151). By developing social capital with universities, biotechnology firms have opportunities to discover new knowledge through personal and professional relationships (Shane, 2002) and offer firms access to knowledge-spillovers (Zucker, Darby, & Brewer, 1998). Whether solving problems, creating new pipeline projects, or developing relational capital, university knowledge is a valuable resource that firms can leverage to support operation or to generate productive opportunities that support financial growth.

Still, the mere acquisition of such knowledge does not enable a firm to leverage it. In the current study, university-industry transfer activities involve the dissemination of university knowledge or know-how (the ability to realize a technology from one person or group to another) (Lundquist, 2003). University technology transfer involves ownership of knowledge or technology, which allows the firm to use the knowledge without assistance (Lundquist, 2003). Thus, technology transfer activities involve partners' willingness to share knowledge and information. Through frequent interactions, partners develop a common language (Mowery, Oxley, & Silverman, 2002) and trust, which facilitates the exchange of knowledge. Although technology transfer is problematic, biotechnology firms may aggressively seek out universities as transfer partners to access knowledge to facilitate survival and growth.

Motives: Survival

The biotechnology industry consists of small firms. The survival of these firms is important because these firms are the innovative engines that drive the U.S. economy. In a robust, empirical analysis comparing small and large firms, Acs and Audretsch (1990) found that small firms play a growing role in developing technological innovations and contributing to the U.S. economy. Given the critical role that small businesses play in the U.S. economy and national system of innovation, studies have identified knowledge as an important predictor of firm survival. Delmar and Shane's (2006) study of Swedish firms' survival revealed that experiential knowledge possessed by founders in terms of start-up and industry experience positively influenced new venture survival. Focused on how external knowledge promotes survival, Chrisman and McMullan (2004) examined the survival rates of new ventures that participated in a program where they received advice from outside experts. The findings revealed that firms that participated in the program had a 64.6 percent survival rate, which is much higher than Phillips and Kirchhoff's (1989) 39.8 percent survival rate of firms that survived six or more years. Although knowledge is critical small firm survival, it is the lifeline of biotechnology firms that need a constant influx of new knowledge to create pipelines and develop projects because only a few will make it through the regulatory process.

In this paper, a firm's survival motive is represented by its adoption of an entrepreneurial orientation (hereafter EO), which captures the organizational processes, methods, and styles used to implement the start-up's founding strategy (Lumpkin & Dess, 1996). Entrepreneurial orientation (hereafter EO) EO is a firm-level capability that is embedded in a firm's routines, systems, and processes (Lee, Lee, & Pennings 2001), which supports a firm's ability to gain an advantage by taking risks when creating new products and services and identifying opportunities to exploit them to become a first-mover (Lumpkin & Dess, 1996). Generally, EO was conceived to be a compilation of innovativeness, risk-taking, and proactiveness (Miller, 1983, Hughes & Morgan, 2007). However, there is a common sentiment that the traditional or aggregate measure

of EO may not be robust enough to examine complex outcomes (Kreiser, Marino, & Weaver, 2002).

In response to these concerns, Lumpkin and Dess (1996) pushed the boundaries of EO research even further by adding new dimensions to the construct. Consensus is present among scholars regarding the first three dimensions that are based on the research of Miller (1983) and Covin and Slevin (1989); however, a lack of agreement exists regarding the new dimensions (i.e., competitive aggressiveness and autonomy). Competitive aggressiveness describes how firms relate to competitors and respond to threats and demands that exist in the marketplace (Lumpkin & Dess, 1996). Autonomy refers to the independent action of an individual or a team in bringing forth an idea or a vision and carrying it through to completion (Lumpkin & Dess, 1996: 140).

Although these dimensions address salient aspects of entrepreneurial behavior, I contend that competitive aggressiveness and autonomy may not be as relevant to the biotechnology industry as the other three dimensions. For example, many biotechnology firms are independently owned (Zahra, 1996) and have fewer than 100 employees (U.S. Department of Commerce, 2003). It is conceivable that these simple structures (Mintzberg, 1973) do not contain significant levels of bureaucratic practices. Thus, including autonomy as an EO dimension may not be as important as the other three dimensions (e.g., proactiveness, innovativeness, and risk-taking) in ascertaining a DBF's entrepreneurial orientation.

Furthermore, survival and profitability in the biotechnology industry is based on innovation and not market share. Biotechnology firms typically occupy small niches that are related to their founder's expertise (Li, 2000). These firms focus on developing their technological capabilities in their niches and developing commercially viable products instead of countering their competitors' strategic moves aggressively. In other industries, where large, established firms battle for market share, competitive aggressiveness and autonomy may be more germane to a firm's EO. Consequently, in an emerging knowledge-intensive industry like biotechnology, these two aspects of EO may be less applicable.

Motives: Growth

Penrose's (1959, 1995) *Theory of the Growth of the Firm* (TGF) describes how firm-specific knowledge influences a firm's ability to identify productive opportunities, which, in turn, affects its rate and speed of growth. TGF is not just a theory of the growth of a firm - it is a theory of the growth of knowledge (Pitelis, 2005). High-technology firms operate in a competitive environment that requires the continuous replenishment of firms' stocks of knowledge (Lane & Lubatkin, 1998). One way to replenish knowledge to support growth is through acquisitions that occur during collaborations or technology purchases. When a firm acquires knowledge form a university, it is engaging in acquisitive learning, which occurs when a firm gains access to and subsequently internalizes preexisting knowledge from its external

environment (Dess et al., 2003). Acquisitive learning can increase the depth and breadth of knowledge resources that managers can deploy in innovative capabilities (Kim & Inkpen, 2005). Empirical studies have found that universities are beneficial knowledge sources that increase a firm's absorptive capacity (George et al., 2001), number of projects in clinical trials (Rothaermel & Deeds, 2006), and university-incubator graduation (Rothaermel & Thursby, 2005). Universities possess a broad range of knowledge that can be leveraged by biotechnology firms to survive and grow in a rapidly changing, technologically complex environment. The following hypotheses examine how a firm's survival and growth motives may lead executives to participate in university-industry technology transfer activities.

HYPOTHESES

Survival: EO Dimensions

Innovativeness reflects a firm's propensity to engage in new idea generation, experimentation, and R&D activities, resulting in new products and processes (Lumpkin & Dess, 1996). Firms must possess a broad range of multidisciplinary skills in order to become competitive (DeCarolis & Deeds, 1999). Innovative biotechnology firms make significant investments in the "R" part of R&D (Zahra, 1996), which involves exploration — the pursuit of knowledge, of things that might come to be known (Levinthal & March 1993, p. 105). Through the exploration process, innovative firms solve problems, learn, and develop new knowledge and capabilities. Innovative firms tend to have more R&D alliances (Powell, Koput, & Smith-Doerr, 1996) and maintain links with universities to stay abreast of new ideas and trends (Niosi, 2003).

Hypothesis 1a: *The more innovative a biotechnology firm, the greater the extent of technology transfer activities between the biotechnology firm and its university partner.*

The proactive dimension refers to a posture of anticipating and acting on future wants and needs in the marketplace, thereby creating a first-mover advantage (Lumpkin & Dess, 1996). Proactive firms search for opportunities to exploit in order to gain an advantage. University technology transfer provides firms with an opportunity to survive by earning profits by developing university inventions and selling the developed invention(s) to pharmaceutical firms for further development (Stuart, Ozdemir, & Ding, 2007). Since the product development cycle for drug development may last nearly a decade, university partnerships allow biotechnology firms to gain access to technologies that have a narrow window for commercialization and earn revenues to support their continued operations. Therefore,

Hypothesis 1b: *The more proactive a biotechnology firm, the greater the extent of technology transfer activities between the biotechnology firm and its university partner.*

Risk-taking reflects a firm's proclivity to support projects in which the expected returns are uncertain (Lumpkin & Dess, 1996). Management teams with a propensity for risk-taking move boldly into new and uncertain ventures (Lumpkin & Dess, 1996). Top management teams that have a propensity toward risk-taking commit resources before developing a clear picture of what actions are needed (Covin & Slevin, 1991). University collaborations may be considered risky because Biotechnology firms invest in the transfer process first in anticipation of being able to use the transferred knowledge and technology. However, the commercial potential of university inventions is often unknown because the technologies are transferred during infancy when there is uncertainty surrounding the technology and replication (Jensen & Thursby, 2001; Lundquist, 2003). Firms that are averse to risks my fail to acquire groundbreaking inventions that may significantly support their R&D activities. Management teams that embrace risk-taking move boldly to promote their firm's survival by acquiring university knowledge, which contains a high level of ambiguity and uncertainty (Rothaermel & Deeds, 2004).

Hypothesis 1c: *The more risk-taking a biotechnology firm engages in, the greater the extent of technology transfer activities between the biotechnology firm and its university partner.*

Growth Motivation

Decreasing pipeline efficiency, along with the declining valuation of biotechnology firms, has fueled pharmaceutical firms' acquisition frenzy (Schweizer, 2005; Frantz, 2006). Given these challenges, nearly half of big pharma's new product pipelines are the result of licensing or acquisitions (Behnke & Hultenschmidt, 2007). There are two reasons why participating in university technology transfer activities will support firm's ability to growth their resources in order to become a may attractive acquisition target. First, biotechnology firms play a central role in many alliance networks because they have upstream alliances with universities (Stuart, Ozdemir, & Ding, 2007). In these linkages, firms acquire and integrate university knowledge into their R&D processes or develop university inventions. The inventions are then licensed out, or it is sold to downstream partners, such as pharmaceutical firms. Previous relationships such as alliances are a critical step in the acquisition process. Second, biotechnology firms engage in alliances with universities to "desire to acquire basic knowledge that can be used to create novel molecular entities which are then entered into the development and regulatory process" (Rothaermel & Deeds, 2004, p. 204). Biotechnology firms can use the basic knowledge they secure from universities to develop their pipelines and make them attractive targets. Therefore,

Hypothesis 2a: *There is a positive and direct relationship between a biotechnology firm's focus on being acquired and an increase in their participation technology transfer activities with their university partners.*

Going public is the holy grail for many founder and investors. However, public investors encounter difficulty evaluating a biotechnology firm's assets because many firms have no approved commercial products and their managers are unwilling to share information about their firms' R&D activities due to competitive intelligence issues (Janney & Folta, 2003). Biotechnology firms can improve their IPO valuations by signaling their technological competence as evidence in their patents and pipeline development. Establishing links with universities can improve to signaling abilities (Janney & Folta, 2003)

Patents are an important signal for biotechnology firms because of the appropriate regime that exists in most developing countries. The United States grants patent holders a status such that "owners enjoy clear property rights to these resources, or rights to use the resources, so that others cannot take them away without the owners' consent" (Das & Teng, 2002, p. 41). Patents are a strong signal of a firm's innovative ability (DeCarolis & Deeds, 1999), as well as its ability to monetize its R&D investments. Firms with patents tend to issue an IPO more quickly than those firms with no patents (Stuart, Hoang, & Hybels, 1999). Since the development of patents depends on a firm's basic science know-how (McMillan, Narin, & Deeds, 2000), establishing links with universities provides biotechnology firms with access to faculty members and their graduate students, who use their basic scientific competence to explore new scientific trajectories. Therefore,

Hypothesis 2b: *There is a positive and direct relationship between a biotechnology firm's focus on issuing an IPO and their participation technology transfer activities with their university partners*

METHODS

Data Collection

A questionnaire and archival methods were employed to collect data on biotechnology firms and to understand the context of the biotechnology-university transfer relationship. Secondary sources — the Carnegie Foundation's University Classifications — provided data for the research university linkages control variable. Entrepreneurship studies regularly collect data using survey methods (Bartholomew & Smith, 2006), because data on small, private firms is not easily accessible. The sample of biotechnology firms was drawn from the U.S. biotechnology industry; because most commercialized biotechnology products have emerged from the United States (Shan & Song, 1997).

The selection of sample firms occurred in two steps. First, 1,000 firms were identified by reviewing state biotechnology associations' membership directories and Hoover's business listings. Second, Reference USA, a library database that contains business listings, was used to verify firm size, founding date, and North American Industry Classification Scheme (NAICS) codes. This study focused on those firms with NAICS codes that emphasized research and

development of human-health biotechnology products (i.e., NAICS 325411 — medicinal and botanical manufacturing; NAICS 325414 — other biological product manufacturing; and NAICS 541710 — physical, engineering, and biological research). The biotechnology industry consists of a heterogeneous group of firms that create a broad range of products. Some firms that focus on human health create products "that are placed inside the human body (in vivo) as opposed to in vitro therapeutics that are used outside the human body" (Rothaermel & Deeds, 2004, p. 209). In-vivo firms produce products that undergo a strict governmental approval process that lasts almost a decade and costs nearly $1 billion dollars. Given these constraints, this study includes firms that address these challenges by collaborating with other firms. The final sample included 838 biotechnology firms (300 public and 538 private).

Since the questions focused on the firm's technology strategy, the questionnaire was mailed to the senior executive responsible for R&D, such as the president and CEO; vice president of R&D; or vice president of scientific discovery. In small firms, the head of R&D is the primary source and perhaps the only source that is knowledgeable about the firm's transfer activities. The survey was developed using a modified version of Dillman's Tailored Design Method (1978). Dillman (1978) proposed that researchers send pre-notification letters, a questionnaire package, and several follow-up reminders to potential respondents. A retired R&D executive from a pharmaceutical firm provided advice regarding the content of the pre-notification letters, questionnaire package, and reminders. Three mailings were administered to collect the survey responses. Each mailing occurred six weeks apart, in order to collect all responses, log address changes, and update the new information into the database. Across the three mailings, a cumulative total of 990 surveys were sent to the most senior executives in charge of R&D.

In total, the three mailings produced 204 responses, of which six surveys were removed due to missing data. The administration of the survey resulted in a final sample of 198 useable surveys and achieved a response rate of 21%, which coincides with response rates of other studies of entrepreneurial firms (for example, 15.4% [Wang, 2008] and 25.4% [Lichtenthaler, 2009]). Studies of small firms typically have low response rates because the CEO must personally respond to the survey, since there are few others knowledgeable enough to assume the task. Thus, the lower average response rate is due to CEO effect and not because of firm size (Bartholomew & Smith, 2006).

In survey research, the timing or lack of responses from certain groups is important and may increase the potential of a response bias. Nonresponse bias was tested by assessing the differences between the early and late respondents with regards to size and R&D spending. Early respondents were defined as the first 60% of the returned questionnaires, and the last 40% were considered late respondents. An analysis of nonresponse bias revealed no significant differences between responding and nonresponding public firms' size (t = 1.07, n.s.), age (t = 7.27, n.s.), or R&D spending (t = .824, n.s.). ANOVA was conducted to ascertain biases among the respondents of the three mailings for a total number of university technology transfers (F = 2.60,

n.s.). The above analysis suggests a reasonable level of confidence that this study did not suffer from serious sampling biases.

In addition, the data was assessed for common method variance (CMV), which may pose a problem because the responses were gathered from a single source inside the firm. Harmon's one-factor test (Podsakoff & Organ, 1986) was used to assess the data for CMV. An exploratory factor analysis produced four meaningful factors with Eigenvalues greater than one that accounted for 69.6% of the variance, with the first factor accounting for only 12.0% of the total. Thus, CMV may not be a material concern, and the results are listed in Table 1.

Responding Firm Profile

The following is an average profile of the responding biotechnology firms (some of the profile variables not included in this study). these firms had an average age of 8.98 years old; 77 percent were located in biotechnology clusters; possessed 31 patents and patent applications; had 91 employees and one project in clinical trials; 86 percent founded by a university scientist; spent $10.2 million in R&D over a 3-year period; 32 percent had stock traded on a public exchange; and participated in 10 university linkages in 5 years (2.5 sponsored research contracts, 2.5 licensing agreements, and 4.6 consulting agreements).

Measures

Prior to administering the questionnaire, a pretest was administered to pharmaceutical professionals who completed questionnaires and were debriefed about their survey experience. No significant changes were made to the scales listed in Table 2. All scales used in this study were measured on a 5-point, Likert-type scale, ranging from 5 (strongly agree) to one (strongly disagree). Table 1 contains the list of the scales used in this study.

Dependent variable

University technology transfer (UTT) is the movement of technology from a university into another organization, including the acquisition of technologies, alliances of many levels and cooperative development that involves the mutual exchange of knowledge, problem-solving, and mutual reliance (Kotabe, Martin, & Domoto, 2003; Lundquist, 2003). This measure consisted of 5 items that assessed a firm's willingness to exchange technology and its reliance on its partner's expertise. Cronbach's alpha for this scale is 0.874.

Independent variable

The three commonly agreed upon EO dimensions are innovativeness, proactiveness, and risk-taking. *Innovativeness* is defined as an "a firm's tendency to engage in and support new ideas, novelty, experimentation, and creative processes that may result in new products, services, or technological processes" (Lumpkin & Dess, 1996, p. 142). The 3-item innovativeness (INV) scale included questions that asked respondents to reflect on their firm's new product development and R&D portfolio. In the present study, Cronbach's alpha for this scale is 0.811. *Proactiveness* refers to a firm's approach to market opportunities through active market research and first-mover actions such as the introduction of new products/services ahead of competitors (Lumpkin & Dess, 1996). The 3-item proactiveness (PA) scale included 3 questions that asked respondents to reflect on their firm's first-mover activities. Firms with a higher score are likely to be more proactive. Cronbach's alpha for this scale is 0.752. *Risk-taking* (RISK) involves the degree to which managers are willing to make large and risky resource commitments (i.e., "those which have a reasonable chance of costly failure") (Miller & Friesen, 1978, p. 923). This variable was measured using a 3-item scale that asked respondents to assess their firm's willingness to take risks. This variable's Cronbach alpha for this scale is 0.772.

Growth motivations reflects a firm's increase in resources. Growth "...sometimes denotes merely an increase in amount, for example, when one speaks of 'growth' in output, export, and sales" (Penrose, 1995, p. 1). To assess a firm's growth plans, a single-item scale was developed. There is precedence in entrepreneurial SME studies of using single-item scales to measure entrepreneurial intent (Wiklund, Davidsson, & Delman, 2003). The item asked executives to note the firm's 5-year growth goals, which were identified and assessed using a 3-stage process. First, I conducted a literature review of academic, practical, and industry-related literature to identify biotechnology firms' long-range plans. The review revealed four options: to be acquired, to grow via an acquisition, to grow via strategic alliances, or to grow by acquiring other firms. Second, the list was reviewed by 3 experts, each of which possessed over 15 years of experience in the biotechnology industry. The experts suggested collapsing the last 2 categories (i.e., growth via alliances and growth by acquiring firms) because both options reflect growing via external sourcing. Third, the single-item scale was pretested and piloted test. During the pilot and pretesting, respondents were given a category labeled "other" to identify any missed options. No other options were identified.

The three options were represented by k-1 variables, where k equals the number of categories. A variable is created for Acquisition, where firms that want to be acquired are assigned a 1, and IPO focused firms and external sourcing firms are assigned 0. The second variable is created for IPO, where firms seeking to issue an IPO are assigned a 1, and firms that want to be acquired and external sourcing firms are assigned 0.

Control variables

Absorptive capacity is the ability to recognize the value of new external information, assimilate it, and apply it to commercial ends (Cohen & Levinthal, 1990, p. 128). To measure absorptive capacity, Cohen and Levinthal (1990) used R&D intensity, which is defined as a firm's R&D expenditure divided by sales. However, many biotechnology firms do not have any sales. Scholars (George et al., 2001; Tsai, 2001) measure the average investment per employee to capture the scale effect of R&D spending between large and small firms. The R&D data was collected over a 3-year period (2003-2005) to adjust for yearly fluctuations. The measure used in this study is an average of the data collected over this time period.

University experience captures the degree to which prior involvement with a specific partner predicts current involvement (Belderbos et al., 2011). When working with a specific partner over time, a firm develops tacit knowledge, which can be leveraged to enhance the partnership (Zollo, Reuer, & Singh, 2002). University and industry interactions may be contentious because the partners have divergent goals (i.e., a university seeks to disseminate knowledge, while industry firms are motivated to keep it proprietary in order to exploit it) (Rothaermel & Deeds, 2004). Thus, experience with a university supports a firm in developing skills and expertise to create routines that support the transfer process (Bierley, Damanpour, & Santoro, 2009). Belderbos et al. (2011) assessed alliance persistence using an indicator variable that reflected the length of an alliance. In the current study, respondents were asked whether they had a previous relationship with their current university partner(s) — 1 reflects a prior relationship, and 0 indicates no prior relationship.

Research university linkages reflects relationships with institutions committed to graduate education; they place a high priority on research (George, Zahra, & Wood, 2002). The respondents were asked to identify their most recent university partner. The impetus was to match the university to the Carnegie Foundation's classification, which classifies U.S. universities into categories by grouping them by what they have done and whom they have taught (McCormick & Zhao, 2005). Biotechnology firms may trust and rely on knowledge received from research universities because these institutions have reputations for disseminating high-quality research. This variable was measured by counting the number of linkages a biotechnology firm has with research-intensive universities over a 5-year period. Annual reports and firm announcements were used to supplement survey data.

Size is included as a control variable because large firms may have the resources to be more self-sufficient than their do their smaller peers. Large firms may not rely on university technology transfer to gain access to cutting-edge knowledge because these firms have the resources to internally generate such knowledge (Minbaeva et al., 2003). This measure is a log of the number of individuals employed by the firm.

Reliability and Validity

The Cronbach's α for each scale listed in Table 3, ranging from a low of 0.752 to a high of 0.874. All scales achieved acceptable coefficient alphas (α) of at least 0.70 (Nunnally, 1978). Construct validity is another psychometric assessment that involves testing a scale in terms of a theoretically derived hypothesis that concerns the nature of the underlying variable or construct. It is explored by investigating its relationship with other constructs (Pallant, 2005, p. 7). A factor analysis was conducted using principal axis factoring to assess the construct validity. All the scales load on one factor, which suggests that the scales are measuring one underlying concept. Table 1 lists the measures of internal consistency and validity assessment.

Table 1: Scale Items, Reliability, and Validity Assessment

Survey Items	1	2	3	4
RISK 1: Top executives favor high-risk projects.	**0.422**			
RISK 2: Top executives favor bold acts to achieve firm goals.	**0.529**			
RISK 3: Top executives adopt a wait-and-see attitude.	**0.571**			
PA 1: Top executives initiate actions, and competitors respond.		**0.679**		
PA 2: Top executives favor being the first business to introduce products, administrative techniques, and technologies.		**0.689**		
PA 3: Top executives favor a strong tendency to be ahead of others.		**0.594**		
INV 1: Top executives exhibit a strong emphasis on R&D.			**0.639**	
INV 2: Top executives promote a diversified product pipeline.			**0.766**	
INV 3: Top executives favor dramatic change to pipeline.			**0.893**	
UTT 1: Received technology transfers from our university partner.				**0.794**
UTT 2: Relied on our university partner's scientific and technological capabilities.				**0.679**
UTT 3: Solved problems using our university partner's technical support and expertise.				**0.689**
UTT 4: Relied on our university partner's scientific and technological capabilities.				**0.794**
UTT 5: Solved problems using our university partner's technical support and expertise.				**0.679**
Eigenvalue	**1.21**	**1.53**	**1.96**	**2.27**
Percentage of variance explained	12.0	15.30	19.60	22.70
Cumulative percentage of variance explained	12.0	27.30	46.90	69.60
Cronbach's alpha	0.811	0.772	0.752	.874

RESULTS

Table 2 presents the summary statistics and correlations among the constructs. A review of the relationships reveals that innovativeness, proactiveness, and risk-taking have a significant positive relationship with university technology transfer. The matrix reveals a negative relationship between the number of research linkages and university technology transfer (r = -0.29). When a firm simultaneously participates in resource- and time-intensive relationships, managers' attentions are diverted, and resources are stretched, thereby reducing transfer effectiveness.

Table 2: Means, Standard Deviations, and Correlations of Study Variables												
	Mean	Std. Dev	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) No. Research Univ. Links	13.1	22.56	1.00									
(2) Specific Univ. Experience	0.4	0.49	0.09	1.00								
(3) Size (log)	0.86	0.308	-0.01	0.04	1.00							
(4) Absorptive Capacity (log)	6.4	1.11	-0.03	-0.03	0.23**	1.00						
(5) Innovativeness	3.61	1.36	0.17*	-0.07	0.02	0.04	1.00					
(6) Proactiveness	3.32	0.79	-0.03	-0.05	0.14	0.04	0.24**	1.00				
(7) Risk-Taking	3.19	0.92	0.04	0.01	-0.09	0.08	0.17*	0.35**	1.00			
(8) Exit: Acquisition	0.42	0.5	0.16*	0.00	-0.24**	-0.19**	-0.05	-0.01	-0.05	1.00		
(9) Exit: IPO	0.18	0.37	0.09	0.19**	0.04	0.07	0.17*	-0.01	0.03	-0.30**	1.00	
(10) Univ. Technology Transfer	3.67	0.94	-0.29**	0.08	-0.02	0.06	0.32**	0.29**	0.26**	0.15*	0.02	1.00
[a]Correlation coefficients greater than 0.15 are statistically significant at $p < 0.01$.												

Table 3 contains the regression testing of each dimension of EO to university technology transfer. Ordinary least squares regression analysis was conducted to test the hypotheses. Multicollinearity analysis revealed that the variation inflation factors (VIFs) for all variables ranged between 1.02 and 2.45, below the limit of 10 suggested by Hair, Anderson, Tatham, and Black (1998). Model 1 includes the control variables. Specific university experience and number of research university linkages were significantly associated with university technology transfer.

Models 2-4 assess the survival motivation hypotheses. Hypothesis 1a proposed that a firm's innovativeness would positively affect university transfer. The analysis offers strong support for this hypothesis ($B = .27$, $p < .001$). Innovative biotechnology firms tend to establish strong links with universities to remain abreast of new scientific and technological knowledge and make significant investments in basic R&D. These activities contribute to an innovative firm's readiness, a strong commitment to learning and possession of essential skills such as communication and an understanding of cultural differences that enhance tacit knowledge acquisition (Yin & Bao, 2006). Although a firm's scientists may lack technical understanding of the invention, innovative firms possess a capacity to learn through exploration, discovery, and sharing. These activities may enhance the transfer process.

Hypothesis 1b proposed that a firm's proactiveness will positively affect university transfer. Model 3 reveals that the data do support this assertion ($B = .29$, $p < .001$), which suggests that biotechnology firms may benefit by managing aggressively and using their network of relationships to support development. Previous research revealed that proactiveness enables firms to leverage their network to gain access to critical resources (Lee, Lee, & Pennings, 2001). In terms of technology transfer, ideas from one group might solve the problems of another, but only if connections between solutions and problems can be made across organizational boundaries (Hargadon & Sutton 1997, p. 716). Proactive management teams make these connections to acquire university research to solve problems that may hinder a firm's R&D activities. Model 4 contains the analysis for Hypothesis 1c, which proposed that a firm's

propensity to take risks would positively affect university transfer, a claim that was supported by the data (B = .35, p < .001). Risk-taking biotechnology firms make bold decisions to acquire and develop the technology. Since many biotechnology firms have yet to earn a profit (DeCarolis & Deeds, 1999), developing and selling a university invention offers the possibility of profit and survival.

Table 3: Results of Regression Analyses

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Controls							
No. Research Univ. Links	-0.04***	-0.05***	-0.04***	-0.04***	-0.04***	-0.04***	0.06***
Specific Univ. Exp.	1.09*	1.42**	1.25*	1.07	1.10	1.06	1.44**
Size (Log)	-0.69	-0.78	-1.31	-0.23	-0.22	-0.70	-0.20
Absorptive Capacity (log)	0.27	0.21	0.26	0.15	0.37	0.26	0.25
Independent Variables							
Innovativeness		0.27***					0.24***
Proactiveness			0.29***				0.26*
Risk-Taking				0.35***			0.27**
Growth: Acquired					1.45**		1.74**
Growth: IPO						0.23	0.14
Fitness Indices							
Adjusted R^2	0.077	0.227	0.161	0.15	0.09	0.07	0.299
R^2 Change		0.15	0.089	0.071	0.022	0	0.239
F-Value	4.1**	9.66	6.66	6.011	4.073	3.27	8.01
F-Value		28.74***	15.26***	12.33***	4.36**	3.27	10.10***

Notes: Table entries are standardized regression coefficients.
[a] Standard errors are in parentheses; n= 171 (Out of 198 - 27did not have participate in university technology transfer)
*p < 0.10
**p < 0.05
***p < 0.001

Models 5-6 present the result of the testing for the growth motivation hypotheses. Hypothesis 1d implies that a firm's motivation to become acquired by a pharmaceutical firm would influence the extent of its participation in university technology transfer activities. The data presented in Model 5 supports this hypothesis (B = .19, p < .05). Management teams focused on being acquired may develop a plan to enhance the firm's pipeline to make it more attractive, which may include strategic allying with universities to gain access to early-stage inventions that need further development (Agrawal, 2006). Model 6 lists hypothesis 2b, which describes the positive relationship between a firm's IPO motivation and the extent of a firm's participation in university technology transfer activities. The data do not support the individual assessment of this dimension (B = 23, n.s). Firms seeking to conduct an IPO may seek high-status partners, such as pharmaceutical and other biotechnology firms who can help them transform projects from the pipeline to clinical trials (Stuart et al., 1999). Model 7 includes the analyses of the survival and growth motivation hypotheses. In the full model, all the EO

dimensions lose some of their significance, but the coefficient for the acquisition motive increases when combined with the other independent variables. The next section elaborates on these findings and discusses their implications.

DISCUSSION

The current article explores whether a firm's survival and growth motives influence the extent of its participation in university technology transfer activities. Examining survival-growth motives are of increasing importance to biotechnology firms, given the turbulent environment they encounter when attempting to develop and commercialize new therapies. These motives are often inferred, but this study explicitly examines survival and growth in the biotechnology industry by assessing key entrepreneurial traits and categorical growth assessments to determine how these motives influence a firm's participation in university technology transfer.

Survival and growth are critical development processes in a biotechnology firm's lifecycle. These firms emerged with the promise and potential to revolutionize drug development (Audretsch & Feldman, 2003); however, only a handful of potential new therapies survive the rigorous clinical trial approval process leading many firms to face dire circumstances on a daily basis (Khilji, Mroczkowski, & Bernstein, 2006) and an industry failure rate of 90% (Gassman, Reepmeyer, & Zedwitz, 2004). The survival of biotechnology firms may depend on their ability to develop promising pipelines by accessing knowledge that complement their existing R&D activities.

Regarding growth, SME studies have long recognized how knowledge contributes to firm growth (Delmar & Shane, 2006; West & Noel, 2009). By leveraging relationships with suppliers such as universities, firms can achieve above-average growth rates (Noisi & Queenton, 2010) and increase their innovative capabilities, because a high percentage of all innovation occurs at the interface between innovative supplier and customers (von Hippel, 1998). In a knowledge-intensive industry such as biotechnology, this study contributes to the continuous dialogue on how to support small firm knowledge-based development and evolution.

The findings generally supported the survival-growth hypotheses. Three key insights emerged from the results of this study. First, universities may appear to be perfect partners for biotechnology firms because they have expertise in basic science and offer the firms access to this knowledge in a non-competitive environment. Yet, these linkages are fraught with challenges. University knowledge is new to the world and is highly tacit knowledge (George et al., 2001; Rothaermel & Deeds, 2006). Firms may need to adopt an aggressive posture not only to ensure that they acquire complementary knowledge to support their survival but also to remain flexible when working with uncertain and ambiguous knowledge in a complex environment (Covin, Green, & Slevin, 2006). Acquiring firms need flexibility when seeking to acquire university knowledge because unanticipated problems might arise when working with early stage inventions that are difficult to replicate (Jensen & Thursby, 2001).

Second, the data did not support the growth-IPO hypotheses. This finding is puzzling when placed in the context of existing research. Firms seeking to issue an IPO use their relationships with collaboration partners to signal the quality of their science and their legitimacy (Pollack & Gulati, 2007). The correlation analysis reveals a non-significant relationship between research university linkages and IPO motive (r = .09, n.s) and university technology-transfer and IPO motive (r = 0.02, n.s.). The results of the correlation analysis, when taken in conjunction with the regression analysis, reveal that IPO-seeking firms do not participate in university technology transfer or possess a high number of linkages with research universities - these links can be used to send signals to outsiders about the firm's legitimacy (Pollack & Gulati, 2007). Speculatively, when firms begin the IPO process, they should be reaping the benefits of their growth strategy in terms of an increase in their R&D pipelines and patents. Conceivably, important university technology transfer activities have occurred when the firm begins its IPO road show.

Third, an unexpected finding of this study revealed that absorptive capacity, a control variable, did not have a significant influence on a firm's participation in university technology transfer activities. This study yielded different results from another study involving university knowledge and absorptive capacity. George et al. (2001) found that university linkages had a positive influence on a firm's absorptive capacity. In the current study, the relationship is reversed - a firm's absorptive capacity is presumed to influence a firm's ability to acquire university knowledge. Reversing the relationship between absorptive capacity and university knowledge reduced its significance. An explanation for this finding may be the novelty of university knowledge. Since university knowledge is new to the world, a firm's R&D learning, absorptive capacity, may not help its scientists understand the groundbreaking science emerging from universities (Rothaermel & Deeds, 2004).

After reviewing these insights, additional questions emerged that have theoretical and managerial implementations. These questions will be delved into in the next section.

Implications and Future Research

The first question that emerges from this study suggests: does the mode of transfer matter when assessing survival and growth motives? In my conceptualization of technology transfer activities, no distinction is made regarding the mode university technology transfer. This is an important question to consider because there are different nuances and characteristics associated with how knowledge is disseminated to industry in each mode of transfer. For example, licensing is codified knowledge that can be exchanged via a blueprint, and academic consulting involves faculty members using their knowledge to help a firm develop a licensed technology or solve an R&D problem. The knowledge contained in a specific transfer mode and may be conducive to one growth motive over another.

The implication of this question highlights the heterogeneity of university knowledge that includes basic scientific knowledge as well as relational knowledge. Awareness of the different knowledge types associated with transfer modes will allow for further exploration of the role that universities play in a firm's survival and growth. An avenue for future research could be investigating how a firm's survival or growth motive influences its participation in academic consulting by using Perkmann and Walsh's (2008) academic consulting conceptual framework, which classifies consulting into three categories. Researchers can leverage the framework to investigate whether a firm's survival and growth motives leads it to participate in one mode of transfer over another.

Another question that arose from my results highlights whether specific university experience substitutes for a firm's absorptive capacity when participating in technology transfer activities. Absorptive capacity is R&D learning that contributes to knowledge identification and exploitation (Cohen & Levinthal, 1990). Specific university experience highlights a firm's ability to manage its relationship with a particular partner by developing routines that facilitate the exchange and sharing of knowledge, conflict resolution routines, and decision-making (Hoang & Rothaermel, 2005). These factors contribute to the emergence of partner-specific absorptive capacity (Dyer & Singh, 1998) or relative absorptive capacity (Lane & Lubatkin, 1998). This form of absorptive capacity depends on the student and the teaching firm sharing a common source of knowledge that the student can draw from to identify, evaluate, and leverage the teacher firm's knowledge (Lane & Lubatkin, 1998). The biotechnology industry emerged from, and still utilizes, universities' basic science "know-how."

An implication of this finding is that university knowledge is so complex and unique, a firm's R&D learning will not prepare it to identify and leverage the new-to-the-world science being created in and disseminated from a specific university. It is through working with a specific university partner that a firm can develop partner-specific absorptive capacity to influence technology and knowledge transfer. Future research may compare and contrast which source of partner-specific absorptive capacity (i.e., graduate students versus academic links) best supports organizational learning. Since universities conduct economic transactions within a social network (Powell et al., 1996), future research might investigate whether network position, density, or tie strength influences a firm's ability to develop partner-specific absorptive capacity.

The final question that scholars may want to ponder is what role survival plays after a firm achieves its growth goal — specifically, issuing an IPO. Although issuing an IPO may allow investors and founder(s)/owners to be rewarded for their investments and intellectual property, it does not guarantee that a firm will remain a going concern. Public biotechnology firms must fend off shareholders who want to cash out (Pollack, 2009) as well as being delisted from a stock exchange for failure to comply with capital requirements. An implication of the query may be that survival is a constant bedfellow of biotechnology firms until they reach the scale and capitalization of their pharmaceutical peers. Speculatively, at each phase of development, when a milestone is reached, a firm may encounter different types of survival

challenges. Future research may seek to identify the survival challenges that emerge as a firm processes through its development lifecycle. To do so, scholars may develop scales to assess a firm's growth motivations, as well as potential survival challenges.

In addition to having scholarly implications, the findings in this study generate practical implications as well. The first implication draws attention to biotechnology firms' need to develop and actively manage and link their technology and alliance management strategies. Since different partners possess unique stocks of technological knowledge, it may be beneficial for biotechnology firms to participate in a technology roadmapping exercise, which will allow the firm to document and track their alliance partners, their knowledge, and how it can be used to help them achieve their goals. A technology roadmap involves the alignment of priorities between all the functions responsible for successfully developing and commercializing a new product (Whalen, 2007). The roadmap enables executives to revise the firm's technology strategy as dictated by changing environmental conditions.

The second implication focuses on universities. As university technology transfer offices seek to promote and maintain industry relationships, they should develop a profile of their industry partners, which highlights a firm's stage of development and growth goals. By doing so, they can work with their industry partners to identify the mode of transfer that will help the firm achieve its survival or growth goals. Alliance management may be beneficial for small and medium-sized research universities that are more willing to work with R&D-focused SMEs than their larger peers (Laursen, Reichstein, & Salter, 2008). Alliance management is important for small and medium universities that rely on industry linkages to fund students and support faculty research.

Limitations

University knowledge is a highly ambiguous and complex construct. Therefore, there are two possible limitations that may be considered when assessing the results of this study. First, in focusing on a single industry that has unique challenges and constraints, I may have limited the generalizability of these findings. Given the unique challenges encountered by biotechnology firms focused on developing human health therapies, the generalizability of the current study's results may be limited to R&D-intensive industries with long new product development lifecycles. A second limitation of this study is using a single-item measure to assess top managers' growth motivations. Single-item measures "...suffer from the intrinsic inability of categorical variables to capture anything of the intensity or degree of intention held" (Thompson, 2009, p. 677). Churchill (1979) advocated for the use of multi-item measures to increase reliability and reduce measurement error. Yet, there is a strong tradition of using single-item measures to assess entrepreneurial intentions (Thompson, 2009), which are similar to motives because they constructs are design to assess a firm's future objective. Despite these limitations, this research is a novel attempt to investigate universities' role in biotechnology firms' survival

and growth. These findings have important implications for management scholars, biotechnology firms, and universities.

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TRENDS IN THE MARKET FOR ENTREPRENEURSHIP FACULTY FROM 1989-2011

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ABSTRACT

Utilizing institutional theory, this article examines data based on the trends in the market for entrepreneurship faculty over the past 22 years. Data is provided from June, 1989 through June, 2011 on advertised candidates and positions throughout the world. The paper shows that the field of entrepreneurship has become increasingly institutionalized over the past 10 years. However, more recent evidence shows a significant increase of non tenure track positions. A discussion of the results follows.

EXECUTIVE SUMMARY

This article examines the trends in the market for entrepreneurship faculty over the past 22 years. Data is provided from June, 1989 through June, 2011 on advertised candidates and positions throughout the world.

Data collected for the study involved a daily process of collecting information about jobs and candidates from a wide variety of sources: the old Academy of Management Placement books before the introduction of the Internet; Chronicle of Higher Education; Academy of Management's Job Placement Board and The Chronicle of Higher Education's weekly online newspaper, and a number of web sites.

There were several significant findings in this study. Over the past year, the number of tenure track candidates was higher than the number of tenure track positions for only the second time in 12 years. This is a negative for candidates. The findings also show that schools were seeking senior faculty more often for their open positions. The number of advertisements for associate and full professors was close to an all-time high. The numbers tell us that entrepreneurship is becoming increasingly institutionalized within Schools of Business and Management.

Schools are also recruiting more candidates with a primary area in entrepreneurship. This shows that schools are valuing entrepreneurship as they recruit an ever increasing number of candidates with a primary area in entrepreneurship.

A prior version of this paper was presented at the 2012 United States Association for Small Business & Entrepreneurship Conference (USASBE).

Using t-tests, this study also examined the trends in tenure track candidates and positions over the past 10 years. Data showed a significant increase in the number of tenure track candidates versus tenure track positions.

The findings of this study can be beneficial to candidates seeking positions as they need to be aware of the current trends. Candidates need to be cognizant that the percentage of tenure track positions in entrepreneurship has been going down over the past few years. They also need to be aware of the opportunities. Schools are increasingly seeking candidates with primary areas in entrepreneurship. Overall, the findings of the study will be beneficial to both candidates and schools.

INTRODUCTION

This article examines both the long-term and short-term faculty trends within the field of entrepreneurship. The significance of this research is vital to candidates interested in entering the field of entrepreneurship to determine if there are existing opportunities at Schools of Business and Management for them. The findings of this study are also important to Schools of Business and Management because they need to understand the trends that are occurring within the field.

The findings of this study will allow both candidates and administrators from Schools of Business and Management to determine the total number of jobs and applicants that were advertised in the field of entrepreneurship from 1989 through 2011. The article also breaks down the total number of candidates and jobs into tenure track applicants and positions as well.

With the downturn in the global economy, most universities across the world have struggled from a financial perspective. For example in the United States, federal and state budget cutbacks have had a devastating effect on the budgets of universities and colleges. Also in Europe, the economic situation has resulted in unprecedented government cutbacks which have put increasing pressure on entrepreneurship centers to raise funds (Finkle, Menzies, Kuratko, & Goldsby, 2012).

This study examines the institutionalization of the field of entrepreneurship by examining the change in the number and level of entrepreneurship positions, as well as the number, level and training of entrepreneurship candidates from 1989-2011. One measure of institutional acceptance within the field of entrepreneurship would be the level of demand and supply for tenure track faculty in the field. This study will address the question of the institutionalization of the field by examining the changes in the market for entrepreneurship faculty between the academic years 1989/90 and 2010/11.

Institutional theory argues that organizations operating in institutionalized environments demonstrate that they are acting in a legitimate manner adopting the structures and activities that are perceived to be legitimate by their critical external resource providers (Finkle & Deeds, 2001). In essence by adopting the appropriate structures (institutions) the organization increases its legitimacy and is able to use this legitimacy to increase its support and ensure its survival (Dowling & Pfeffer, 1975; Meyer & Rowan, 1977).

This is where I investigate the global faculty trends in the field of entrepreneurship. Utilizing the entire sample of advertised candidates and jobs from 1989-2011, this study will answer the following research question: Is the field of entrepreneurship becoming increasingly institutionalized within Schools of Business and Management? To answer this research question I will examine the current trends in the global job market for faculty in entrepreneurship. I will also examine the percentage of current candidates and positions that are tenure track.

PREVIOUS RESEARCH

A variety of studies have examined trends in the market for entrepreneurship faculty (see Finkle and Deeds (2001; 2002) and Finkle (2006; 2007a; 2007b; 2008; 2010; 2012). Finkle and Deeds (2001) utilized institutional theory (Meyer & Rowan, 1977; Scott, 1987; 1995) to investigate whether or not Schools of Business and Management were integrating entrepreneurship into their faculties, which in turn would enhance the legitimization of the field. The study investigated jobs and candidates from 1989 through 1998 and found that the field of entrepreneurship was becoming increasingly institutionalized through the dramatic increase in rankings of entrepreneurship programs, press coverage, and demand for entrepreneurship faculty. However, they asserted that the field was still not fully institutionalized because most of the positions had been either non-tenure track or untenured assistant professorships.

From 1989 through 1998, faculty struggled to legitimize entrepreneurship at their respective universities. They attempted to overcome the negative stigma where other disciplines stated that entrepreneurship belonged in trade schools. During their study more traditional faculty questioned the legitimacy of the entrepreneurship journals and lack of rigor in the theoretical developments within the field. Tenure was difficult to earn. Departments of entrepreneurship were virtually non-existent and few pure entrepreneurship faculty existed. During this period faculty almost always had to earn a degree in an area within a more established field like business policy or organizational behavior with a secondary or tertiary area in entrepreneurship.

Finkle (2007a) examined the job market for entrepreneurship faculty (jobs and candidates) from 1989-2005. He found that the field of entrepreneurship was increasing its institutionalization on a number of fronts. For example, Schools of Business and Management had committed more resources to hiring a larger number of tenured or tenure track faculty. Finkle found that the ratio of tenure track positions per candidate improved from a low of .43 positions per candidate in 1994/95 to 1.78 positions per candidate in 2004/05 (+314%). The results of this study confirmed that entrepreneurship was becoming increasingly institutionalized within Schools of Business and Management.

Finkle (2010) found that entrepreneurship was one of the fastest growing areas in higher education. The findings indicated that in the academic year 2007/08 there were 366 job openings at schools and 231 candidates seeking positions in entrepreneurship. The data showed the

enormous rise of international positions and candidates. The number of international positions nearly doubled from 34 in 2006/2007 to 76 in 2007/08. The number of international candidates was 44 in 2006/2007 and grew to 62 in 2007/08. The data indicated that entrepreneurship was being institutionalized on a global basis.

Finkle (2012) examined data from June, 1989 through June, 2010 on advertised candidates and positions throughout the world. The article examined the trends over the past 21 years with a primary focus on how the current economic crisis was affecting the job environment. The findings of this study showed that the field has matured in regards to tenure track and non tenure track positions. In 2009/10 there were 1.1 tenure track jobs per tenure track candidate. Due to the lackluster economy, the decrease in the number of candidates seeking positions in 2009/10 may have been partially caused by fear. The worst economic environment since the Great Depression may have caused people to remain conservative; not willing to sell their house and make a move. As a result, in 2008/09 there were 260 candidates and in 2009/10 there were only 169 candidates. Finkle (2012) concluded that, in that volatile environment, savvy candidates could take risks and apply for desirable jobs. This was especially true for senior level faculty where the demand remained very strong.

Overall, previous research showed that the number of positions (including tenure track) peaked in 2007/08, right before the economic crisis.

METHODOLOGY

Data collection for the study involved a daily process of collecting information from a wide variety of sources. The initial collection of data was done through the old *Academy of Management Placement* books before the introduction of the Internet. Data older than that was collected through micro fiche from the *Chronicle of Higher Education*. Other sources used to collect the data included: the *Academy of Management's* Job Placement Board and *The Chronicle of Higher Education's* weekly online newspaper. A number of web sites were also used to collect data: United States Association for Small Business and Entrepreneurship (USASBE) (http://usasbe.org/); Academic Keys for Business Education (http://business.academickeys.com/seeker_job.php); University 500 (http://www.university500.com/);); American Marketing Association (http://academicplacement.marketingpower.com/search/); Financial Management Association (http://www.fma.org/); RE Ladder (http://www.reladder.com/); Mid Atlantic Higher Education Consortium (http://www.midatlanticherc.org/home/); Academic Careers Online (http://www.academiccareers.com/); Academic Employment Network (http://www.academploy.com); University Affairs (http://www.universityaffairs.ca); HigherEdJobs.com (http://www.higheredjobs.com/); Jobs.ac.uk http://www.jobs.ac.uk; Times Higher Education Supplement (http://www.timeshighereducation.co.uk); Career.edu (http://www.career.edu); and UniJobs.com.au (http://www.UniJobs.com.au) (Finkle, 2011).

Data was also collected through direct e-mails on a variety of networks and directly from universities themselves. It must be noted that due to the tremendous growth of the field of entrepreneurship, other areas such as marketing and finance were also included in the study.

The methodology in the study was similar to Finkle and Deeds (2001; 2002) and Finkle (2006; 2007a; 2007b; 2008; 2010; 2012). The data was split into academic years (e.g., 2010/11). Two categories were then created; January through June (spring) and July through December (fall). Overlapping candidates and positions found in each subset were dropped. For example, if Donald Kuratko advertised for a job in fall 2010 and spring 2011 he would be counted only once.

In this study, I broke down the average tenure track positions and candidates into two different categories; 2001/02 to 2005/06 and 2006/07 to 2010/11. I then ran t-tests to determine if there were any significant differences between the samples.

RESULTS

This study created three tables to evaluate global faculty trends for candidates seeking jobs within Schools of Business and Management.

Table 1 evaluates the number of positions and candidates dating back from June, 1989 through June, 2011. The table also examines the desired interest level of a candidate or school (e.g., Primary, Secondary, or Tertiary). International jobs and candidates were also located in Table 1. Table 2 shows the number of tenure track candidates and positions from June, 1989 through June, 2010. The percentages indicate the percentage of candidates and positions that were tenure track. Table 3 shows the percentage of candidates and positions and the fields that they cross-listed with on their advertisement. For example, if Tim Pollock was on the market seeking a job, he might list Business Policy, Entrepreneurship and International Management as his three areas.

Table 1 shows the number of positions and candidates from June, 1989 through June, 2011. The table documents a number of variables. First, the table documents the total number of candidates and positions (tenure track and non-tenure track) advertised during the time frame of the study. The table also shows the desired interest level in entrepreneurship for candidates and schools (e.g., Primary, Secondary, or Tertiary). The table also includes the total number of international jobs and candidates.

The total number of jobs peaked at 366 in 2007/08. However, by 2010/11 the number of jobs decreased to 283 or a decrease of 23% from the peak. The total number of candidates peaked at 270 in 2008/09. However, by 2010/11 the number of candidates decreased to 213 or a decrease of 21% from the peak. The ratio of total jobs per candidate in 2010/11 was 1.33. This ratio is favorable to candidates seeking employment.

Table 1: Number & Level of Interest in Entrepreneurship for Candidates & Positions 1989-June 2011

	Candidates w/Primary Interest	Positions w/Primary Assignment	Candidates w/2nd Interest	Positions w/2nd Assignment	Candidates w/Tertiary Interest	Positions w/Tertiary Assignment	Int'l Candidates	Int'l Positions	Total Candidates	Total Positions
Academic Yr. 89-90	5	5	15	12	15	9	3	0	35	26
Academic Yr. 90-91	3	9	23	6	20	12	2	2	46	27
Academic Yr. 91-92	7	12	20	3	13	3	1	2	40	18
Academic Yr.92-93	6	16	23	3	27	9	2	3	56	28
Academic Yr. 93-94	10	18	32	6	25	3	3	1	67	27
Academic Yr. 94-95	15	20	45	4	29	6	3	5	89	30
Academic Yr. 95-96	24	20	50	9	35	9	9	7	109	38
Academic Yr. 96-97	19	36	35	18	31	6	4	12	85	60
Academic Yr. 97-98	20	50	25	26	23	16	6	13	68	92
Academic Yr. 98-99	16	58	10	45	28	46	9	22	54	149
Academic Yr. 99-00	17	92	17	67	27	69	10	21	61	228
Academic Yr. 00-01	15	82	25	56	27	59	5	26	67	197
Academic Yr. 01-02	24	54	28	65	24	56	12	16	74	175
Academic Yr. 02-03	31	83	19	50	29	57	6	19	79	190
Academic Yr. 03-04	35	74	33	67	30	44	22	20	98	185
Academic Yr. 04-05	33	94	40	65	33	53	15	17	106	212
Academic Yr. 05-06	33	141	59	104	49	82	25	36	141	316
Academic Yr. 06-07	62	111	63	82	57	64	44	34	184	263
Academic Yr. 07-08	90	165	87	90	54	111	62	76	231	366
Academic Yr. 08-09	57	128	106	63	107	74	61	66	270	265
Academic Yr. 09-10	42	153	48	68	91	85	48	75	181	306
Academic Yr. 10-11	45	149	47	41	121	93	58	60	213	283

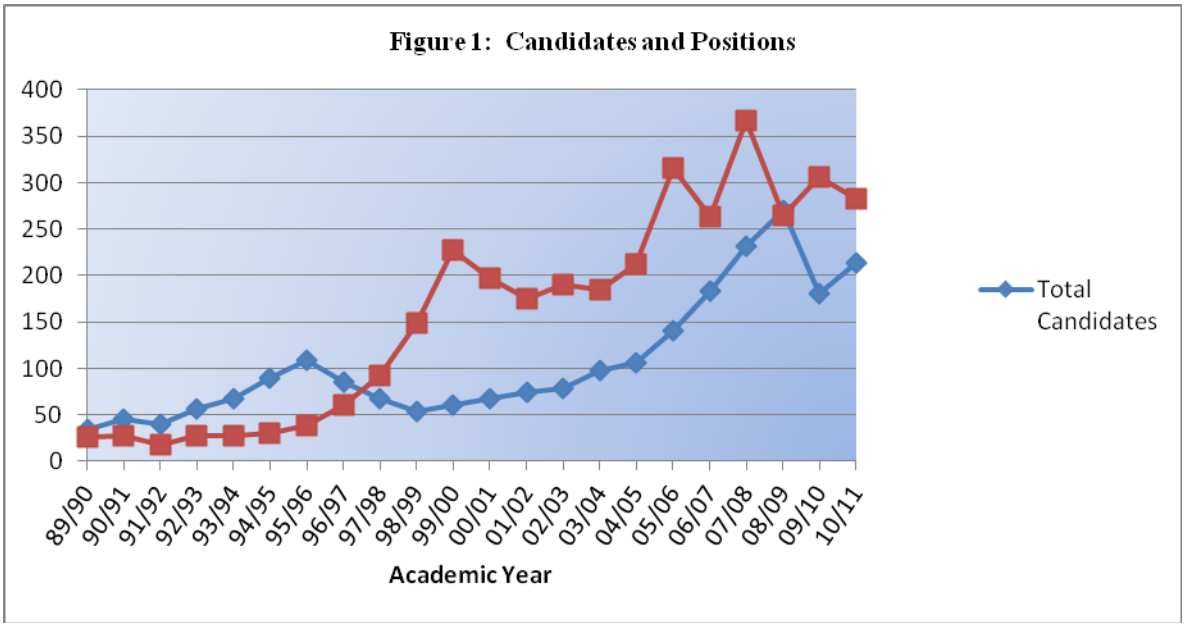


Figure 1: Candidates and Positions
400
350
300
250
200
150
100
50
0
89/90
90/91
91/92
92/93
93/94
94/95
95/96
96/97
97/98
98/99
99/00
00/01
01/02
02/03
03/04
04/05
05/06
06/07
07/08
08/09
09/10
10/11
Academic Year
Total Candidates

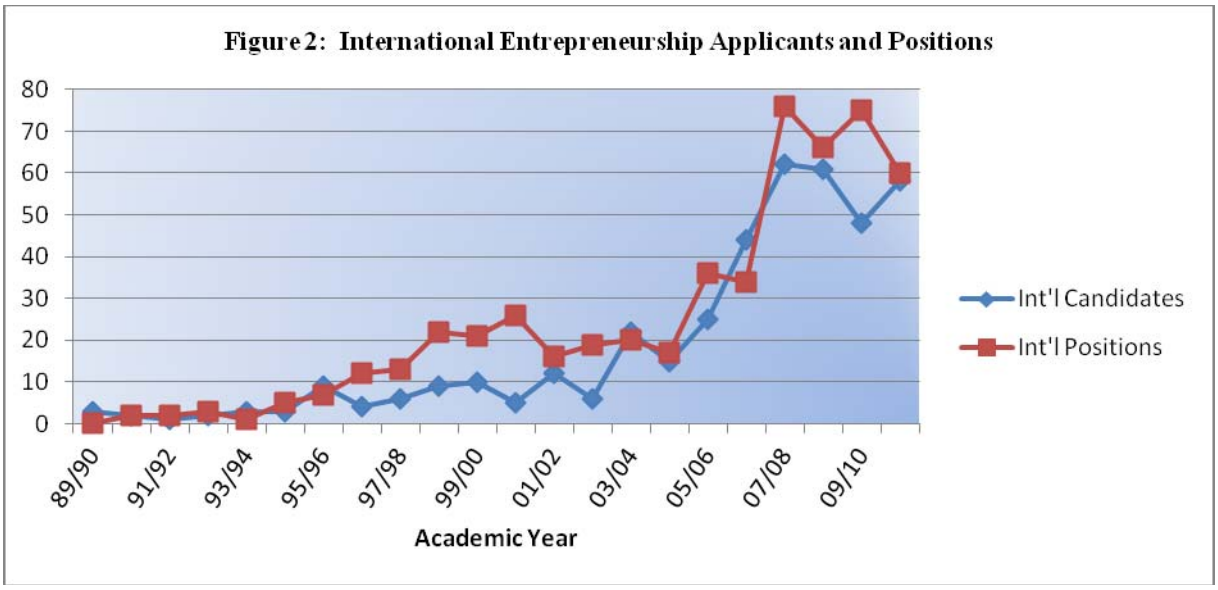


Figure 2: International Entrepreneurship Applicants and Positions
80
70
60
50
40
30
20
10
0
89/90
91/92
93/94
95/96
97/98
99/00
01/02
03/04
05/06
07/08
09/10
Academic Year
Int'l Candidates
Int'l Positions

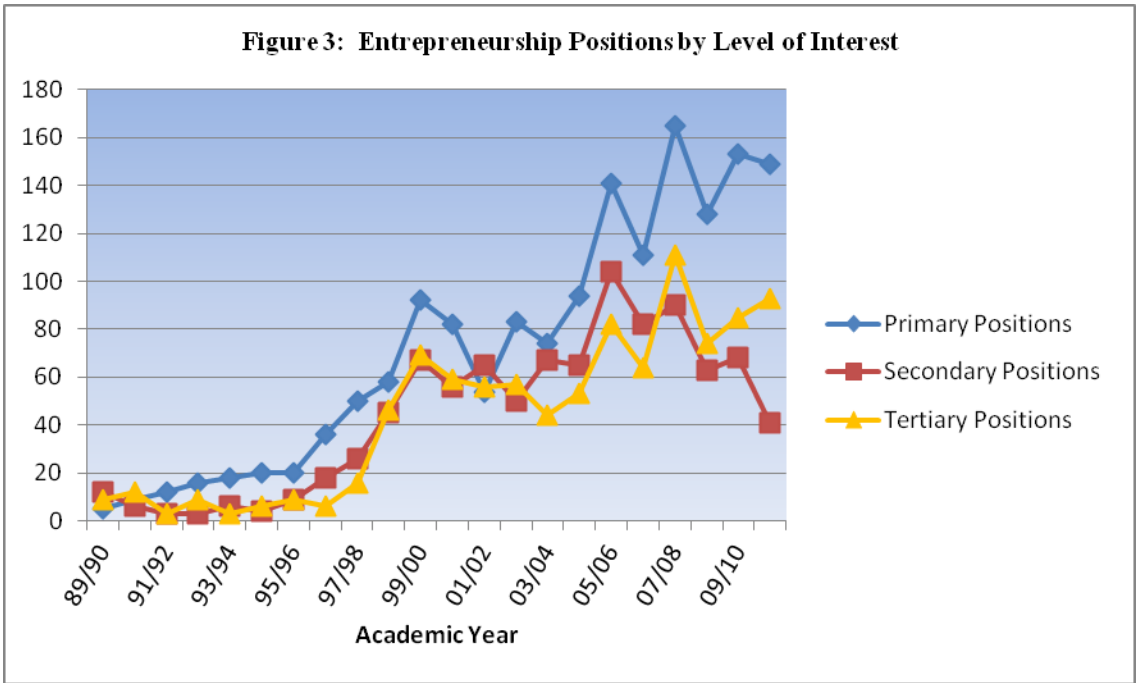


Figure 3: Entrepreneurship Positions by Level of Interest
180
160
140
120
100
80
60
40
20
0
89/90
91/92
93/94
95/96
97/98
99/00
01/02
03/04
05/06
07/08
09/10
Academic Year
Primary Positions
Secondary Positions
Tertiary Positions

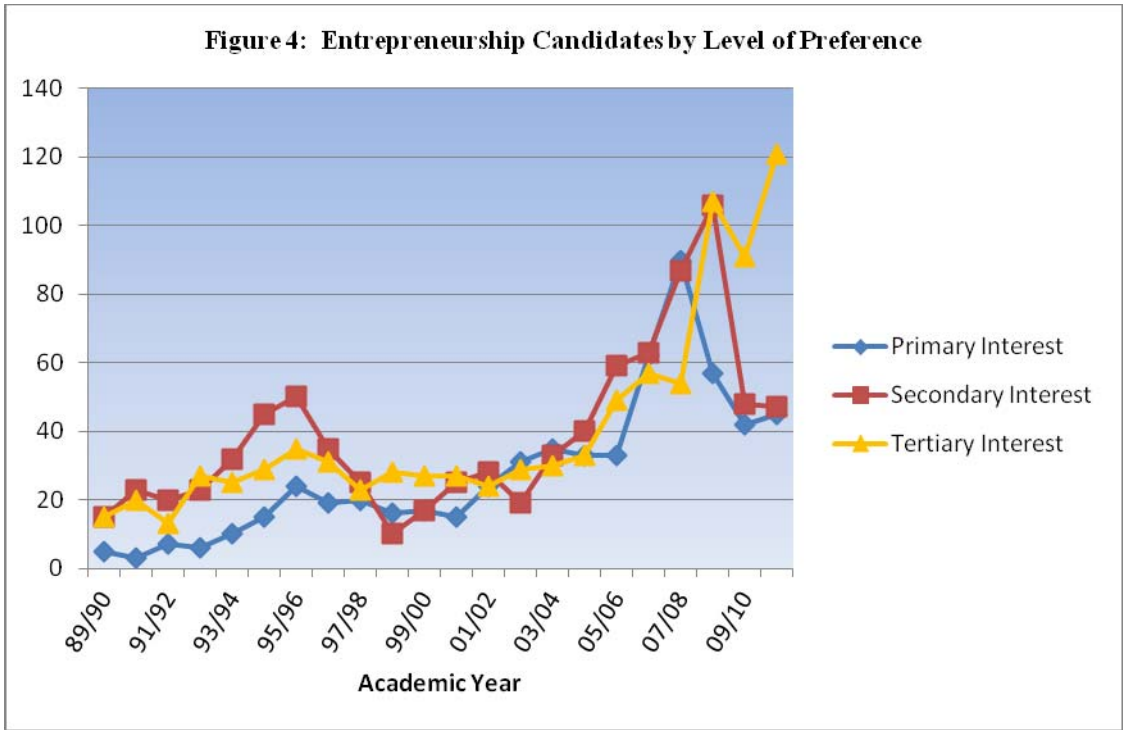


Figure 4: Entrepreneurship Candidates by Level of Preference
140
120
100
80
60
40
20
0
89/90
91/92
93/94
95/96
97/98
99/00
01/02
03/04
05/06
07/08
09/10
Academic Year
Primary Interest
Secondary Interest
Tertiary Interest

International Market

The number of international positions and candidates was also located in Table 1. In 2007/08 there was the largest number of international positions at 76. By 2010/11, that number had decreased 21% to 60.

The number of international candidates was at an all time high at 62 in 2007/08. However, by 2010/11, that number had decreased 7% to 58. In 2010/11 the ratio of international jobs to international candidates was 1.03.

Level of Interest

Table 1 also shows the number of positions and candidates by their level of interest (e.g., Primary, Secondary and Tertiary). The number and percentage of jobs with entrepreneurship as their primary field of expertise in 2010/11 was 149 (53%). Secondary and tertiary numbers were 41 (14%) and 93 (33%), respectively.

The number of candidates in 2010/11 that sought positions with entrepreneurship as their primary field of expertise was 45 (21%). Secondary and tertiary numbers were 47 (22%) and 121 (57%), respectively.

The ratio of primary jobs per primary candidates was 3.3 (149/45). The numbers indicate opportunities for candidates specializing in entrepreneurship as their primary area of expertise.

The findings show that candidates are marketing themselves in other fields like Business Policy/Strategic Management, Organizational Behavior, etc.

Table 2 focuses on tenure track candidates and positions as advertised by academic rank from June, 1989 through June, 2011. It drops all of the candidates and positions from Table 1 that were not seeking full-time tenure track positions and candidates.

In 2010/11 there were 182 tenure track positions available or 64% of the total number of advertised positions in entrepreneurship. The rank of the advertised positions were 66 (36%) assistant, 59 (32%) associate, 18 (10%) full, 16 (9%) endowed chair, and 23 (13%) open.

The total number of tenure track candidates was 201. The rank of the advertised candidates was: 181 (90%) assistant, 17 (10%) associate, 3 (4%) full, 0 (0%) endowed chair, and 0 (0%) open.

Overall, the ratio of tenure track positions per tenure track candidate was .90. This is only the second time in the last 12 years that the number of tenure track candidates has outweighed the number of tenure track positions.

Similar to recent research by Finkle (2008; 2010; 2011) there continues to be a drop in the percentage of tenure track positions. There has been a decline in the percentage of tenure track positions starting in 2002/03 from 92% (181 positions) to 2010/11 at 65% (182 positions). Academia has been criticized in the popular press for a variety of reasons including tenure. So it

is no surprise to see the percentage of tenure track positions decreasing. The numbers tell us that Schools of Business and Management are decreasing resources oriented towards full-time tenure track entrepreneurship positions.

Table 2: Rank of Tenure Track Candidates & Positions, 1989-June 2011

	Candidates							Positions						
Academic Year	**Assistant**	**Associate**	**Full**	**Endowed**	**Open**	**Total**	**%**	**Assistant**	**Associate**	**Full**	**Endowed**	**Open**	**Total**	**%**
89/90	24	4	2	0	5	35	100	19	0	0	3	4	26	100
90/91	34	4	1	0	3	42	91	19	0	0	3	3	25	93
91/92	29	5	1	0	5	40	100	10	1	0	3	1	15	83
92/93	29	4	2	0	7	42	75	15	0	0	4	4	23	82
93/94	30	4	1	0	5	40	60	18	0	1	3	1	23	85
94/95	46	2	0	0	5	53	60	14	2	0	2	5	23	77
95/96	51	1	0	0	3	55	50	22	2	1	5	4	34	89
96/97	48	1	0	0	5	49	58	23	6	0	8	14	51	85
97/98	63	0	0	0	4	67	99	41	4	3	5	7	60	65
98/99	37	3	0	0	9	49	91	58	17	5	10	51	141	95
99/00	47	1	1	1	5	58	95	88	21	3	23	81	216	95
00/01	49	1	0	0	12	62	84	52	16	4	18	97	187	95
01/02	60	4	1	0	9	74	100	81	34	4	3	38	160	91
02/03	56	12	4	0	5	77	97	81	33	14	12	41	181	95
03/04	66	11	6	2	11	96	98	63	40	8	13	47	171	92
04/05	75	8	4	0	15	102	96	64	59	9	17	35	184	87
05/06	87	24	0	2	24	137	97	71	110	14	24	73	292	92
06-07	98	52	3	1	29	183	99	71	55	8	13	36	183	69
07-08	185	20	6	4	7	222	96	84	107	12	17	68	288	79
08-09	209	34	10	5	2	260	96	69	46	12	22	16	165	66
09-10	144	18	6	0	1	169	93	74	47	14	17	33	185	60
10-11	181	17	3	0	0	201	94	66	59	18	16	23	182	65

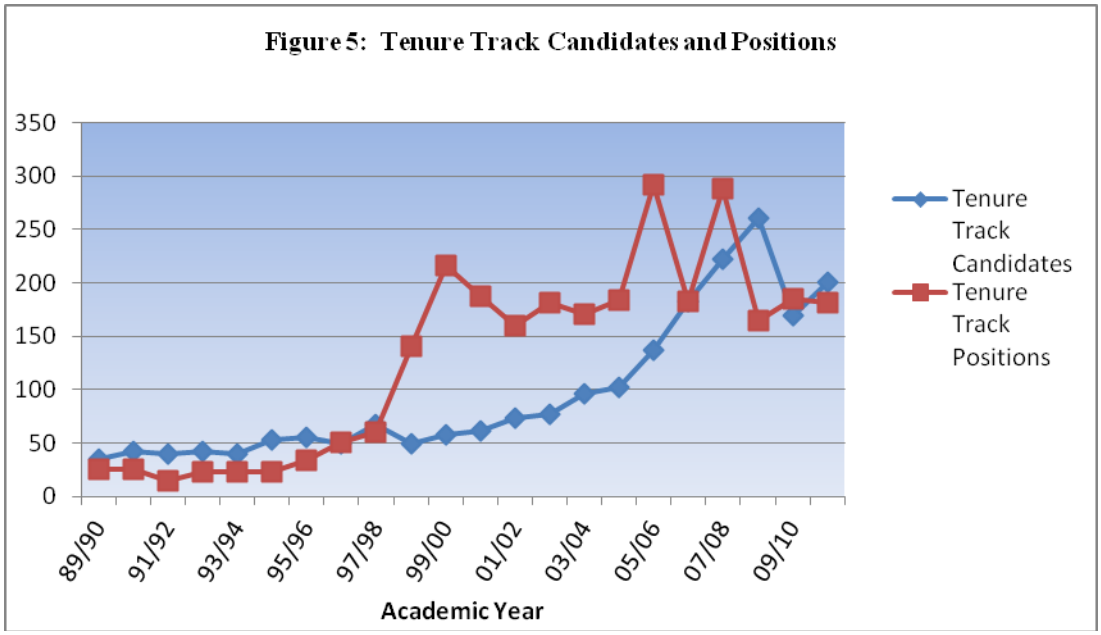
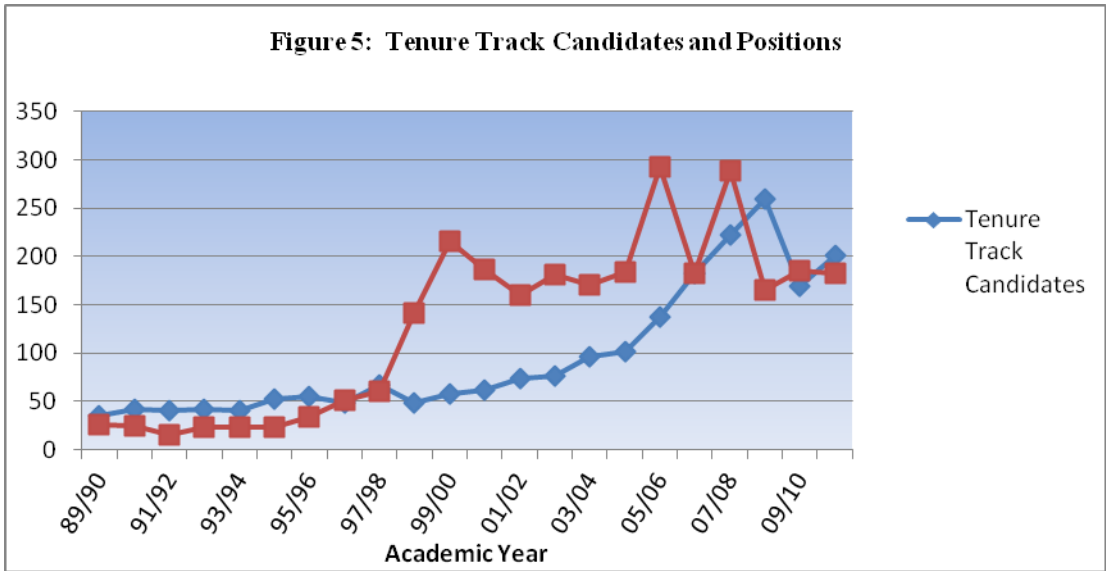


Table 3 breaks down the sample into the average tenure track positions and candidates for the past 10 years. They were then divided into two categories; 2001/02 to 2005/06 and 2006/07 to 2010/11. T-tests were run to determine if there were any significant differences between the samples. Data showed a significant increase in the number of tenure track candidates versus tenure track positions. Thus according to institutional theory, more and more tenure track candidates are seeking legitimate tenure track positions in the field of entrepreneurship.

Table 3: Tenure Track Positions and Tenure Track Candidates Over the Past 10 Years			
	2001/02 to 2005/06	**2006/07 to 2010/11**	***p*-value**
Average Number of Tenure Track Positions Per Year	200.6	197.6	.82
Average Number of Tenure Track Candidates Per Year	207.0	97.2	.000***
* p < .05 ** p < .01 *** p < .001			



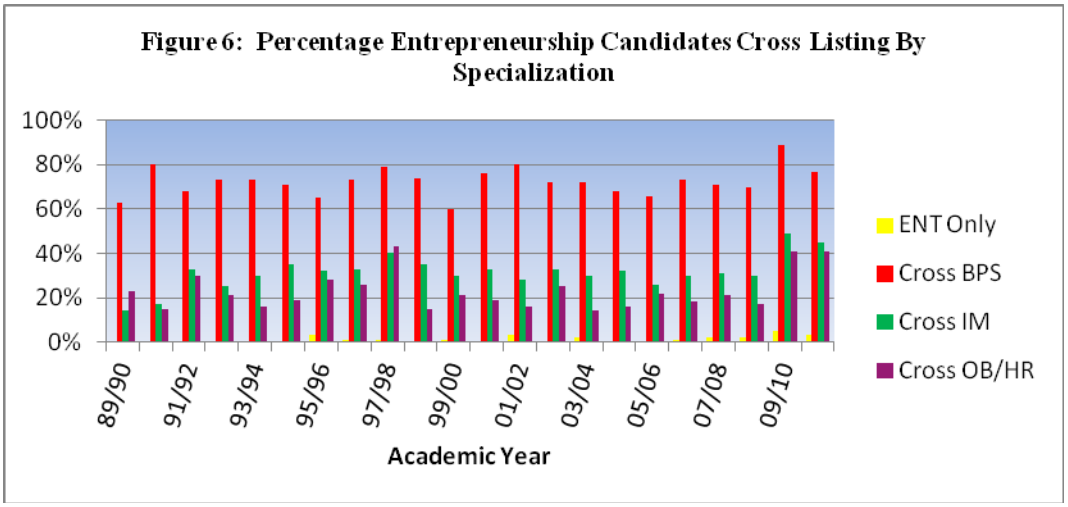
Similar to Finkle (2006; 2007a; 2007b; 2008; 2010; 2012), Table 4 breaks down the positions and candidates into the fields that they advertise on their profile. For instance, if Ted Baker was advertising for an entrepreneurship only position he would put that down on his profile. Similarly, if Florida International University was seeking a candidate with areas in Business Policy, International Management, and Technology and Innovation Management, they would list these in their profile.

The importance of studying this area is vital so the field of entrepreneurship can examine the trends that are occurring within the marketplace and we can address the needs of the schools. Then the candidates can be more proactive and study the appropriate areas that are needed in the field.

Table 4: Percentage of Applicants & Positions Cross-Listed by Field, 1989-June 2011

	CANDIDATES					POSITIONS				
Academic Year	**Entrepreneurship Only**	**Strategy**	**International**	**OB/HR**	**TIM**	**Entrepreneurship Only**	**Strategy**	**International**	**OB/HR**	**TIM**
89/90	0%	63%	14%	23%	3%	15%	69%	38%	7%	0%
90/91	0%	80%	17%	15%	2%	28%	40%	12%	12%	0%
91/92	0%	68%	33%	30%	3%	67%	40%	0%	0%	0%
92/93	0%	73%	25%	21%	13%	65%	30%	26%	13%	0%
93/94	0%	73%	30%	16%	10%	61%	22%	13%	4%	4%
94/95	0%	71%	35%	19%	7%	74%	17%	9%	26%	0%
95/96	3%	65%	32%	28%	8%	35%	21%	15%	18%	3%
96/97	1%	73%	33%	26%	6%	37%	41%	22%	33%	8%
97/98	1%	79%	40%	43%	9%	48%	65%	27%	27%	8%
98/99	0%	74%	35%	15%	11%	47%	56%	27%	33%	15%
99/00	1%	60%	30%	21%	16%	24%	37%	15%	18%	14%
00/01	0%	76%	33%	19%	25%	26%	38%	18%	19%	16%
01/02	3%	80%	28%	16%	20%	18%	50%	21%	19%	12%

Table 4: Percentage of Applicants & Positions Cross-Listed by Field, 1989-June 2011										
CANDIDATES						POSITIONS				
Academic Year	Entrepreneurship Only	Strategy	International	OB/HR	TIM	Entrepreneurship Only	Strategy	International	OB/HR	TIM
02/03	0%	72%	33%	25%	15%	25%	48%	16%	17%	9%
03/04	2%	72%	30%	14%	25%	25%	51%	19%	9%	10%
04/05	0%	68%	32%	16%	17%	22%	51%	18%	15%	11%
05/06	0%	66%	26%	22%	32%	22%	46%	16%	17%	8%
06-07	1%	73%	30%	18%	33%	23%	44%	29%	18%	9%
07-08	2%	71%	31%	21%	23%	22%	45%	18%	22%	14%
08-09	2%	70%	30%	17%	25%	20%	46%	20%	20%	16%
09-10	5%	89%	49%	41%	48%	33%	37%	19%	21%	17%
10-11	3%	77%	45%	41%	40%	46%	30%	15%	13%	9%



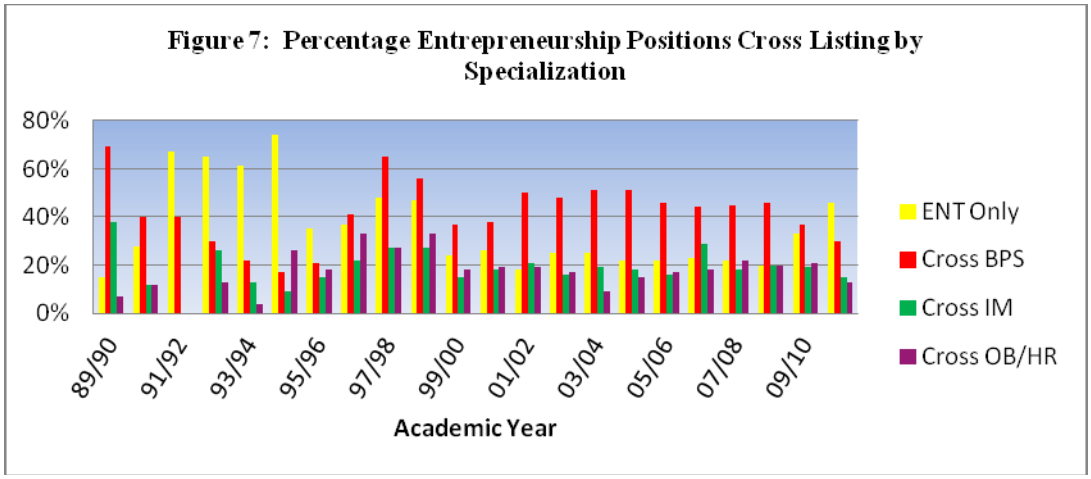


Table 4 is divided into five categories: Entrepreneurship only, Strategy, International Management, OB/HR (Organizational Behavior/Human Resources Management), and TIM (Technology and Innovation Management). Each category has a percentage, which indicates the percentage of jobs or candidates in that were listed on that advertisement.

When we examine the percentages advertised in the respective position categories for 2010/11 we see the following percentages: Entrepreneurship Only (46%), Strategy (30%), International Management (15%), OB/HR (13%), and Technology and Innovation Management (9%).

When we examine the percentages advertised in the respective candidate categories for 2010/11 we see the following percentages: Entrepreneurship Only (3%), Strategy (77%), International Management (45%), OB/HR (41%), and Technology and Innovation Management (40%).

The data for the candidates indicates an increasing percentage of the candidates advertising in a larger number of areas. The past two years we have seen a significant jump in the number of areas that the candidates are advertising that they have expertise in. This may be due to the economy's affect on the job market. As it has become more competitive for tenure track positions, candidates are positioning themselves in a variety of areas to enhance their possibilities.

The data for the jobs indicate the strong need for applicants with a primary in entrepreneurship. Strategy was the second most popular area advertised. This was the complete opposite of what the candidates were specializing in. Candidates appear to be hedging their bets by specializing in other areas in addition to entrepreneurship**.**

CONCLUSION AND IMPLICATIONS

This research answered the following three research questions: What are the current trends in the global job market for faculty in entrepreneurship? What percentage of the current candidates and positions are tenure track and what are their respective ranks? What supporting areas (e.g., Business Policy, Organizational Behavior, etc.) are advertised by schools and candidates in their advertisements?

Table 1 answered the first research question. In 2010/11 there were 283 advertised tenure track and non tenure track jobs for entrepreneurship faculty in Schools of Business and Management all over the world. During the same time frame, the number of candidates was 213. The ratio of total jobs per candidate during 2010/11 was 1.33. This ratio is favorable to candidates seeking employment, however it must be noted that not all of these positions were full-time tenure track.

Another trend I examined was the desired interest level of both candidates and schools (e.g., Primary, Secondary, or Tertiary). There were two numbers that stood out. The first was the ratio of schools seeking primary positions in entrepreneurship, 149. However, there were only 45

candidates with a primary area in entrepreneurship. This was a very favorable ratio for candidates of 3.31 jobs per candidate. Another figure that stood out was the number of tertiary candidates, 121. This was the highest number of candidates in this category since the study began in 1989.

The table also looked at international jobs and candidates. In 2010/11, there were 60 internal jobs and 58 international candidates. The ratio of international jobs to international candidates was 1.03.

Overall, the numbers tell us that there are strong opportunities for candidates seeking entrepreneurship positions within the U.S. as their primary area of expertise.

Table 2 is a very important table for faculty seeking tenure track positions as it shows the trends from June, 1989 through June, 2011. The percentages in the table show the percentage of candidates and positions that were tenure track. The table shows the tenure track candidates and positions as advertised by academic rank. In 2010/11 there were 182 tenure track positions available or 64% of the total number of advertised positions in entrepreneurship. The rank of the advertised positions were 66 (36%) assistant, 59 (32%) associate, 18 (10%) full, 16 (9%) endowed chair, and 23 (13%) open. The total number of tenure track candidates was 201. The rank of the advertised candidates was: 181 (90%) assistant, 17 (10%) associate, 3 (4%) full, 0 (0%) endowed chair, and 0 (0%) open.

The findings of Table 3 are noteworthy because they show a significant increase in the number of tenure track candidates applying for tenure track positions over the past five years. This is especially important since there has not been a significant increase in the number of tenure track positions.

When looking at this past year we see that the ratio of tenure track positions per tenure track candidate was .90. As I stated earlier, this is only the second time in the last 12 years that the number of tenure track candidates has outnumbered the number of tenure track positions. This is a rather disturbing trend for the field, but not surprising. Given the backlash that industry has been giving academia about why should faculty even have tenure and the guarantee of life-time contracts, it is not surprising to see this number. While the earlier years in the study almost all years had 80-95% tenure track positions, over the past five years that has dropped to the 60+ percentages. As a result, it has become increasingly competitive to get a tenure track position in entrepreneurship. This might make it harder to earn tenure at universities due to the increase in demand for positions. While I cannot say that with 100% certainty, a future study could investigate this assertion.

Despite this, the findings of Table 2 are very encouraging for senior faculty. Senior positions comprised 65% (116) of the advertised positions while candidates who advertised for senior positions were only 10% (20). The findings of this study show that there is a strong demand for senior entrepreneurship faculty, especially at the associate and full professor level. The number of associate professors tied for the third highest ever during the time frame of this study. Also the number of advertised positions for full professors was the highest ever. The

numbers tell us that entrepreneurship is becoming increasingly institutionalized within Schools of Business and Management.

Finkle et. al.,'s (2006) study where we see the number of U.S. entrepreneurship centers increasing from 146 in 2006 to 249 in our current study in 2011. This is an average increase of 20 centers a year or an annual growth rate of 14% a year in the U.S. As we see more new entrepreneurship centers develop, it will take time for them to become institutionalized and build upon the legitimacy that is needed to garner funding from their external environment (Finkle et. al., 2011). As a result, the findings of this study may indicate that schools are attempting to recruit existing senior faculty with reputations that can enhance the legitimacy of their programs.

Another indication that the field is becoming institutionalized at Schools of Business and Management is the recruitment of candidates with a primary area in entrepreneurship. The past three years have been very strong with numbers at 128, 153, and 149. This compares with candidates seeking a primary position in entrepreneurship at 57, 42, and 45. This shows that schools are valuing entrepreneurship as they recruit an increasing number of candidates with a primary area in entrepreneurship.

In summary, the findings of this study confirm the trend that entrepreneurship is becoming increasingly legitimized within Schools of Business and Management.

LIMITATIONS

Limitations always exist to some extent. There were a few limitations in this study. First, I may not have captured the full extent of the candidates on the market. For example, senior faculty do not always advertise. Therefore, this study may not have captured the true nature of the candidates, which may make the job market look more promising than it actually is. Second, some positions are advertised but may not be filled due to a variety of reasons like budgetary issues or the inability to find the appropriate candidates. Furthermore, these same advertisements may be counted again the following academic year. Third, despite my effort to expand this study into countries throughout the world, I may not have captured the full extent of the international component of the study.

FUTURE RESEARCH

Entrepreneurship scholars can perform research in a number of areas to enhance the legitimacy and institutionalization of the field.

The field needs a recent study examining faculty with primary areas in entrepreneurship and whether or not these faculty are earning tenure and/or are getting promoted. Future research can update the results of this study by examining whether or not entrepreneurship faculty are earning tenure and what their research records are comprised of at the time of tenure. Finkle, Stetz, and Mallin (2007) examined the research records and perceptions of tenure requirements of 108 faculty members who taught entrepreneurship and earned tenure between 1964 and 2002.

The sample was broken down based on the primary focus of the school (research versus teaching) and time frame, 1964-1988 versus 1989-2002. Significant differences were found between faculty members' perception of the College's stated requirements for teaching, research, and service compared to the faculty member's own perceived requirements for teaching, research, and service. Furthermore, research schools were found to have a significantly larger amount of A, B, and C refereed journal publications, books authored, and chapters in books. Finally, the findings indicate that 60% of successful tenure candidates at research schools had a least one publication in a top management journal, compared to only 13% at teaching schools. The limitations to the study were the lack of controls for faculty with a primary versus secondary teaching interest at the respective schools. Another limitation was the disagreement on what the respective classification of research was at different universities. Further research in this area would advance the field.

Utilizing social comparison theory (Festinger, 1954; Goethals & Darley, 1977) the field needs to incorporate studies on salaries. We need to determine if entrepreneurship faculty are making comparable salaries to their colleagues in other departments within Schools of Business and Management. A recent study by Finkle et. al., (2012) investigated the salaries for entrepreneurship center directors all over the world. The average annual salary including summer was approximately $134,833 for a director. Future studies need to investigate starting salaries and senior level salaries and benefits. Furthermore, Buller and Finkle (2012) did an in-depth examination on the history and successes of a leading entrepreneurship programs. More research should be done in the aggregate and reported.

While entrepreneurship centers have been investigated by researchers (see Finkle 1998; Finkle & Kuratko, 2004; 2006; Finkle, Kuratko, & Goldsby, 2006; Finkle, 2007; Finkle et. al., 2012; and Finkle, et. al., 2010; 2012 have all studied entrepreneurship centers. Finkle et. al., (2006) examined the characteristics of 146 entrepreneurship centers in the United States. Finkle, et. al., (2010; 2012) examined the financial aspects of 300 entrepreneurship centers world-wid. Entrepreneurship scholars need to investigate the specific roles that the centers are playing at universities.

Finally, in this era of accountability, faculty affiliated with entrepreneurship (e.g., center directors, faculty, administrators, etc.) need to be proactive in the methodology by which they account for their value. The field would greatly benefit from a landmark study evaluating the value that entrepreneurship brings to universities. A study building a model by which we can measure the contribution our field makes to universities throughout the world would enhance the field.

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BUSINESS MODEL MAPPING: APPLICATION AND EXPERIENCE IN AN INTRODUCTION TO ENTREPRENEURSHIP COURSE

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ABSTRACT

Business modeling is a method for broadly documenting the rationale of how a firm proposes to create and deliver value to its customers. A relatively complete business model can be prepared, providing a means to develop and assess a number of alternative approaches to a business opportunity, in a very short period of time and with a modest amount of effort. By way of contrast, business planning is seen as focusing on a specific business proposition and being sufficiently detailed to justify that particular approach and outline an implementation plan with specific strategies, tactics, policy decisions, budgets and milestones.

This paper describes the use of business modeling in an introductory entrepreneurship course. This experiment hypothesized that using higher-level business modeling techniques is an effective and appropriate alternative to the common, but more advanced, business planning technique. Instructor and students using this method report:

- *Increased appreciation of the effort involved in starting a business.*
- *Increased appreciation for the breadth of knowledge and decision-making required to start a business.*
- *Increased awareness of how the various functions and activities of the firm are interconnected.*
- *Increased sense of preparedness to undertake a formal business plan.*
- *Increased sense of whether entrepreneurship is an appropriate personal direction.*

The paper also suggests business modeling would be valuable to real-world entrepreneurs as a preparatory step before taking a business planning course or workshop.

Keywords: entrepreneurship, pedagogy, business modeling, business planning, business model canvas, business model map

INTRODUCTION

This paper describes the experience of using "business modeling" as the primary business design tool in an introductory entrepreneurship course instead of the perhaps more common and expected business plan format. Business modeling is defined as:

> *"... the rationale of how an organization creates, delivers and captures value" (Osterwalder, 2010).*
>
> *"(The business model) is not intended to capture all the detail and depth expected in a business plan, rather it should be sufficient to communicate a fairly clear vision of how an idea might be translated into a business and the implications thereof. That is, it should be sufficient to compare, contrast and critique competing approaches (e.g., an on-line retailer versus a physical retail storefront), clearly highlighting their differences" (Leschke, 2012).*

By way of contrast, business planning is seen as focusing on a specific business proposition and being sufficiently detailed to justify the selected approach and provide an implementation plan with strategies, tactics, policies, budgets and milestones.

First, the paper describes the course, its objectives, the student body and the university context, as well as the conceptual framework used in this course, namely, "The Entrepreneurial Path." Then business modeling is discussed in terms of how and where it is incorporated into the Entrepreneurial Path framework (business modeling is a precursor to business planning). Following this background narrative, instructor and student comments are shared.The paper concludes with a critical appraisal of the effectiveness of using business modeling as a means to introduce entrepreneurship (in preference to business planning) and makes suggestions for employing business modeling as an educational and practical device.

COURSE AND UNIVERSITY CONTEXT

In 2010, the School of Business and Economics (SBE) introduced a new concentration and set of courses in the area of entrepreneurship. The 200-level introductory course in this sequence was designed to provide an appreciation of the process of launching a new venture and a sense of what it means to be an entrepreneur. This course would have no prerequisites so as to draw students from majors across the university. In this way, the course served as a general introduction to business, a possible gateway into the business major (or minor), an elective credit for other business concentrations and an early start to the Entrepreneurship concentration. The current course description (revised after two iterations to more strongly emphasize entrepreneurship as a personal endeavor) is provided below:

> BUS 2XX. The Entrepreneurial Path. 3 credits. Open to all students in all majors. Introduction of entrepreneurship as both a personal journey and a new venture creation process. Examines desirable entrepreneurial attributes and competencies as well as the demands and rewards of pursuing an entrepreneurial path. Provides an overview of the new venture creation process including idea generation, opportunity identification, opportunity assessment, business modeling, and marketing and funding strategies. Concepts apply to large or small, not-for-profit and for-profit ventures.

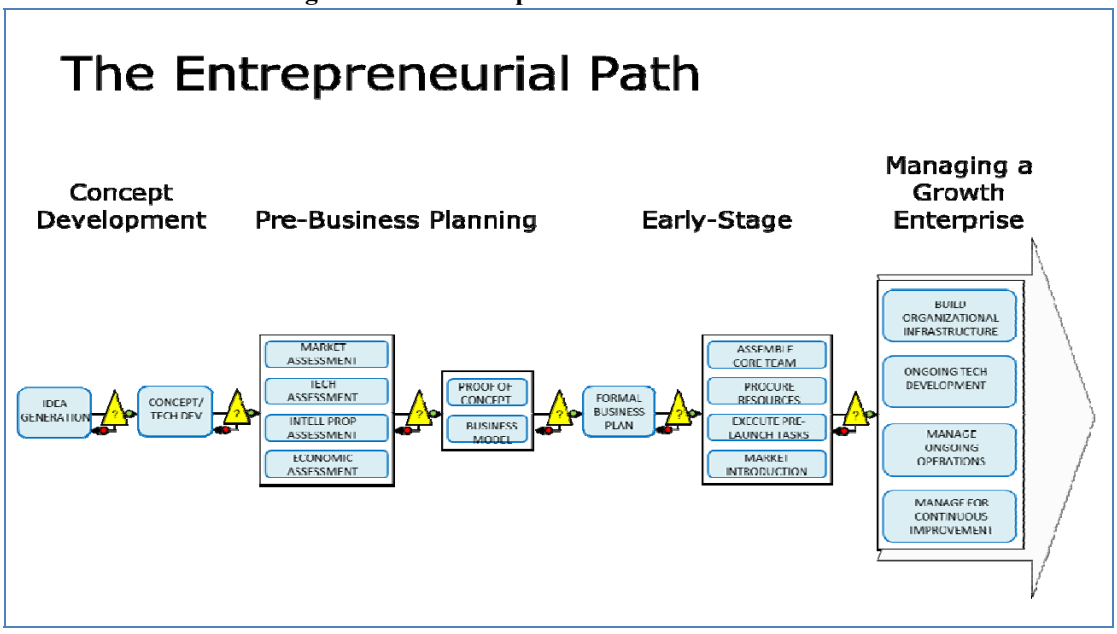
The university is part of a state system, located in a semi-rural area. Population density is relatively low over a wide area with a substantial agriculture/natural resources industry as well as a few mid-sized cities with light manufacturing, logistics, food processing, financial services, and insurance firms. In that sense, it is neither rural nor urban, but somewhere in between.

A majority of students are drawn from a radius of 75 miles, fifty percent are first-generation college students and a near majority aspires to stay within the region. These demographics manifest themselves in a student body with limited exposure to business culture and business principles, which strongly prefers pragmatism over theory and is generally risk-averse.

THE ENTREPRENEURIAL PATH

The course originally employed a "new venture creation process" as its conceptual framework. Over time, this process has been formalized into the "Entrepreneurial Path" framework shown in Figure 1. The framework emphasizes the sequence of tasks or stages the entrepreneur must navigate while launching a new venture: Concept Development, Pre-Business Planning, Early-Stage Development and Managing a Growth Enterprise. Each major task is followed by a "go/no-go" decision point where the entrepreneur is encouraged to pause and deliberately choose whether to proceed forward or step back to revisit a previous step in the process.

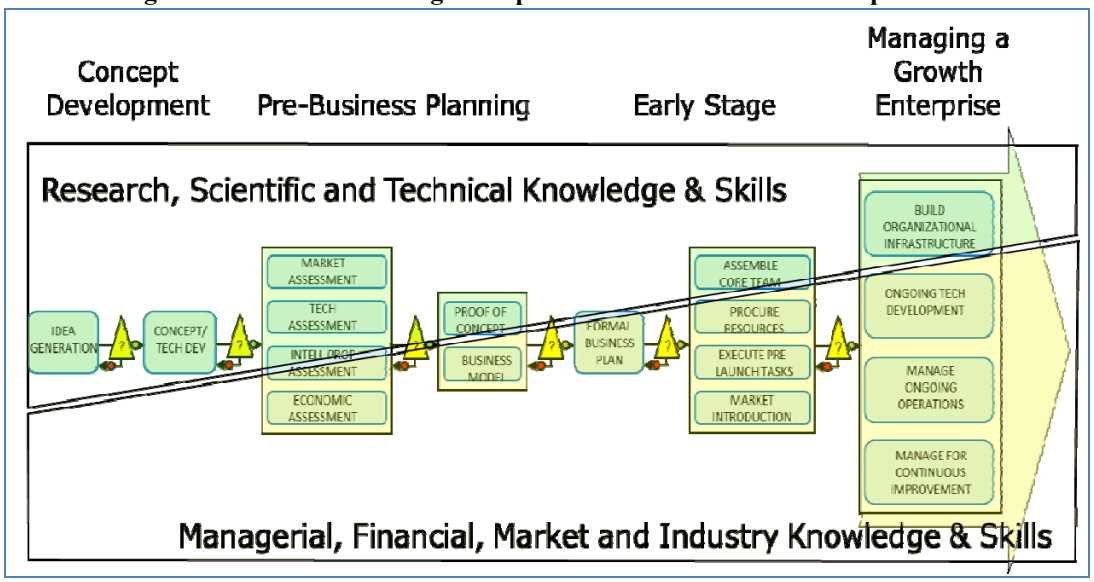
Figure 1: The Entrepreneurial Path Framework



The subtext which makes the name Entrepreneurial Path a fitting title is that, over the course of following this process, the entrepreneur is similarly following a path of development.

In terms of skills, attributes, and competencies, the entrepreneur must evolve or adapt, relying on creativity, persistence, research skills and technical abilities during the early stages, and becoming more and more strategic and managerial as the process evolves. This insight is illustrated in Figure 2.

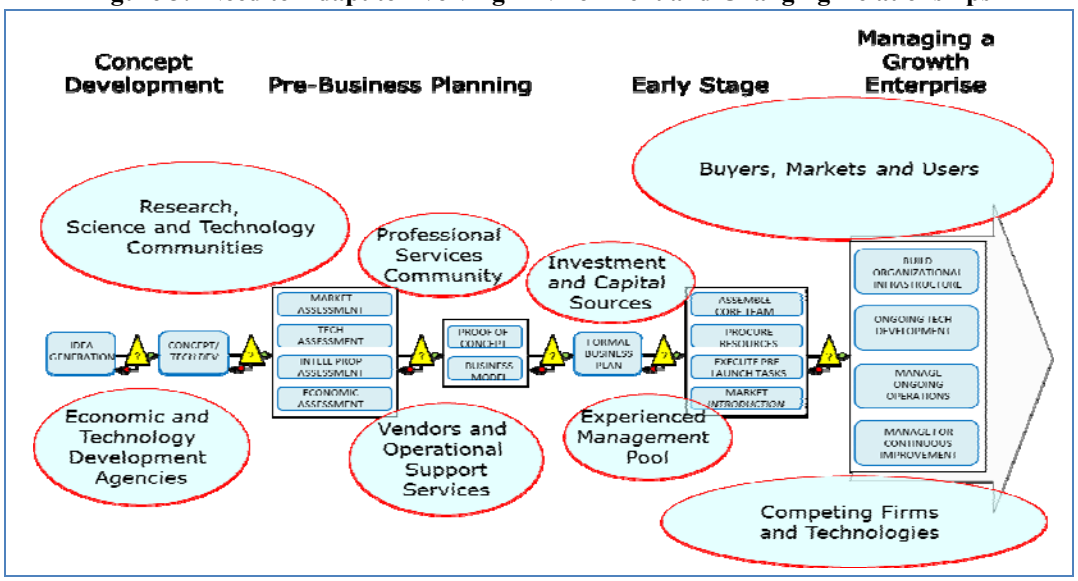
Figure 2: Need for Evolving Entrepreneurial Attributes and Competencies



To compound this challenge to the aspiring entrepreneur, the environment in which this process occurs also changes over time. In the concept development stage, the entrepreneur must develop networks and relationships with the technology communities and the economic development community. As the business concept matures, other relationships become important and must be developed. During Concept Assessment and Proof of Concept, relationships with business service professionals and specialists become more relevant. To bring the concept to reality, the entrepreneur must expand his or her network to obtain access to real resources (financial, material, capital, etc.). And, as the firm grows, the entrepreneur's environment becomes more and more concerned with customers, buyers and competitors.

Figure 3 illustrates this important insight, namely, that the entrepreneur must grow and evolve over the course of launching a new venture to deal with the changing demands, skills and knowledge required—or must be willing and prepared to seek help from individuals who can and will.

Figure 3: Need to Adapt to Evolving Environment and Changing Relationships



Thus, the Entrepreneurial Path model depicts not only the steps required to launch a new venture but also what makes it so difficult for any one individual to see it through. In this way, students are encouraged to think about the Entrepreneurial Path as both a professional journey as well as a personal journey.

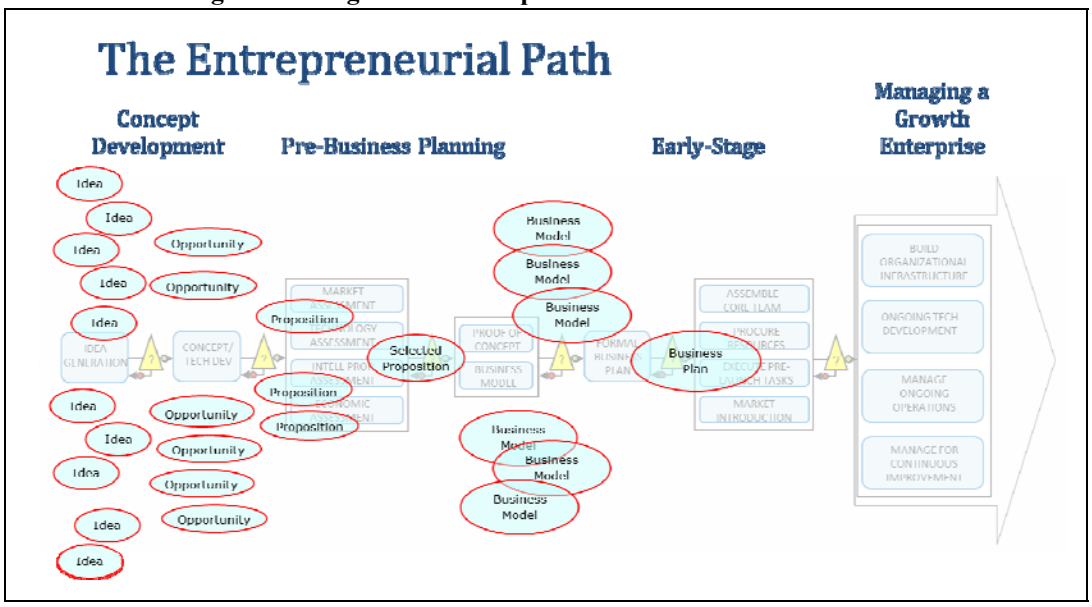
RATIONALE: BUSINESS MODELING VERSUS BUSINESS PLANNING

A perusal of other introductory entrepreneurship approaches suggests that the process and content associated with preparing a business plan is a common course framework and, frequently, the basis for the primary learning activity—constructing a formal business plan. However, is it realistic or appropriate to expect students with limited business experience and vocabulary to develop a meaningful and sophisticated business plan as part of their *introduction* to entrepreneurship?

Based on the initial offering of this course, the answer is a clear "no." The target students lack sufficient business background and experience to research, analyze, or construct a reasonably complete or credible business plan, and it would be unfair to expect this of them. At this stage of their development, students need to be encouraged to be more inventive, creative, open-minded and divergent, as opposed to converging on the details of a particular plan. While understanding and appreciating what is involved in preparing a business plan is important, knowing its purpose, format, tone and content is sufficient. These students are better served by developing skills relevant during the earlier stages of the entrepreneurial path (i.e., idea generation, concept development, opportunity assessment and business modeling) and developing the fundamental discipline of considering a broad set of options and making a

thoughtful, informed choice before proceeding. How this process plays out prior to reaching the point of preparing a business plan is illustrated in Figure 4.

Figure 4: Progressive Development from Idea to Business Plan



From many ideas[1] come a number of opportunities[2]. An opportunity might lead to a variety of specific business propositions[3]. The most promising propositions might be further assessed to verify their imagined commercial potential. These assessments are general and relatively high-level (e. g., market size and customer characteristics; technological capability; applicability and salability; intellectual property; novelty and defensibility; and economic factors, such as costs, capital requirements, and profitability). They need only be sufficient to determine whether a proposition is technically and commercially viable and worthy of further development.

In general, the time and effort required to prepare a formal business plan implies that only a very small number of propositions would receive that level of consideration. Therefore, there is a need for a cost-effective method to capture the substantive details and compare the meaningful differences between alternate approaches, namely, business modeling[4]. By providing students with a tool to consider the implications of multiple approaches broadly rather than develop a single approach in depth, students are better able to rely on their current level of business experience and vocabulary. Developing a business model is more dependent on intuition, creativity, and imagination than specialized business knowledge, techniques or terminology. In this way, students are enabled to feel the satisfaction of a relatively complete outline of their vision of a new venture without the necessity of developing a full business plan[5].

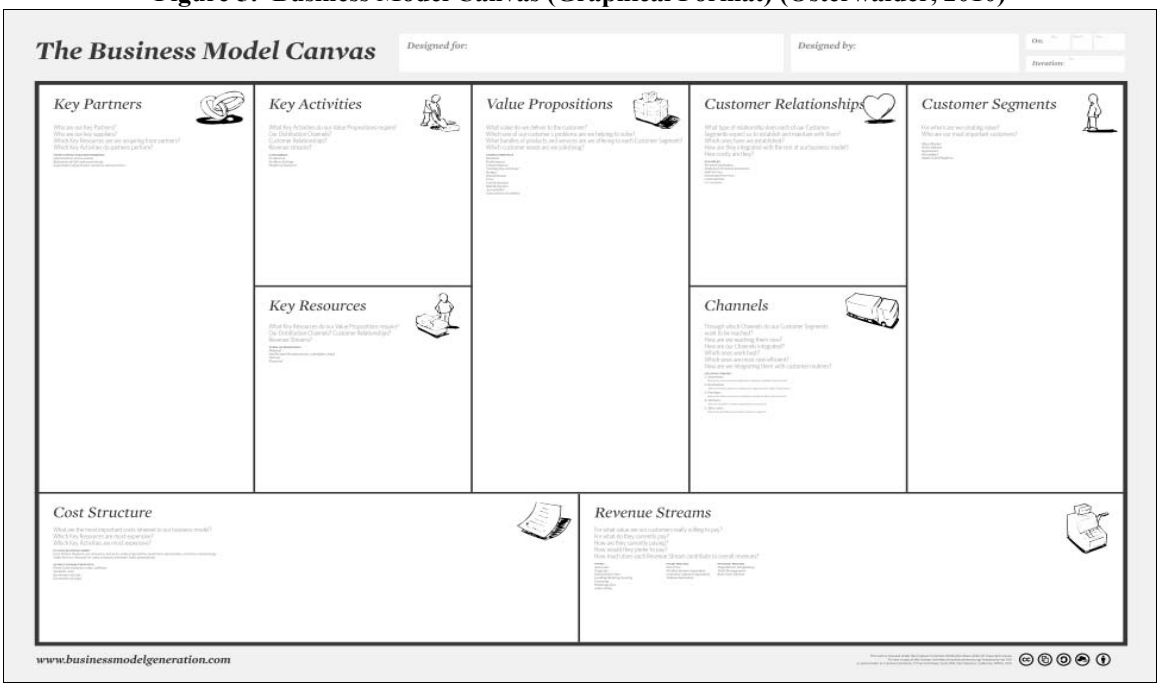
Presumably, they will be better prepared and more capable, should they wish to pursue a business proposition in greater depth.

BUSINESS MODELS AND BUSINESS MODELING

Informally, business models are often described in simple terms or catch phrases, e.g., bricks-and-mortar, free-mium, deep discounter, value-added reseller, online-retailer, or less reputable models—Ponzi scheme, and bait-and-switch. Such terms more aptly refer to *revenue models* than business models, given they focus primarily on aspects of the revenue stream.

More formally, Osterwalder (2004, 2008 and 2010) introduced the business model canvas methodology to provide an efficient means of capturing completely the key aspects of how a firm might approach a particular business proposition. The business model canvas, depicted in Figure 5, is comprised of nine "building blocks" that encompass a relatively complete and comprehensive set of business planning dimensions. Completing the canvas (i.e., creating bulleted lists of descriptors within each building block) to document how a firm might approach a particular opportunity constitutes a business model and the process of generating a number of alternative models is business modeling.

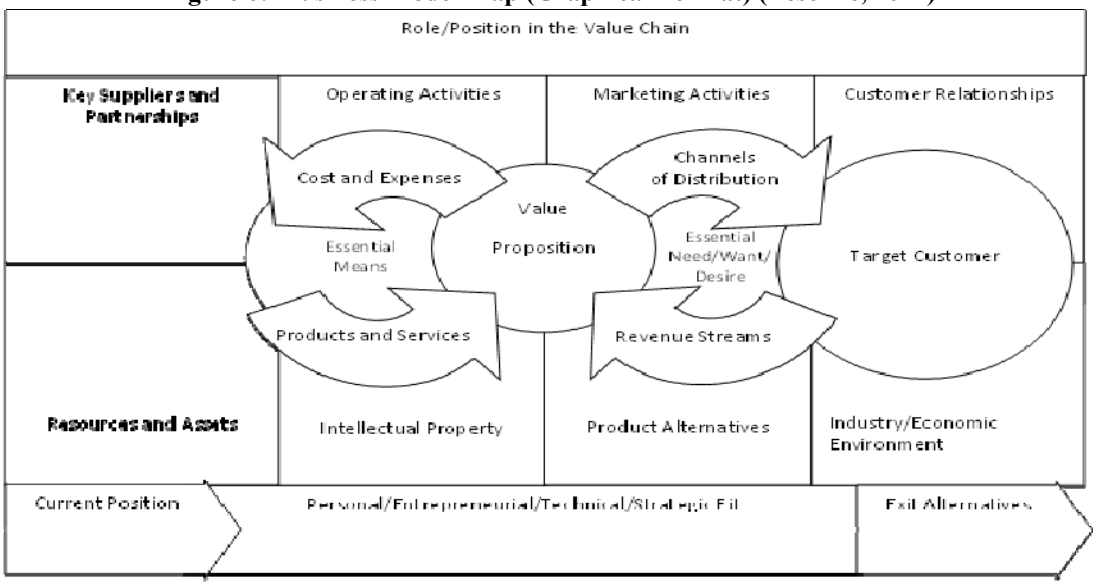
Figure 5: Business Model Canvas (Graphical Format) (Osterwalder, 2010)



The business modeling methodology employed in this course is Business Model Mapping (Leschke, 2012). The Business Model Map, reproduced in Figure 6, differs from Osterwalder's

canvas by the addition of five new building blocks and dividing another into more distinct parts, resulting in sixteen business model "components."

Figure 6: Business Model Map (Graphical Format) (Leschke, 2012)



Entirely new components include Entrepreneurial Fit, Role/Position in the Value Chain, Intellectual Property, Product Alternatives and Industry/Economic Environment while others like Operating Activities and Marketing Activities represent a more precise delineation among Osterwalder's "Key Activities." Figure 7 shows how the Business Model Map components correspond to the Business Model Canvas building blocks.

Figure 7: Comparison of Map Components to Canvas Building Blocks	
Business Model Map Components (Leschke, 2012)	**Business Model Canvas Building Blocks (Osterwalder, 2010)**
Value Proposition Essential Means Essential Need	Value Propositions
Entrepreneurial Fit Current Position Personal/Technical/Strategic Fit Exit Alternatives	
Role/Position in the Value Chain	
Target Market/Customer	Customer Segments
Products/Services	Value Propositions
Channels of Distribution	Channels
Revenue Streams	Revenue Streams

Figure 7: Comparison of Map Components to Canvas Building Blocks	
Business Model Map Components (Leschke, 2012)	**Business Model Canvas Building Blocks (Osterwalder, 2010)**
Costs and Expenses	Cost Structure
Operating Activities	Key Activities
Key Suppliers and Partners	Partner Network
Resources and Assets	Key Resources
Intellectual Property	
Marketing Activities	Key Activities
Customer Relationships	Customer Relationship
Product Alternatives	
Industry/Economic Environment	

The added components call on the modeler to consider a more complete set of issues. Entrepreneurial Fit demands reflection on the entrepreneur's personal strengths and limitations, ambitions and goals, personal values and lifestyle objectives. Since the process of building a business is both a personal as well as a professional journey, it is critical that "the entrepreneur as an individual" be included in the assessment. Similarly, if the model is intended to expand an existing business, it is important to consider the firm's prior history, current strategy, and competencies. Considering this dimension is particularly relevant, given the introductory nature of this course and the background of the target student.

Describing the Role/Position in the Value Chain is important for perspective. By noting where the value proposition falls within the overall value chain, the modeler not only better defines the value added, products and services, channels, target market and other components, but also sees where this particular opportunity fits into the larger scheme of value creation. Perhaps this higher-level perspective may lead a student with limited business background to consider an opportunity at a different value-adding stage. For example, a student initially intent on opening a retail coffee shop might consider the alternatives of being a wholesaler, roaster, franchisee, or importer—any of which may, in fact, be more profitable, lower in risk, or a better entrepreneurial fit.

Intellectual Property is important to consider if there are substantial intangible assets currently in place or required for the model to be successful. Explicitly noting a wealth or dearth of intellectual property complements the assessment of Fit. It encourages students to reflect on and appreciate the skills they possess as well as recognize they may need to seek outside help. It can also suggest examining alternative business models such as licensing, consulting, or selling property rights.

Adding Product Alternatives and Industry/Economic Environment components to the Map fill out the analysis by incorporating four major elements of business strategy: product substitutes, rivals, other threats, and dynamics in the external environment. Business strategy

and competitive analysis are critical components of a business plan. The Business Model Canvas appears to assume these factors are implicitly incorporated through the knowledge and experience brought to the process by the modelers. However, for business novices, it is beneficial for these contextual elements to be explicitly considered.

EXPERIENCE AND OUTCOMES

Business Model Mapping was introduced as described above—as an idea generation/concept evaluation and analysis tool and precursor to formal business planning. An example of a formal business plan was briefly presented and walked through to establish a basis for comparison. Class activities included lectures detailing the Entrepreneurial Path, the example Business Pan, the Business Model Mapping methodology and an illustrative Coffee Café – Coffee Kiosk comparison (see Appendix 2). Assignments included working in pairs during class to create business models for an assigned business proposition and other propositions suggested by students. Impressions were gathered in the form of an in-class survey. (Selected student responses are recorded in Appendix 3.)

Student Survey Question:
Based on this introduction to Business Modeling in BUS 2XX, what are your initial reactions to the concept and the tool? How do you see it as helpful (or not)? What sort of impact did learning this tool have on your perception of how to start a business?

As hypothesized, introducing business modeling and the business model map successfully achieved the course objectives, namely:

- To encourage broader, deeper, and fuller appreciation of the implications of pursuing a particular business opportunity.
- To encourage consideration of multiple approaches prior to developing a formal business plan.
- To encourage those suited to entrepreneurship to pursue their ambitions by providing a realistic projection of what starting a business implies and entails.
- To discourage those not suited to entrepreneurship by providing an honest and full introduction to the effort and complexity associated with starting a business.

The great majority of student feedback was strongly positive, with a few lukewarm endorsements. There were no negative comments.

The greatest challenge for students was to imagine and describe the consequences for operating activities, costs and expenses, resource requirements and the role in the value chain components. This is likely a symptom of limited experience with the internal workings of a firm. This gap presented an opportunity to discuss what goes on behind the scenes of a business and

describe how firms take on various approaches. Students also had difficulty judging how detailed the descriptive bullet points in each component should be and were uncomfortable with the proper level of detail being ambiguous. These descriptions need only be sufficient to clearly define what is implied (or assumed) when pursuing a particular business approach and clearly distinguish one approach from another. For example, in the description of the kiosk's channel of distribution (Appendix 2), including "in a high-traffic location" adds value by providing a meaningful detail and clarifying the modeler's vision and intent. The difficulty arose mostly in differentiating between distinguishing characteristics of the model versus generic or non-distinguishing characteristics across models. For example, "kiosk" would be a generic or non-distinguishing term, whereas, "Drive-thru kiosk" is adds an essential distinction. In the classroom, sharing and discussing numerous examples illustrating these varying levels of detail reduced some of the anxiety and led to noticeable improvement.

A tactic used to illustrate variations in applying business modeling was to have students set up different combinations of models for contrast as depicted in Figure 8. For example, one variation is to compare clearly different opportunities, e.g., a coffee shop (A) versus a web design firm (B). A second variation would be to develop multiple variations for approaching a single opportunity, e.g., a stand-alone coffee shop (A_1), a drive through kiosk (A_2) or a coffee catering and delivery service (A_3). A third variation would be to deconstruct a particular approach into its core and sub-business models, e.g., a stand-alone coffee shop might be broken down to the core coffee beverage service ($A_{1\ Core}$) and a number of incremental or subordinate models (e.g., food and dining (A_{11}), merchandise sales (A_{12}), roasting (A_{13}), catering (A_{14}), on-line sales (A_{15}), wholesaling (A_{16}), and so on (A_{1n})).

Figure 8: Variations in Business Model Comparisons

A	B

A_1	A_2	A_3

A_{1Core}	A_{11}	A_{12}	…	A_{1n}

This assignment helps students distinguish common overlapping component characteristics from incremental differences between models. Ideally, students take away the notion that a business may be comprised of multiple business models and those business models may be complementary (or not) and that a business may grow incrementally by adding on models as resources and demands allow. Thinking in terms of incremental growth can be useful later when developing the Business Plan implementation sequence and long term vision. The

notion of incremental growth is likely less overwhelming and easier to fathom than envisioning a mature business as a whole.

SUMMARY

This paper described how shifting the emphasis from business planning to business modeling is more appropriate for an introductory entrepreneurship course. In an introduction to entrepreneurship, placing too much emphasis on the importance of the business plan can mislead a novice into converging on a specific business approach too quickly before considering a variety of alternatives. Shifting the emphasis to developing and evaluating multiple business models as a precursor to preparing a formal business plan is more appropriate in that it instills the discipline of evaluating multiple alternatives before committing to a particular direction. Moreover, since the process of business modeling produces a preliminary outline for a business plan, preparing the formal business plan should be easier and take less time.

In this case, the particular business modeling methodology employed was business model mapping (Leschke, 2012). Student reactions to the overall concept of business modeling and the business model mapping tool showed:

- General positive response
- Increased appreciation of the effort involved in starting a business
- Increased appreciation for the breadth of knowledge and decision-making required to start a business.
- Increased awareness of how the various functions and activities of the firm are interconnected.
- Increased sense of whether the entrepreneurial path is an appropriate personal direction.

In other applications, business modeling is being used in a 400-level business strategy course (to serve as a concise strategic modeling framework) and as the basis of a practitioner-oriented workshop. This workshop is marketed to aspiring entrepreneurs as a preparatory step before taking a business planning workshop sponsored by the SBA, SCORE, or similar organization. It is also recommended for investors, economic development agencies, new product developers, and existing firms exploring new business development or growth opportunities.

ENDNOTES

1 **idea** – imagining a method, technology or device or recognizing a need, desire or problem without necessarily making a connection between a market or demand and mode of supply.

2 **opportunity** – the coming together of ideas; a general statement of how a method, technology or device might be applied to satisfy a need or solve a problem.

3 **business proposition –** a restatement of an opportunity, more specifically proposing how a particular device, method or technology might be applied to satisfy a demand, or how a particular means might be applied to a particular problem with the idea of deriving revenue.

4 **business model** – a description of how an organization creates, delivers and captures value (or proposes to). Many business models may be created for a particular business proposition.

5 **business plan** – a formal and explicit documentation of how a particular business model will be implemented; includes sufficient detail to serve as an action plan with justification for decisions, budgets, policies, milestones, resource requirements and objectives.

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APPENDICES

Appendix 1: Business Model Mapping Components and Component Descriptions	
Mapping Components	**Component Descriptions**
Value Proposition Essential Means Essential Need	What is the nature of the value provided for which the customer is willing to pay? What are essential characteristics of the means or method employed? What are the defining needs, wants or desires being met?
Entrepreneurial Fit Starting Position Personal/Technical/Strategic Fit Exit Alternatives	What is the current situation? Fit with the entrepreneur's or existing business's… Ambitions and goals? Attributes and competencies? Managerial expertise? Technical and managerial experience? Strategic objectives and goals? What are the exit and harvest options?
Role/Position in the Value Chain	What is the value adding activity? Extraction? Processing? Fabrication? Transportation? Wholesale? Retail?
Target Market/Customer	Who is the target customer or market? Demographics? Needs? Wants? Desires? Sources of pain? What is the customer's buying behavior? Order-winning criteria? Order-qualifying criteria?
Products/Services	What products and/or services are offered? Differentiating characteristics? Mix? Functions and features? What research and design infrastructure is required?
Channels of Distribution	What are the channels for distributing the product or service? Retail? Wholesale? Distributors? Online Storefronts?
Revenue Streams	How will the business make money? Subscription? Commission? Direct sale? etc.? How is the product priced? How is the transaction executed?

Appendix 1: Business Model Mapping Components and Component Descriptions	
Mapping Components	**Component Descriptions**
Costs and Expenses	What are the major cost and expense components? What categories are unique to this model? Require close management?
Operating Activities	What operating activities are critical to this business model? Product design? Logistics? Production? Transaction processing? Quality? Flexibility? Cost? Speed?
Key Suppliers and Partners	Who are the key suppliers and upstream partners? Joint ventures? Contractual relationships? Vendors? Networks?
Resources and Assets	What resources or assets are critical to implementing the business model? Plant and equipment? Human capital? Infrastructure?
Intellectual Property	What intellectual property is essential to the business model? Distinctive competencies? Patents? Trade Secrets? How much additional research and development is required? Critical milestones? Resources required? Timeframe?
Marketing Activities	How are the products and/or services to be marketed? Product Features and Attributes? Pricing, Placement and Positioning? Selling methods and strategy? Advertising and Promotion? Media? Branding?
Customer Relationships	What kind of relationship between the customer and the company is desired? Face-face? Online? Professional? Personal? Social Media?
Product Alternatives	What alternatives exist to address the customer's needs, problems or desires? What are their comparative advantages? Disadvantages?
Industry/Economic Environment	What are the relevant industry, market, technological, and cultural trends? Growth and Expansion? Contraction? Rules and Regulations? What broad economic trends or factors are relevant? Income Levels and Spending Patterns?

Appendix 2: Business Model Map (Tabular Format) comparing a Coffee Café with a Coffee Kiosk		
Business Model Mapping Components	**Café**	**Kiosk**
Value Proposition Essential Means Essential Need	A café offering fine coffees and espresso-based drinks in a warm welcoming atmosphere	A kiosk offering fast and convenient hot coffee and espresso drinks for people on the go
Entrepreneurial Fit Starting Position Personal/Technical/Strategic Fit Exit Alternatives	No prior restaurant experience Changing careers Enjoys meeting people Enjoy the business then sell in a few years	No prior restaurant experience Changing careers Enjoys meeting people Enjoy the business then sell in a few years
Role/Position in the Value Chain	Final production step and direct delivery to customer	Final production step and direct delivery to customer
Target Market/Customer	People seeking a place to enjoy a conversation and a cup of coffee	Professionals on the go, on break, between meetings or on an errand
Products/Services	Coffee, tea, espresso, smoothies, pastries, bulk coffee, iced drinks, t-shirts and coffee-related gifts	Hot coffee and espresso drinks, to-go snacks, soft drinks and water
Channels of Distribution	Café in upscale business district, shopping district or neighborhood	Kiosk in high traffic location

Appendix 2: Business Model Map (Tabular Format) comparing a Coffee Café with a Coffee Kiosk		
Business Model Mapping Components	**Café**	**Kiosk**
Revenue Streams	Sales of products Premium pricing Cash, credit and loyalty cards High volume required	Sale of drinks Competitive/affordable pricing Cash and prepaid punch cards Limited capacity and volume
Costs and Expenses	Coffee and food, milk, staff, utilities, lease, laundry, insurance, high fixed costs, high margin	Coffee and food, milk, outdoor space rental, wages, low fixed and variable costs, high margin
Operating Activities	Drink preparation, table service, cleaning, maintenance, scheduling, purchasing, stocking inventory and merchandise, opening and closing	Drink prep, transportation, setup, teardown, cleaning, maintenance, purchasing and stocking kiosk, seasonal prep and shutdown
Key Suppliers and Partners	Landlord, coffee supplier, other vendors, health department, neighboring businesses	Coffee supplier, kiosk vendor, equipment maintenance firm, licensing and permitting agencies
Resources and Assets	Personal Savings, furniture, fixtures and equipment, inventory Significant external funding	Kiosk and brewing equipment Personal savings (small amount of external funding)
Intellectual Property	Brand, name and trademark, logo, knowledge of coffee, location, specialty drinks, menu, atmosphere, décor, barista skills	Location, coffee making, barista skills, customer service skills, specialty drinks
Marketing Activities	Signage, print media, website, promotions, events, advertising, sponsorships, coupons	Signage, word of mouth, coupons, social media promotions
Customer Relationships	Personal, loyal, face to face, professional, yet friendly, repeat customers, sense of affinity to café	Personal, friendly, face to face, repeat customers
Product Alternatives	Home brewing, nearby cafes, non-coffee beverages	Home brewing, office break rooms, nearby cafes, soft drinks
Industry/Economic Environment	Coffee culture, limited disposable income	Coffee as a pick-me-up, faster pace of life

Appendix 3: Selected Student Survey Responses
Student Survey Question Based on this introduction to Business Modeling in BUS 2XX, what are your initial reactions to the concept and the tool? How do you see it as helpful (or not)? What sort of impact did learning this tool have on your perception of how to start a business?
I felt that this was very helpful for me as an entrepreneur. I have so many facets to my business that sometimes it gets all tangled up in my mind, so this was a great way for me to sort everything out. I think this will be a great tool to use to start a business.
My initial reactions to the concept were feelings of being overwhelmed… Going through the flow chart, I started to realize that there is a lot that goes into creating a business. It has started me thinking about whether this is the path I want to take or not.
Coming from a family of serial entrepreneurs I know they could have benefited if they had known how to do this.

Appendix 3: Selected Student Survey Responses
I had limited ideas when I started the model and by the end, I had a ton of ideas that went right along with the initial idea. It makes me want to start a business that much more because I feel like I have a better grasp of what I need to do, but at the same time, I feel like there's a lot left to think about before I could get started.
I never realized how much thought actually went into starting a business. It was nice to take a step back from solely thinking about generating a business idea and really evaluate myself and whether or not I am even cut out to be an entrepreneur.
My perception changed a little on how many factors had to be considered when starting a business. Before when I thought about starting a business I thought of my goods and inventory and building but after I saw the model it really made me branch out and consider the suppliers and distribution and assemblers of the products. It gave me a little wider view of the process and gave me a little more appreciation for all of the hard work entrepreneurs have to go through.
The impact this tool had on my perception on starting a business definitely put a perspective on how much work is needed to be done ... There are so many little things that get overlooked and the business model can help you not lose sight of the importance.
It really helps you to focus on each step separately, but also to be able to see the bigger picture at the same time. … I'm getting a much better sense as to what it would be like to start my own business.
The first time I heard about business modeling in class, I thought it was really helpful. I failed in my own business because of lack of knowledge about business modeling. … I did not consider the channels of distribution, costs and expenses, operating activities, and resources and assets.

MODELING STUDENT ENTREPRENEURSHIP: A LONGITUDINAL STUDY

Yongseok Jang, University of Florida

ABSTRACT

The endeavor in advancing entrepreneurship education seems to be based on somewhat inconclusive evidence. This research adds to the literature of entrepreneurship education research by investigating the career path of student entrepreneurs during the early stages of the post-graduation period. Three areas of questioning are posited in order to achieve the research goal. The first area of questioning is: how do the careers of student entrepreneurs develop after graduation? The second question area enlarges on the main question of entrepreneurship education research: can entrepreneurship be taught and what is the role of entrepreneurship education in improving student entrepreneurship when prior experience is present? Does education enable entrepreneurship alone? Does education work together with prior experience? Or does prior experience work regardless of education? The third area of questioning concerns what constitutes evidence of the success of entrepreneurship education. Should we consider early venture creation as evidence of success? What about getting a job in a small business? To address these questions, I have conducted a longitudinal study using a panel dataset and a generalized regression model, using a dataset created by combining alumni surveys conducted in multiple years by the University of Florida Center for Entrepreneurship and Innovation.

On the first question, this study found that speed of venture creation is increased by participating in a formal degree program and from having prior venture experience. On the second question, I conclude that degree program would reduce the time taken to venture creation. On the third question, I question the validity of a career in a small business as evidence of the success of entrepreneurship education.

INTRODUCTION

Based on the belief that entrepreneurship can be learned, the number of institutions of higher education offering formal educational programs grows exponentially, thus becoming a global phenomenon in the last couple of decades (Drucker, 1985; Henry, Hill, & Leitch, 2005; Kuratko, 2005). The endeavor in advancing entrepreneurship education, however, seems to be based on somewhat inconclusive evidence. A number of studies provide evidence of the positive impact of entrepreneurship education and show that entrepreneurship graduates are likely to demonstrate a three times greater chance of being self-employed, with a 27% higher annual income. Other research also found that alumni of entrepreneurship education achieved greater satisfaction with their work (A. Charney & Libecap, 2004). Evidence of other positive impacts also includes the enhanced attractiveness and feasibility of new ventures (Fayolle, Gailly & Lassas-Clerc, 2006; McMullan, Chrisman & Vesper, 2002) and stimulated students' intention

toward an entrepreneurial career. Still, as Matlay (2008, p.382) points out, the results of most empirical studies on the outcomes of entrepreneurship education remain controversial (H. Matlay, 2008). Van der Sluis, Van Praag and Vijverberg (2004) observed only weak associations between the entrepreneurial performance of students enrolled in post-secondary education and those belonging to the no-schooling category. Other research has found evidence that the impact of entrepreneurship education may be subject to economic context. In other words, the inverse relationship between countries with greater economic opportunities and the high wages associated with higher educational levels deters quality applicants from selecting an entrepreneurial career (Le, 1999). Due to the underlying assumption regarding entrepreneurship education being only partially proven, the academic novelty of entrepreneurship is on the verge of being questioned.

This research adds to the literature of entrepreneurship education research by investigating the career path of student entrepreneurs during the early stages of the post-graduation period. Three areas of questioning are posited in order to achieve the research goal. The first area of questioning is: how do the careers of student entrepreneurs develop after graduation? The second question area enlarges on the main question of entrepreneurship education research: can entrepreneurship be taught and what is the role of entrepreneurship education in improving student entrepreneurship when prior experience is present? Does education enable entrepreneurship alone? Does education work together with prior experience? Or does prior experience work regardless of education? The third area of questioning concerns what constitutes evidence of the success of entrepreneurship education. Should we consider early venture creation as evidence of success? What about getting a job in a small business? To address these questions, I have conducted a longitudinal study using a panel dataset and a generalized regression model. The next section discusses explanatory variables and relevant theories upon which this study draws hypotheses to model student entrepreneurship. After presenting the data, methodology and results of the models, implications will be drawn. Finally, based on the findings, I conclude with future implications for entrepreneurship education arising from the findings of this study.

THEORY AND HYPOTHESIS

Dependent Variable: Venture Creation

The dependent variable to measure entrepreneurial performance of alumni is a new venture creation of their career after graduation. While it is not the only indicator of successful entrepreneurship, a new venture creation is regarded as a positive outcome of entrepreneurship education. Therefore, it is relevant to regard as a successful outcome if students show successful new ventures. In this study, the number of new businesses launched after graduation is counted.

Predictor1: Start-Up Experience

As widely accepted, previous venture experience is an important variable that affects the performance of entrepreneurs. Conceptually speaking, experience means any non-traditional learning activities, including practical business experience, functional training, and any industry experience (Becker, 1964; Shane, 2003). Research found that industry experience constructs positive human capital and is likely to lead to business success if the experience is task-related (Lerner & Almor, 2002). Labor market experience, management experience, and any prior entrepreneurial experience seem to affect venturing activities positively (Gimeno, Folta, Cooper & Woo, 1997; Robinson & Sexton, 1994). On the other hand, Matlay (2006) found students lacking relevant experience tend to dismiss dealing with problems that have arisen from unexpected situations (Matlay, 2006). The positive effects of prior experience in entrepreneurship have been observed, showing that experience would provide context for an entrepreneurial career (Fiet, 1995). Experience develops human resources and reduces uncertainties associated with the risk of opportunities (Marvel & Lumpkin, 2007). Entrepreneurs tend to become more assured when taking actions based on perspectives they have developed from prior experience (Fiet, 1995). Most importantly, extending the 'Corridor principle,' experience with launching a business creates a strong advantage for entrepreneurs in discovering career business opportunities (Ronstadt, 1988; Rotefoss & Kolvereid, 2005). Nascent entrepreneurs showed a greater likelihood to discover and exploit opportunities because of experience they gained when developing their earlier careers (Bhide, 2000; Case, 1989; Vesper, 1980). Finally, researchers have observed an even stronger association between business success and owners' previous experience with a similar operation (Srinivasan, Woo & Cooper, 1994).

Based on the discussion, I propose that prior ventures experience would lead to enhanced entrepreneurship performance after graduation. One predictor is the number of businesses created while the alumni were attending college. But one should note that more business does not necessarily mean more success of those businesses. It may indicate entrepreneurial aggressiveness, but may also indicate serial failures. To supplement this issue, I have included two variables. The first variable indicates whether they have launched a business or not to address the "quantity" bias. The second variable is the number of businesses that survive at the moment of the response, to address the "success or failure" issue. The following is a series of first hypotheses to test the association between the experience of venture creation and entrepreneurial performance.

H1: Alumni with a prior venture experience are likely to create more ventures after their graduation.

H1a: Alumni who have more prior venture experience are likely to create more ventures after their graduation.

H1b: Alumni who have launched a business are likely to create more ventures after their graduation.

H1c: Alumni with more successful ventures are likely to create more ventures after their graduation.

In terms of time, I contend that prior experience would reduce the amount of time between graduation and venture creation. In other words, the model would be likely to show a shorter time before venture creation from those who have more experience. Therefore, the following hypotheses are suggested:

H1d: Alumni with a prior venture experience are likely to take less time to create ventures after their graduation.

Relying on a general framework of modeling outcomes of human capital measuring education and work experience (Becker, 1964), measuring a number of new ventures created by alumni as one of the variables of outcome has been regarded as a valid approach since it reflects valid relationships between human capital investments and outcomes. (Reuber & Fischer, 1994; Unger, Keith, Hilling, Gielnik & Frese, 2009) In that sense, this study includes 'experience of launching a new business in college' as a variable of venture experience that would affect entrepreneurship later in a career. One should note that there is no one-to-one relationship between investment and outcomes, meaning that the same input, i.e., the same education, would still result in a different outcome (Unger, Rauch, Frese & Rosenbusch, 2011). In addition, even when two individuals are going through the same experience, the outcomes would be dramatically different due to a combination of different reflective orientations and metacognitive activities (Quions, Ford & Teachout, 1995). Because of different reflective orientations, individuals differently understand the meaning of ideas and situations and put these into new knowledge (Kolb, 1984). For different metacognitive activities, concrete experiences are differently transferred into new knowledge to individuals (Ford, Smith, Weissbein, Gully & Salas, 1998). To account for different effects of a combination of education and experience, this study factors in interaction terms to measure cross functioning effects of education and experience.

Predictor2: Formal Education

In general, evidence suggests that the level of educational attainment of entrepreneurs has a positive effect on entrepreneurial performance (Dickson, Solomon & Weave, 2008). Aside from analytical skills that enable the efficient processing of information and knowledge, opportunities perception and networking with peers are other advantages offered by entrepreneurship education in particular. Networking is one of the important benefits expected to be acquired by most students enrolled in business schools because relationship building is crucial to preparations for launching a business. Teaming (Kamm, Shuman, Seeger & Nurick, 1990) and networking have come to the attention of entrepreneurship education as important activities that would result in a greater chance of success later in one's career (Burt, 2000; Grandi & Grimaldi, 2003). Education also influences business survival rates and venture success (Rosa, 2003).

Moreover, entrepreneurship cohorts were three times more likely to create a new venture than alumni of traditional business schools were (A. Charney & Libecap, 2000). Entrepreneurship education enhances students' risk-taking attitudes, as well as encourages them

to establish new ventures (Kolvereid & Moen, 1997; Peterman & Kennedy, 2003), seek self-employment, and increase their income (A. Charney & Libecap, 2000; Van der Sluis, Van Praag, & Vijverberg, 2004). In addition, entrepreneurship education contributes to fostering technology transfer from universities to the market by promoting courses that develop skills sought after by technology-based firms (A. Charney & Libecap, 2000). Interestingly, one study found stronger effects from education than a prior experience in improving entrepreneurship (Robinson & Sexton, 1994). With all factors considered, entrepreneurship education seemingly enhances managerial capabilities by training students to make entrepreneurial decisions with a variety of choices (Dickson et al., 2008). It is reasonable, therefore, to hypothesize a positive correlation between entrepreneurial education and stronger venture activities after graduation. Thus, I propose the following hypothesis to test the effects of participating in degree programs on the chances of venture creation to highlight the impact of taking more courses with stronger commitment on the learning activity.

H2: Participating in degree programs of entrepreneurship education would enhance venture creation activities after graduation.

Again, I contend that alumni from a degree program would take a shorter time to launch a new venture after graduation. Therefore, in terms of time, I propose that entrepreneurs graduating from a formal degree program would be more likely to report earlier success in their career than those who had taken entrepreneurship courses without a degree seeking purpose. .

H2a: Alumni of degree programs would report successful venture creation in a relatively shorter period of time.

Information of type education program is collected in a categorical format. It is important to discriminate intensity of commitment in formal type of educations. An appropriate way of using programs of education is, nevertheless, to use it as different categories without giving them any ordering consideration given unobserved factors behind the intention of enrolled students to a program. One can assume degrees of intensity by the number of credits and the level of program. Considering the number of credits and the level of program jointly, seven groups were created, as in table 1.

Table 1 Student Groups by Educational Programs

	Description	Frequency	Percent
PMAJOR	Students enrolled in professional masters in entrepreneurship	85	20.73%
TMAJOR	Students enrolled in traditional masters in entrepreneurship	71	17.32%
CNCNTRN	Students enrolled in certificate or concentration in entrepreneurship as graduate students	21	5.12%
SOME	Students taken graduate or undergraduate level entrepreneurship courses with other reasons	157	38.29%
MINOR	Students chosen entrepreneurship as an undergraduate students	76	18.54%
Total		410	100.0

Predictor 3: Intention to Entrepreneurship

Intention is a psychological direction that is set by a person toward achieving a goal (Bird, 1988). Acknowledging the fact that entrepreneurial success is largely associated with entrepreneurs' motivation, research has been devoted to understanding the mechanism of psychological direction behind entrepreneurship, and proved a strong relationship between behavioral intentions and considerable proven value (Kim & Hunter, 1993). One of the models applied by entrepreneur researchers is the theory of planned behavior (TPB), which presents three factors as antecedents of intention. First is attitude toward behavior, which refers to the extent that a person can achieve appraisal by performing a certain behavior. Second, subjective norm plays a critical role in determining one's intention. It means that individuals use a set of norms based on perceived social pressure to perform a certain behavior. The third factor is the degree of difficulty or ease of performing the behavior (Ajzen, 1991). On the other hand, the entrepreneurial event model (SEE), inspired by Shapero, relates entrepreneurial intentions and three other elements, mostly focusing on the individual's self-decision. These are: the perception of desirability, the propensity to act, and the perception of feasibility (Shapero, 1982). Notably different in the two models is that TPB focuses more on contextual elements than SEE, which stresses personal elements. The third model, developed by Bird (1988), asserts that entrepreneurial intention results from the combination of TPB and SEE; the author asserts that both contextual and personal elements affect entrepreneurial intention. Finally, Davidsson (1995) proposes another model that relates intention to conviction and domain attitudes. Conviction refers to general attitudes such as change, competition, money, achievement, and autonomy, depending on other personal variables including age, gender, and educational attainment. On the other hand, domain attitudes include payoff, societal contribution, and know-how (Davidsson, 1995). For student entrepreneurship, integration of TPB and SEE has successfully proved a relationship between intention and entrepreneurship's theoretical legitimacy by including factors such as personal background.

Therefore, taking "entrepreneurial intention" into a modeling framework to investigate student entrepreneurship is more than legitimate. Extending the premises of intention theory, I propose that entrepreneurial success depends on purposefully planning to start a business. Taking one step further from just making it into model, I would like to tackle one problem related to measuring different intention. One of the issues is the difficulty of knowing how to measure the seriousness behind expressed intention. Entrepreneurial intention tends to be vaguely presented, and thus may require more substantiation from multiple dimensions. Responding to the problem, I propose to investigate the extent to which entrepreneurs show intention in terms of length of planned action. In this sense, I suggest that intention for the near future would show stronger seriousness, causing a greater likelihood of performing planned actions. Based on this idea, a third hypothesis is derived as follows.

H3: Entrepreneurs planning to start a business in the short term are more likely to start a business than those having a long-term plan.

The same logic applies for time variables. I contend that having stronger intentions would result in a shorter time lapse between graduation and venture creation. Therefore, the following hypotheses are suggested:

H3a: Entrepreneurs planning to start a business in the short-term are more likely to start a business than those having a long-term plan.

Control Variables

I included two variables to control alternative explanations based on the demographics of respondents. Gender is used in the model as a control. Female respondents tend to show a negative association with performance indicators of overall measures. Research has observed that work experience does not significantly help increase earnings of female entrepreneurs, while experience of the counterpart contributed significantly (Robinson & Sexton, 1994). Another control variable is ethnicity. Information about gender and ethnicity of respondents was obtained from alumni information UFAC has provided.

DATASET

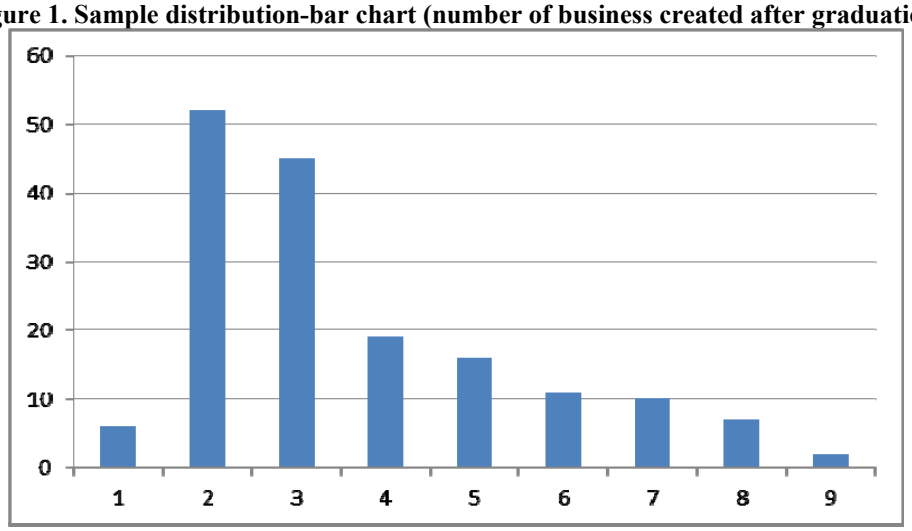
A dataset was created by combining alumni surveys conducted in multiple years. These were prepared by the University of Florida Center for Entrepreneurship and Innovation (CEI) with the primary purpose of assessing the performance of the University of Florida's entrepreneurship education. From 2005 through 2012, the University of Florida Alumni Center (UFAC) has administered an annual survey by sending emails to all students who had taken any course of entrepreneurship offered by the University of Florida. The multi-year survey provided sources to create panel data that records alumni career paths based on the answers given by respondents. These respondents comprise alumni who have graduated from 2004— the first year the courses were offered. I have then incorporated the programs they participated in—based on the answers and the sources provided from UFAC. Primary demographic information was obtained from UFAC. After clearing up invalid records, 410 valid cases were obtained.

METHODOLOGY

I employed two different regression techniques to generate two models. One was to consider the time variable in the response in order to enable observation of venture creation. The other was to account for the number of ventures—regardless of the time variability.

A Duration Analysis

Figure 1. Sample distribution-bar chart (number of business created after graduation)

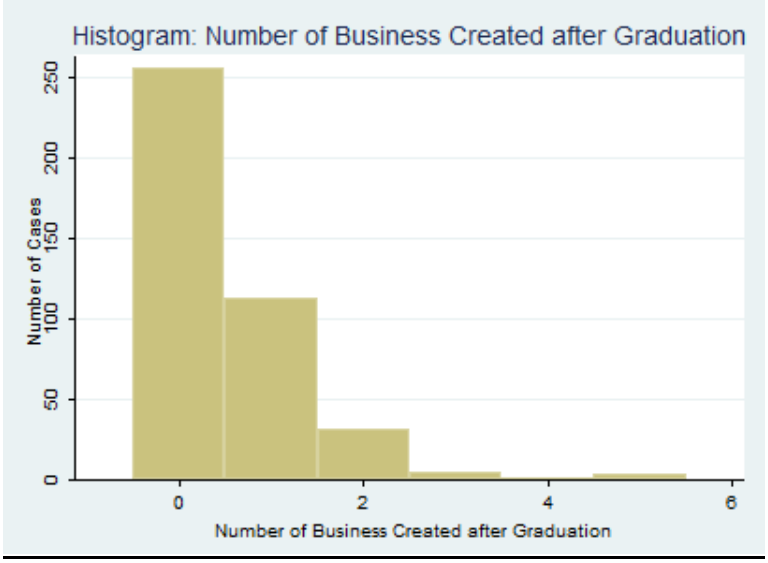


First, I conducted a duration analysis modeling technique to model student entrepreneurship and explanatory variables in terms of venture creation. In the model, the duration looks from the year of graduation to the year of the event of interest; thus, there is no issue of left-censoring. Figure 1 shows the distribution for the response variable: observation of venture creation by time, measured in the number of years after graduation. There were only a few observations of venture creation in Year 1. Most cases were observed in Year 2 when 52 alumni reported that they had launched businesses two years after graduation. Year 3 followed, with 45 cases. In subsequent years, the number of observed start-ups started to drop below 20.

Also, due to its collection period, the distribution shows a great number of 'ties,' which refers to the events that occurred at exactly the same given point in time *t*. Because the information is aggregated in a year, there is no way of knowing the actual time the event of interest occurred. Therefore, in this case, it is more appropriate to consider the distribution 'discrete'. All positive integers with many observations on one is observed. All things considered, this study used the complementary log-log discrete model to estimate via ordinary likelihood techniques. One of the advantages of using the discrete-time model is that it allows for non-proportional hazards. Finally, it is widely known that count data usually involves discreteness, nonlinearity and intrinsic heteroskedasticity. The population-averaged model is used to achieve the best model. No time varying repressors are used.

Count Data Analysis

Figure 2 Histogram: distribution of response variable

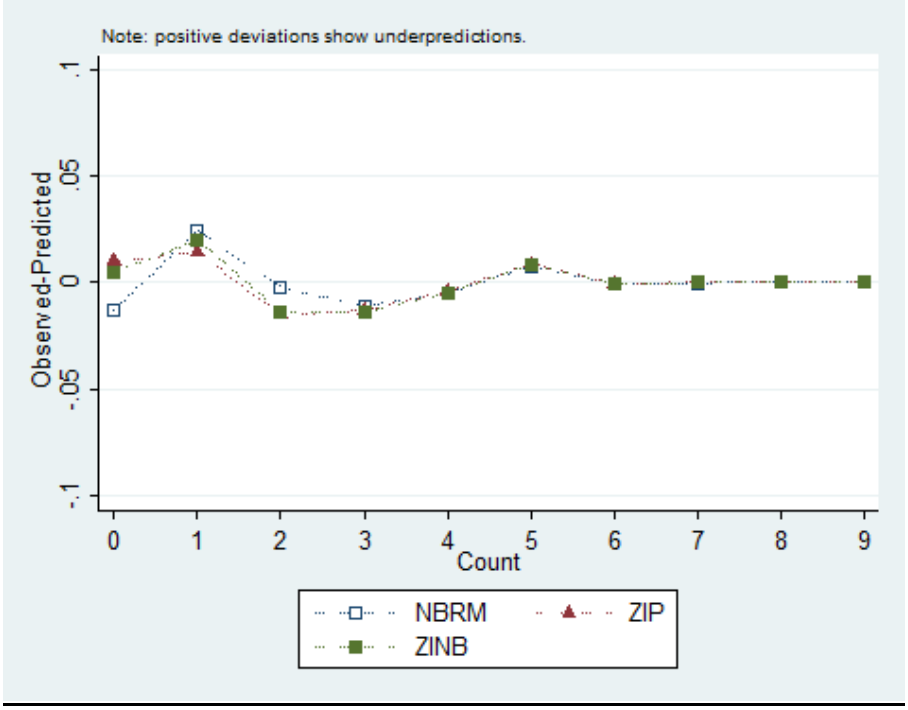


Second, I conducted a generalized linear regression to model the association between predictors and the numbers of businesses launched after graduation. Employing a generalized linear regression modeling technique is appropriate since the distribution of response variable severely breaks the normality assumption, which disqualifies ordinary least square techniques. In this case, the distribution of the response variable even demonstrates unevenly large observations between 0 and 2, positively skewed, which seems to emulate a typical Poisson pattern (Long & Freese, 2005). There are several issues to choosing the appropriate technique to model count data.

The first issue is whether the data contain zeros. In this case, the data contain many zeros as plotted in the histogram presented in figure 2. Perhaps there are excessive zeros because seemingly not all respondents have tried to launch a business after graduation. There must be respondents who have intentionally chosen a different career path than launching a business. The zero-inflated negative binomial (ZINB) model could be considered one of the methods.

Relying on one of the testing approaches to examine residuals graphically(UCLA Academic Technology Services), I chose zero inflated negative binomial technique resulting in small residuals as an appropriate method. In the graph presented in figure 3, models with lines closer to zero would be appropriate. ZINB showed the best performance between 0 and 2. (Note that ZIP only performs better at 2. Using ZINB seems to be relatively appropriate.)

Figure 3 Comparing ZINB, ZIP and NBRM



RESULTS

Descriptive Statistics

Table 2 summarizes the descriptive statistics about variables used to model student entrepreneurship. The total number of businesses created on campus was 173, which equals .28 businesses per person. At the moment of survey, 117 businesses seem to be surviving. 180 alumni reported that they were hired in a small business. In terms of demography, the majority ethnic group was white with 290 alumni participating. In terms of gender, 283 were male. 118 alumni indicated that they plan to start a business within one year. The number increases to 214 for those who indicated that they plan to start within five years.

Table 3 summarizes the number of observations for venture creation and the number of ventures created after graduation from education programs. The first column lists different categories of education program discussed in the previous section. The second column, Cases, lists the number of alumni by each program category. The third and fourth columns, Before and After, list observations of venture creation and the actual number of ventures created in the Before and After sub-columns. These comprise alumni from each category listed in the first column. The column, Observations, reports how many alumni launched businesses in each time period, while the #Business Created column reports the actual number of businesses they have created. For example, a number of alumni from group PMAJOR indicated that they had launched 36 businesses while they were in college. Subsequently, those 36 alumni launched 48 businesses

after graduation. In the case of TMAJOR, 22 alumni out of a total 71 respondents launched 34 businesses while they were in college. In sum, 127 alumni launched 175 businesses while they were still in college.

Table 2. Descriptive Statistics				
		N	**Mean**	**Std.**
# Running business		117	.29	.57
Number of Businesses While attending College		173	.28	.55
Jobs in small business		410	-	-
	1=yes	180	-	-
	0=no	230	-	-
Number Cases Reported Business Creation after graduation		410	-	-
	1=yes	158	56.1%	-
	0=no	252	43.9%	-
Gender		401	-	-
	1=Male	283	69.02%	-
	0=Female	118	30.98%	-
Ethnicity			-	-
	Asian	19	4.83%	-
	Black	12	3.05%	-
	Hispanic	47	11.96%	-
	Other	25	6.36%	-
	White	290	73.39%	-
Plan to start 1 year		397		
	1=yes	121	28.78%	
	0=no	276	71.22%	
Plan to start 5 year		410		
	1=yes	214	52.20%	
	0=no	196	47.80%	

In terms of venture creation activities after graduation, 57 alumni among 157 respondents of the largest group, SOME, reported that they had launched businesses after graduation, and they had actually launched 70 businesses between them. For group PMAJOR, 39 alumni among 85 respondents had created 43 businesses. For group TMAJOR, 27 out of 71 alumni reported that they had launched 37 businesses. Only 9 out of 21 alumni had reported that they have launched 12 businesses. Finally, 26 alumni of group MINOR had launched 34 businesses. In total, from all the groups, 158 alumni had launched 196 businesses after graduation.

Table 3. Number of Business Launched after Graduation (by Type of Program)					
	Cases	**before**		**after**	
		Observations	**#Business Created**	**Observations**	**#Business Created**
PMAJOR	85	36	48	39	43
TMAJOR	71	22	34	27	37
CNCNTRN	21	5	5	9	12
SOME	157	43	56	57	70
MINOR	76	21	32	26	34
SUM	410	127	175	158	196

FINDINGS

A Duration Analysis

Table 4 demonstrates the regression results of the complementary log-log discrete model for the time to venture creation. The study used multiple blocks to highlight the difference in the explanatory power of the variables. The first column reports outputs of the model generated only by using control variables, gender and ethnicity. Coefficients are interpreted as the effect of one unit change in covariates on the log-odds of an event in interval t. Obtaining the multiplicative effect of x covariate is possible by exponentiating the coefficients. The given goal of this study is highlighting the factors reduce the time, and the expected association is negative. In the first column, gender (β = .395, p < .001) is the only factor that would reduce time to market entry. One interesting finding is that the gender of entrepreneurs is positively associated, meaning that male entrepreneurs would take more time before venture creation in the first model, whereas male entrepreneurs are associated with a greater number of venture creation in the count data analysis summarized in Table 5.

The second column summarizes the result of the model accounting for venture experience after controlling for demographics. In this model, gender lost its significance but 'number of businesses launched while attending college (β = 383 p < .001)' turned out to be a delaying factor at a statistically significant level. This trend stays throughout the rest of the models. As speculated, a greater number of venture creations may not necessarily translate into later success. Model 4 includes education programs, venture experience, and intention to venture creation. Another surprise here is that short-term planning to create a venture turned out to be a delaying factor with statistical significance. In this model, the number of on-campus businesses stayed still as a delaying factor, but the number of surviving businesses turned out to be a contributing factor. It would indicate that student entrepreneurs with more successful businesses may take less time to create business than those have less surviving businesses. This trends stays the same in Model 5, which considers the interaction term between education and campus venture experience. Finally, and interestingly, TMAJOR—the traditional MSE program— turned out to be a contributing factor (β = -849 p < .05). It means that alumni of the traditional MSE program would take less time to create a business when they had launched businesses while they were in college. The number of surviving businesses still contributes to reduce time to venture creation (β = -662 p < .001). Gender, ethnicity and work experience, as well as work experience in small businesses did not play statistically significant roles.

Table 4 Complementary log-log model Businesses Launched after Graduation from College

Controls	Model1 controls only	Model1 control+venture experience	Model3 control+venture experience+intention	Model4 full
Gender				
Male	.359(.182)*	.087(.212)	.066(.253)	.059(.258)
Female	–			
Ethnicity				
White	-.40(.423)	-.465(.519)	-.010(.603)	.049(.641)
Hispanic	-.661(.471)	-.763(.571)	-.582(.680)	-.394(.714)

Table 4 Complementary log-log model Businesses Launched after Graduation from College				
Controls	Model1 controls only	Model1 control+venture experience	Model3 control+venture experience+intention	Model4 full
Other	-.050(.490)	.351(.583)	.423(.687)	.397(.722)
Asian	.000(.496)	-.190(.608)	.308(.694)	.252(.763)
Black	–	–	–	–
Education				
PMAJOR			-.582(.680)	-.692(.483)
TMAJOR			-.010(.603)	-.849(.424)*
CNCNTRN			.308(.694)	-.366(.475)
MINOR			.423(.687)	-.335(.418)
SOME				–
Business Before*PMAJOR				-.404(.796)
Business Before*TMAJOR				-.141(728)
Business Before*CNCNTRN				-.128(.912)
Business Before*MINOR				.092(.726)
Business Before*SOME				-.440(.517)
Intention				
Plan to start in 1 year			.785(.255)**	.878(.269)**
Plan to start in 5 years			.361(.250)	.349(.259)
Venture Experience				
Number of businesses launched while attending college		.383(.540)**	.669(.184)**	.892(.334)**
Number of survived businesses launched while attending college		-.252(.213)	-.712(.258)**	-.662(.268)**
Hired by small businesses		.272(.186)	.305(.218)	.258(.224)
Constant	-.912(.439)*	-.876(.540)	-1.606**	-1.336(.670)*
N: observation	521	380	308	308
N: groups	393	326	275	275
Wald Chi-Square (df.)	9.70+	22.86**	47.78**	50.99**
[a] Coefficients are reported. S.E in parentheses Robust S.E for model by negative binomial regression +p<.10 *p<.05 **p<.01				

Count Data Analysis

Table 5 summarizes the results of the zero-inflated negative binomial models. In this table, the dependent variable is the number of businesses launched after graduation. The estimated coefficients indicate the log of the expected count as a function of predictor variables. The dispersion parameter alpha, all being greater than zero, indicates that the data are overly dispersed, reaffirming that the data are better estimated using a zero-inflated negative binomial model rather than the Poisson model. The Wald chi-square tests show the statistical significance of all models.

Table 5 Businesses Launched after Graduation from College Generalized Linear Models					
Controls	Model 1: controls	Model 2: By Education Program + controls	Model 3: venture experience +intention +education	Model 4 venture experience +intention +controls	Model 5 full
Gender					
Male	.516(.184)**	.512(.179)**		.163(.178)	.162(.180)
Female		--		--	--
Ethnicity					
White	-.465(.386)	-.504(.392)		.042(.315)	.012(.321)
Hispanic	-.778(.449)+	-.838(.452)+		-.401(.369)	.-.434(.377)
Other	-.194(.474)	-.160(.491)		.090(.395)	.160(.412)
Asian	-.106(.537)	-.191(.515)		-.208(.487)	-.183(.491)
Black				--	--
Education					
PMAJOR		.412(.193)*	-.112(.204).		-.198(.256)
TMAJOR		.122(.236)	254(.214)		-.605(.281)*
CNCNTRN		.433(.311)	-.0382		-.070(.429)
MINOR		.133(.243)	-.002(.224)		.137(.307)
SOME		--	--		--
Business Before*PMAJOR					.742(.369)*
Business Before*TMAJOR					1.101(.350)**
Business Before*CNCNTRN					.766(.501)
Business Before*MINOR					.218(.418)
Business Before*SOME					--
Intention					
Plan to start in 1 year			1.122(.154)**	1.18(.209)**	1.210(.194)**
Plan to start in 5 years			.128(.192)	.047(.195)	--
Venture Experience					
Have launched businesses while attending college			.691(.236)**	.634(.234)**	--
Number of businesses launched while attending college			-.094(.154)	-.080(.154)	-.024(.154)
Number of survived Businesses launched while attending college			-.052(.165)	-.076(.172)	-.121(.171)
Inflate: Hired by small businesses	-19.194(.886)**	-22.423(.865)**	-21.774(1.204)**	-25.966(1.164)**	-.13.704(1.02)**
Constant	-1.315(.593)*	-1.250(.566)*	-2.225(1.089)**	-2.124(.313)**	-1.275(.370)**
N: observation	393	393	410	393	393
Nonzero obs	146	146	154	146	146
Zero obs	247	247	256	247	247
Wald Chi-Square (df.)	14.25(5)**	21.50(9)	107.45(9)	115.50(14)**	126.92(17)**
LR chi2(18)					
Alpha	.314		.023	.033	.007
Log pseudolikelihood	-373.9661		-354.08	-337.13	-335.33
[a] Coefficients are reported. S.E in parentheses Robust S.E for model by negative binomial regression +p<.10 *p<.05 **p<.01					

The first column presents a model showing the predicted probability of venture creation using only the control variables of gender and ethnicity of respondents. In this model, male respondents appeared to be positively associated with the number of ventures launched after graduation, with statistical significance over female respondents. The difference in the logs of expected counts is expected to be .516 units ($p < .001$) greater for men than women, while holding the other variables constant. Among ethnic groups, in this model only Hispanic respondents seem to have underperformed with statistical significance, to a moderate degree. The second column highlights the effect of education as it is tested by different programs. In this table, men remain positive and a significant factor that would increase .512 units in the logs of

expected counts compared to women, as well as the Hispanic ethnic group, with a negative sign (coefficient -.838). Among the education programs, only PMAJOR demonstrated significant associations, with a coefficient of .412, with the number of new ventures created after graduation. Model 3, in the third column, highlights the effect of previous experience with venture activities and entrepreneurial intention. Without controlling for education programs, the model shows that whether they created the business while in college matters with statistical significance, shifting .69 in log odds, whereas the number of ventures created may not. Having a plan to start a business in the short-term seems to show a strong association with venture creation later in the career, with a 1.122 coefficient ($p < .001$). In Model 4, variables of short-term planning and venture experience—regardless of number—still remain significant, even after controlling for demographics. In Model 5, venture experience is interrelated with the education program. Long-term plans to start a business dropped out due to its low significance. Gender and ethnicity still stay in the model, but note that they lost significance from Model 3. TMAJOR decreases expected outcomes in comparison to the reference group, SOME, by -.605 ($p < .05$) log odds, at a statistically significant level when measured alone. With venture experience counted together, however, TMAJOR changes the sign and shifts the coefficient to 1.101 at a statistically significant level ($p < .001$). PMAJOR also shows a positive impact with a .742 log odds increase at a statistically significant level. Here, one should note that PMAJOR is comprised of students who demonstrated at least two years of professional experience as a condition of program admission. One can draw an implication that supports professional experience as an important factor in successful entrepreneurship. Also, based on the positive impact observed from a combination of TMAJOR with venture experience, student entrepreneurship may be enhanced—even for those lacking prior professional experience if these students experienced venture creation while in college. Interestingly, the number of businesses launched while attending college still stays as an insignificant factor, in any model.

DISCUSSION

To the best of my knowledge, this was the first study relating venture creation experience in college and alumni entrepreneurship practices by the number of new ventures created after graduation; this should be stated as a major contribution of this study. There is a number of studies measured alumni entrepreneurship relating to entrepreneurship education, but only with their enrollment in a program. Understanding attributes of entrepreneurship may help improve program curricula, but may not be able to stress integrating components of experiential learning, such as student business incubators (SBI). One of those studies, e.g. Charney et al. (2000) has successfully separated attributes of entrepreneurship to highlight the effects of entrepreneurship education, and to consider prior business ownership. This study makes another step forward by considering their venture creation activity while in college. By doing so, this study improves understanding about the mechanism of on-campus venture creation experience to the existing body of knowledge about the effects of entrepreneurship education. It is the first study to serve as a basis to stress the importance of a student business incubator in the existing curriculum of an entrepreneurship education program. In the following paragraphs, I discuss the contributions of

this study and highlight the implications of the findings. Suggestions for future research are presented based on the discussion.

Implications of Considering Time Factor in Modeling Student Entrepreneurship

The uniqueness of this study is that, for the first time, the factor of time gets considerable attention in modeling student entrepreneurship. Time is important in considering the success of student entrepreneurship in a couple of ways. First, failing to account for any temporal effect is likely to result in misspecification when modeling entrepreneurial success. As demonstrated in this paper, factors that affect the number of ventures created might have a different impact on timing. One of the examples was that having a 'short-term plan to start' may delay the time to venture creation, but has a positive impact on the number of ventures created after graduation. A potential implication of this finding is that 'short-term plan to start' may signal the seriousness of intention in that it resulted in a greater number of business start-ups, while the longer time-frame of '1 year' may not be achieved as planned. Without considering time factors in the model, the research may have ended up concluding only on the positive impacts of short-term planning, thus failing to account for how long the plan actually needs to be implemented. Second, a simple measurement without considering time factors, such as venture creation 1 year after graduation, may lead to misleading evaluation when the schema is used to evaluate entrepreneurship programs. As shown by the distribution, there were only a few observations at Year 1, while many venture creation activities followed later on. The finding implies that measuring venture activity might be sensitive according to when it is measured. Is there a right moment to measure then? The answer is no since the effect of education is observed throughout time rather than at a particular moment in time. On the other hand, the impact from variables related to venture experience implies a direction that entrepreneurship education should follow by implementing new programs. This study found positive indirect evidence to support the integration of SBI by presenting the positive impact of venture experience while attending college on venture creation after graduation. This approach would reduce the time to create ventures and help students to create more ventures. This discussion leads to the next passage which discusses another contribution this study made—presenting evidence to support the prestige of entrepreneurship education.

Implications of Entrepreneurship Education

This was the first study to test the effects of entrepreneurship education according to different types of program (characterized by the number of credits and the level of program). In addition, the study presented striking evidence to support the synergistic effects of combining entrepreneurship education and experiential learning components. Most importantly, the prestige of formal entrepreneurship education is verified from its positive impact on the time taken to create a venture after graduation when compared with other programs. While the formal degree program showed a contrasting effect in terms of the number of ventures (β=. -.605), the sign changes to positive for those alumni of TMSE and PMSE who had created ventures while they

were in college. Alumni of TMSE, (a traditional degree program) created considerably more ventures than the comparable groups (β=1.101, p<.001). A similar event also occurs with the alumni of PMAJOR, (the weekend entrepreneurship degree program)—the sign has changed and its impact changes to statistically significant (β=. 742, p<.05). These finding clearly indicate that experiential learning would enhance entrepreneurial capability in terms of venture creation. Most of all, such a big difference in the magnitude between TMAJOR (1.101) and PMAJOR (.742) is noteworthy, considering the fact that the alumni of TMAJOR are deficient in professional experience. This can be fairly regarded as a great achievement of formal entrepreneurship education. An implication of this finding might be a strong emphasis on action-oriented learning. Note that students in the PMAJOR group had a minimum of two years of professional experience prior to admission. It is obvious that the experience of venture creation would convey an additional benefit beyond just work experience. An implication of this finding is that general education theory may have only a weak implication for entrepreneurship education.

I should stress finally, that the drastic change occurs when formal education programs and venture experience work together. The experience of venture creation emphasized here is one that students obtain while attending college, which necessitates distinguishing professional experience from the experience of venture creation—regardless of academic setting. The venture creation experience within an academic setting would provide the necessary exposure to a context in which knowledge and skillset are required for venture creation, not to mention the opportunity for mentoring and networking. Perhaps, there could be other unobserved factors behind the lower impact of other programs—even those with on-campus venture experience. For example, it is viable to associate weak or moderate entrepreneurial intention with alumni participated programs such as CNCNTRN, in the sense that most of the participants were students of an MBA program. Considering the general preference of MBA students for a professional career in a large corporation, it is likely that they partook in the program as part of an MBA requirement—aiming to utilize entrepreneurial skills in a corporate setting when they get a job in a large corporation.

In future research, based on these findings, one could construct a hypothesis to highlight the potential uniqueness of campus venture experience as: the four years of college may provide tolerant circumstances that encourage the risk-taking spirit, thus encouraging entrepreneurship. Alternatively, one may rephrase this as: college enrollment may provide a sense of security. This raises the question of whether students in college are encouraged to start a business without minding the risk associated with the opportunity.

Implications of Entrepreneurial Intention

Reiterating my discussion provided in the results section, there was a set of contrasting findings observed from the test about entrepreneurial intention. The short-term plan to start a business seemed to create a delay in the time taken to create ventures, but it resulted in more businesses in any model. One explanation for its delaying effect might be that it actually took more time than was originally planned. There are two more points I would like to make about the findings. First, it requires further investigation in the sense that it was unclear why respondents

indicated that they had plans—perhaps, they were going through the process of preparing to launch a business. So they meant it when they answered and it was based on an incorrect projection. The second possibility is that they were working for an organization, and were planning to quit the job in the next year to start a business but it did not happen as planned. A third possibility is that they were running a business at the time of the survey and were planning to start a new business next year, but operating the current business delayed their future plans.

Therefore, it may indicate the need for reinterpretation of professional careers with small businesses during the early post-graduate period. I want to go back to the issue of measuring the outcomes of entrepreneurial education. For example, how do we know whether entrepreneurship education is successful? Do we consider getting a job in a small business a success of entrepreneurship education? There are reasons that we should be careful with interpreting the results. In a general sense, getting a job in a small business is largely regarded as evidence of under-competence in the job market due to its lower compensation and weaker job security. Educators of entrepreneurship tend to acclaim by taking it as an evidence of entrepreneurial intention. This needs to be considered in light of the findings of this study which signaled that getting a job in a small business may only delay time to venture activity—its potential contribution on later entrepreneurship is unclear. However, despite its deterrent effect, one reason to still consider it as evidence of successful entrepreneurship is that it could be a terminal achievement in preparation for venture creation. This argument might be conditionally supported by one of the findings of this study: having a short-term plan to start a business actually led to venture creation. Based on this finding, one may hypothesize that long-term commitment as an employee of a small business may work against entrepreneurship, whereas short-term experience may be a contributing factor. Based on the possibility of many interpretations, we may be better to hold back until we can warrant job experience in a small business with later success as entrepreneurs. Nevertheless, it is worth noting that one issue is clear; measuring entrepreneurial success without time consideration results in only a snapshot picture of entrepreneurs, whereas we always teach that entrepreneurship is a lifetime journey. Speaking of measuring the time component, the next passage will discuss the methodological contribution that this study has made.

Methodological Contribution: First Study Employed a Longitudinal Modeling Technique

In addition to engaging a closer investigation of the relationship between education and new venture creation, this study has undertaken an event history analysis to model the lifetime entrepreneurship of student entrepreneurs, focusing on their early career. To the best of my knowledge, this research attempted to present a model of the relapsed time of first venture creation for the first time in the history of research. For future research, panel data development is necessary to enable a long-term longitudinal study to further investigate the implication of professional experience with small businesses for the later careers of graduate entrepreneurs. Potential topics in this line include modeling the relapsed time of first venture creation, speed of commercialization, time/likelihood to venture from getting a job in small business, or duration of student ventures. To enable the tracking of alumni entrepreneurial careers, the creation of massive panel data is necessary and it requires collaboration between multiple institutions.

In addition to the fact that it expands the time-span to find evidence of entrepreneurship education and venture experience, the study achieved a methodological advancement by recognizing inflated zeros, conducted zero-inflated negative binomial modeling. Noticing inflated zero is a meaningful advancement because it helps researchers of future studies avoid mistakenly assuming that all graduates of entrepreneurship education would attempt to start a business, which would cause errors in estimation. In reality, there are other options to practice entrepreneurship, such as starting as joiners of an existing venture as an employee. As observed, excess zero in the distribution of response variables was explained by alumni who were hired in a small business.

LIMITATIONS

In consideration of the results of this study, it is important to note that the study was done without limitations. First, while it considers the number of ventures, it was not able to tell whether they were successful. Second, the number of surviving business accounted for in the model was based on the status when alumni responded to survey, which indicates possible issues with temporal sensitivity. Some businesses were counted as successful even if they had actually lasted for a relatively short period. Third, even though the study tests the effectiveness of education according to different programs, it was impossible to include a control group due to lack of relative data. Without including a control group, it was difficult to speculate about counterfactual situation. Fourth, the study used a dataset collected from alumni of only one university, and this may reveal weak generalizability. Finally, there is room to improve the model by adding other factors considered as important determinants of entrepreneurship in general—such as family background—in any future research.

Most of all, poor response rate (1%) should be addressed in a future survey. This might be because the dataset's creation was not initiated to serve academic research. Instead, it was to create supportive material for establishing and improving campus-wide entrepreneurship programs. The University of Florida CEI will continue to administer the alumni survey and plans to revise the questionnaire to suit academic research in the future.

CONCLUSION

I would like to conclude this paper by answering the major questions of this research. On the first question (how the careers of student entrepreneurs develop after graduation), this study found that speed of venture creation is increased by participating in a formal degree program and also from having prior venture experience. As described, the first year after graduation does not observe active venture creation. The second question, (the role of the education when prior experience is present) is in somehow complicated. Based on the observation which shows that a degree program would reduce the time taken to venture creation. However, I failed to find its impact in increasing number of venture creation. Therefore, I conclude that education helps students to get ready to start few businesses in a short term. When students with prior venture experience take a degree program, though, the number of businesses created is also increased.

Based on these findings, the role of entrepreneurship education is refined as a context in which students can further develop the capability of venture creation that they already have. A stronger impact is expected when they participate in a degree program. On the third question, (how to view evidence of the success of entrepreneurial education), I question the validity of a career in a small business as evidence of the success of entrepreneurship education. It is unclear that it leads to venture creation in alumni's later careers. I also suggest reconsidering the practice of measuring the number of ventures after graduation in that it is likely to disregard many institutions actually using best practice.

Finally, to make future research possible, I would like to invite peer academic institutions to join the effort of developing a database for student entrepreneurs. Databases for small businesses are rare. Databases for student entrepreneurship have not been developed extensively. Some researchers have developed their own databases to suit their interest in a particular research topic. However, such databases are not widely known and are not likely to meet the needs of general-purpose research. By developing relevant and comprehensive data that track career paths of student entrepreneurs, academic institutions could further improve their programs to meet their goals. The research community would benefit from a larger database from which to draw insights for educators.

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THE DEVELOPMENT OF CRITICAL THINKING SKILLS THROUGH A SERVICE-LEARNING ORIENTED ENTREPRENEURSHIP COURSE

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ABSTRACT

The present case study introduces a service learning-based entrepreneurship course for undergraduate business students. It aims to teach experiential entrepreneurial skills and also expose the students to important critical thinking skills. Based on Bloom's taxonomy (1956) and Paul and Elder's (2010) critical thinking framework, the linkages between the service-learning project and the development of students' critical thinking skills are discussed. Suggestions for replicating the course at other universities are given.

INTRODUCTION

Due to the globalization and the increasingly fast-paced rate of change in the marketplace, critical thinking skills have become key components for success among business professionals in recent years. More specifically, the dynamic and highly competitive nature of the business environment is requiring executives and professionals to gather relevant information, analyze multiple scenarios, and offer creative solutions to complex and rapidly changing market problems. Parallel with the demands of the corporate world, the American Assembly of Collegiate Schools of Business (AACSB) has repeatedly urged business schools to incorporate higher order or reflective thinking skills as an integral part of their undergraduate business education (www.aacsb.org). In order to properly prepare business students for the real world challenges they will face in the workforce, business colleges have consequently responded by including effective pedagogical tools such as active learning exercises to foster critical thinking skills in their students (Page & Mukherjee, 2007).

Some of the tasks typically associated with college business students' critical thinking include identifying problems, incorporating underlying assumptions, using relevant data sources, incorporating varying perspectives into the analysis of the problem at hand, generating viable alternatives, and comprehending the consequences of the suggested solution(s) (Boyles, 2012). It is clear that critical thinking goes beyond simply recalling certain facts and information. Critical thinking requires individuals to understand and interpret information appropriately. Thus, the important role of business educators in fostering critical thinking skills is to provide learning

tools and environments for students to advance from the basic knowledge and comprehension of concepts to the advanced cognitive skills of application, analysis, synthesis, and evaluation.

Service-learning is such a pedagogical tool that combines academic learning with community service. Service learning can help students move beyond the basic technical and functional skills taught in various business classes and focus on more broad-based skills such as multidisciplinary integration, soft skill development, global perspectives, ethical reasoning, and corporate social responsibility (Navarro, 2008). Many business schools and colleges incorporate service learning into the curricula in order to engage students in their communities, increase awareness of social issues, and foster multi-organizational partnerships to jointly solve problems (Poon, Chan & Zhou, 2011).

A review of the literature on service-learning and business education indicates that there are two important gaps for prospective researchers to fill. First, although previous research has examined many benefits of using service learning as an effective pedagogy for student learning and success, the research primarily focusing on the impact of service learning on critical thinking skills is largely missing from the literature. Second, even though there has been much scholarly work outlining the use of service-learning projects in various business school disciplines—marketing, management, management information systems, accounting, and finance—with a few exceptions (e.g., Hernandez & Newman, 2006, 2011; Mancuso, Alijani, Kwun, & Smith, 2010; McCrea, 2010), the research on the use of service learning pedagogy for the entrepreneurship is quite limited.

Therefore, the purpose of the current study is twofold. First, the paper aims to introduce a service learning course that is specifically designed to develop experiential entrepreneurial skills for undergraduate business students. Second, with the introduction of this experiential service-learning course, the present case establishes essential relationships between a service-learning project and critical skill development that are so important for the survival and success of business students under very competitive and dynamic market conditions.

The rest of the paper is organized as follows. First, the rationale of the study is introduced by briefly reviewing the literature on the connections among the study's concepts (i.e., service learning, entrepreneurship education, and critical thinking). Second, the experiential entrepreneurial class design is introduced. Then, the course's impact on the development of critical thinking skills via service learning is articulated. Finally, a discussion of this study's findings and general conclusions is provided.

RATIONALE

Wilson (2008) defines service learning as a "form of experiential learning designed to engage students, faculty, and community partners in a mutually beneficial experience." This pedagogy allows students to move from transient, surface learning to deeper, meaningful learning which is "longer-lasting, and more portable to new situations and circumstances"

(Ehrlich, 2006). Kolb (1984) describes experiential learning as an outcome of the continuous interaction between students and their surroundings. The process of experiential learning typically allows students to interact with the community to fulfill unmet needs, demonstrates course content via real world organizations and experiences, and broadens students' exposure to the discipline and common industry practices (Bringle & Hatcher, 1996). Common characteristics of service-learning courses include being learner-centered, community-based, cooperative and multidimensional.

Previous research indicates that service-learning projects produce many positive outcomes for students such as enhanced motivation (Thomas & Landau, 2002); civic engagement and volunteerism (Tomkovick, Lester, Flunker, & Wells, 2008); social responsibility and values development (Eyler, Giles, Stenson, & Gray, 2001; Lester, Tomkovick, Wells, Flunker, & Kickul, 2005; Papamarcos, 2005); and self-efficacy and confidence (Giles & Eyler, 1994; Papamarcos, 2005; Tucker & McCarthy, 2001).

In addition to these benefits, service-learning projects are believed to be essential to help students develop and sharpen their critical thinking skills, by engaging the participants in real world experiences and exposing them to real world problems. Scriven and Paul (1987) define critical thinking as "the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action." Bloom's (1956) well-known taxonomy of learning outcomes for education provides a theoretical framework in which six cognitive objectives—knowledge, comprehension, application, analysis, synthesis and evaluation—are listed with an increasing order of complexity. Similar to Scriven and Paul's (1987) conceptualization, Bloom (1956) associates the last three objectives—analysis, synthesis and evaluation—with the higher order or critical thinking skills. Critical thinkers demonstrate high levels of adaptability to changing situations and are equipped with enhanced problem solving capabilities. More specifically, in order to solve complex and ambiguous problems they need to successfully recognize and frame the problem, analyze the parameters of the problem, draw valid conclusions, and offer viable solutions to the problem often under uncertain conditions and with limited resources (Paul & Elder, 2010).

Previous research has revealed that students participating in service learning activities demonstrated enhanced cognitive moral development (Boss, 1994), creativity in applying knowledge to novel situations (Osborne, Hammerich, & Hensley, 1998), and critical thinking and problem solving skills (Conrad & Hedin, 1991; Cress, Kerrigan, & Reitenauer, 2003; Eyler & Giles, 1999; Kendrick, 1996; Lester et al., 2005).

With its clear benefits regarding the development of critical thinking and problem solving skills, the service-learning pedagogy is very suitable to teaching entrepreneurship courses (Fiet, 2001). By its very nature the entrepreneurial process is highly uncertain, complex, and ambiguous and the successful creation and the management of a new venture requires

entrepreneurs to be equipped with higher order cognitive skills of analysis, synthesis, and evaluation. Thus, previous research has suggested a shift from using traditional teaching methods (e.g., lectures, exams, and case studies) to using experiential learning methods (i.e., service learning) that reflect the risks and unpredictability of the real world situations in entrepreneurship education (Maritz, Brown, & Shieh, 2010; Solomon, Weaver, & Fernald, 1994). Ulrich (2009) also found that entrepreneurially-minded business students have shown preference for active educational strategies such as internships, management simulations, and experiential exercises.

A review of experiential learning techniques used in entrepreneurship education reveals a wide range of applications, such as writing business plans, consulting, student business start-ups, computer simulations, and field trips (Solomon, Duffy, & Tarabishy, 2002). However, this review indicated that although the service learning pedagogy is highly utilized by other business disciplines (see Andrews, 2007 for extensive listing of these studies), only a few service-learning studies have focused on entrepreneurship courses and education (Hernandez & Newman, 2006, 2011; Mancuso et al., 2010; McCrea, 2010). Considering the natural fit between service learning pedagogy and entrepreneurship education and the essential role of service-learning projects in the development of critical thinking skills that are fundamentally important for entrepreneurial success, there is a void in the literature for studies integrating these three realms (i.e., entrepreneurship education, service-learning, and critical thinking skills). This paper, thus, is an effort to fill this void by codifying an entrepreneurship course that incorporates service learning and critical thinking with positive outcomes for the students, faculty and clients involved.

COURSE DESCRIPTION

Entrepreneur-in-Residence (EIR) is a unique course that is offered in the business school at a small, public, teaching-focused university in the Southeastern United States. The course offers an ideal combination of a community service and multi-disciplinary learning experience for business school students. EIR is designed to be an interactive experience between senior level business students and prospective entrepreneurs and/or executives of existing companies. In the class, entrepreneurs and executives introduce the business idea they want to pursue to the students and indicate what specific project deliverable (e.g., feasibility analysis, business plan, or market research) they want the students to complete by the end of the semester. In response, the students, acting as consultants, conduct independent research, perform various analyses, and compile relevant information to deliver their completed project to the entrepreneur or executive on time in the form of a written report and oral presentation. The presentation is open to representatives from the organization as well as business faculty and students.

In the first semester that this course was offered, the students helped create a feasibility analysis for opening a new business in the telecommunications industry. The analysis was completed for a local branch of a well-known national non-profit organization. The non-profit

organization needed to operate a profitable business to generate necessary financial resources to successfully deliver its mission-oriented services to local clients. For this semester long project, twenty three students explored the financial, organizational, and labor feasibility of the proposed business in the local community. They used the parameters provided by the non-profit, such as location, size of the business, and existing building facilities to structure their research.

In the creation of the feasibility analysis, the students were assigned to groups of 4 or 5 to focus on a specific aspect of the feasibility analysis (e.g., labor feasibility analysis, competitor analysis, or infrastructure analysis). After working on their group assignments, the students then periodically shared their findings with the rest of the class to keep the entire class moving towards achieving the ultimate goal of preparing a feasibility analysis. In this process the students interacted with their peers, professors, local and state government agencies, the client, and industry experts to ask questions, receive information and direction, and gain valuable insights regarding their project. At the end of the term, the students presented their findings to the executives of the non-profit in a formal presentation.

COURSE IMPACT ON CRITICAL THINKING SKILLS AND SERVICE LEARNING IMPLICATIONS

According to Paul and Elder (2010) a well-cultivated critical thinker is able to raise and formulate vital questions and problems, gather and assess relevant information, come to well-reasoned conclusions and solutions, think open-mindedly within alternative systems of thought, and communicate effectively with others in figuring out solutions to complex problems. Through their involvement with the Entrepreneur-in-Residence course the students found opportunities to develop important and valuable learning outcomes corresponding closely with the critical skills defined by Paul and Elder (2010). More specifically, the students interacted with a real client to solve a complex problem (i.e., to understand whether it is feasible for the given organization to enter a specific industry to generate profits to achieve its mission), conducted original research, collected relevant company and industry specific data, and considered and analyzed many different scenarios, picked the most feasible solution among other alternatives, and finally delivered a real and applicable solution to the given organization. In this process, they not only learned to provide a valuable service to the community but also learned to (a) develop creative and critical thinking; (b) refine interpersonal skills and build confidence; (c) integrate theoretical classroom learning with hands-on real world experiences; (d) gain useful insights and knowledge about the entrepreneurship process and success factors; and finally (e) build a network of professional relationships that would be helpful for future career prospects. Table 1 specifically illustrates project tasks, their descriptions, and how they relate to critical thinking outcomes of Bloom's taxonomy.

TABLE 1 – Project Tasks and Critical Thinking Links		
TASKS	**TASK DESCRIPTIONS**	**CRITICAL THINKING LINKS**
		Question/Information: Knowledge and Comprehension **Communication: Application** **Alternatives: Analysis** **Solution: Synthesis and Evaluation**
Labor Feasibility Analysis	Collect and analyze secondary labor data (e.g., median income, age, education, etc.) to understand whether it is feasible to operate the proposed business with available human capital in the region.	**Question:** Is there a sufficient amount of human capital that fits the needs of the proposed business? **Information:** Collected relevant labor statistics to assess the fit. **Communication**: Communicated the findings with the task group, the entire class, and the client to make better use of the data. **Alternatives:** Considered different cities as potential locations for the proposed business. **Solution:** Picked and presented the city location that provides the best fit for the client's labor needs.
Legal Feasibility Analysis	Gather legal information (e.g., available legislation and necessary permits and/or licenses) by conducting online/library research and talking to the legal team of the client company to understand whether the proposed business is legally feasible.	**Question:** Are there any legal limitations to start the proposed business? Are there any specific permits and licenses required to start such a business? **Information:** Collected relevant legal information. **Communication:** Communicated with the legal team, the task group, and the client to collect and interpret the information collected. **Solution:** Picked and presented the appropriate advice to the client.
Financial Feasibility Analysis	Collect cost and revenue information from both secondary (i.e., online and library search) and primary resources (i.e., talking to the industry participants and experts), create pro forma statements (e.g., income statement), and analyze the information to understand whether the proposed business is financially viable.	**Question:** What will be the profitability of the proposed business? How can we accurately estimate the costs and revenues of this business? **Information:** Collected relevant cost and revenue information. **Communication:** Communicated with the industry experts, existing companies, the task group, and the client to collect and interpret the information collected. **Alternatives:** Prepared pro forma statements and the break-even analyses for different scenarios. **Solution:** Picked and presented the scenario with the highest profit potential.
Competitor/Industry Analysis	Collect secondary data of regional, national, and international competitors of the industry and analyze this data to understand whether this is an industry that is feasible for the proposed business to enter.	**Question:** Who are the existing competitors of the industry? Is the industry a favorable one to enter? **Information:** Collected relevant information about regional, national, and international competitors of the industry. **Communication:** Communicated the findings with the task group, the entire class, the school faculty, and the client to better understand and present the results. **Alternatives:** Considered alternative strategies to enter the industry successfully. **Solution:** Picked and presented the best possible penetration strategy to the client.
Infrastructure Analysis	Collect secondary data about location and other physical properties of the proposed business, create alternative scenarios for possible locations and physical characteristics of the business, and help the client to choose best possible scenario for its business.	**Question:** Where will the proposed business be located? **Information:** Gathered relevant information about possible location choices? **Communication:** Communicated the findings with the task group, the entire class, and the client to better understand and present the results. **Alternatives:** Considered physical office versus virtual office alternatives. **Solution:** Picked and presented best possible solution to the client.

TABLE 1 – Project Tasks and Critical Thinking Links		
TASKS	**TASK DESCRIPTIONS**	**CRITICAL THINKING LINKS**
Final Presentation	Create and present a professional and well-prepared presentation that helps the client to understand the critical aspects of starting the proposed business in the given industry and offers the "best" possible alternative for the client to choose.	**Question:** How long will be the presentation? What is the best way to present critically important information? **Information:** Gathered advice and information from the task group, the school faculty, and the entire class to effectively prepare and present the information to the client. **Communication**: Arranged rehearsal presentations to the faculty, the class, and the school peers to solicit their feedback to make the final presentation as effective as possible. **Alternatives:** Considered alternative ways to create and deliver the presentation (e.g., integrate different media to the presentation). **Solution:** Picked and used the most effective and precise way of presenting relevant and critical information to the client. Also, made sure that the client was presented with the most optimal solution to their initial question.

Towards the end of the semester the students were asked to reflect on their experiences and evaluate both their own and their peers' performance in the course. Table 2 displays the students' comments about the learning outcomes of the EIR class experience. The comments of the students revealed that they embraced the combination of service and real life learning that the EIR course intended to offer in the classroom environment. Many students expressed a positive sentiment that this course was a nice break from the normal business class in that there was no book and there were no right answers. The students indicated a self-satisfaction in dealing with the ambiguity of the real world as a group united to find answers to questions posed by an actual organization.

TABLE 2 – Student Evaluations of the Project Outcomes	
Project Learning Outcomes	**Sample Student Quotes**
Doing real work and dealing/interacting with real people	"The fact that it is a real situation and we were able talk to business people (in other business classes we would make up business plans but they were not actually put in to use)". "The fact that we were dealing with an actual company and a real life situation".
Developing research skills	"It was a real life project and actually had to research like we would in our careers".
Applying theory to practice (e.g., learning about starting a business from scratch)	"Application of concepts learned from schooling" "I was thrilled with the prospect of learning about starting a call center from the beginning. " I enjoyed the challenge of creating something from nothing.
Dealing with ambiguity, lack of structure, and frustrations	"….experiencing "real life ambiguities" when preparing this project". "I feel that the class has prepared me for the frustrations that I am likely to face in the workplace. It has showed me how to apply my academic excellence to something other than simply an examination. It has forced me to redefine my comfort zone time and time again. "The structure of the class. I enjoyed not having my brain picked from memorizing a book".
Serving the community	"I especially liked doing realistic research to create an actual feasibility analysis to help a non-profit organization. (Giving back to the community)".
Developing communication, presentation, and team skills	"….a lot of group work experience; and presenting". I liked "working as a team"; "exchanging ideas; learning new competencies; and the challenge". "I like the fact that I got a chance to listen to some very great speakers and got to hear my peers really brainstorm for a project as a class".

DISCUSSION

This paper describes a new approach to business school pedagogy that can be replicated in other colleges and universities. The general outline of the project given here can serve as a guide for interested schools. It combines the aspects of teaching entrepreneurship, critical thinking skills and service-learning into a single course that allows students to learn in a unique and shared way. The entrepreneurial experience allows students to work with actual entrepreneurs in the marketplace, instead of reading about them from a distance. The critical thinking experience requires students to take real world information and dynamic environmental factors and use them to make reasoned decisions about strategies for an actual organization. The service-learning experience allows students to engage with the local region, get out of the classroom, and also see opportunities for partnerships between the academic and business communities. This multi-faceted course could be used as a capstone course, or a senior-level business elective. It has generated much interest from the students and continues to be a popular course for those who want to study entrepreneurship first-hand.

CONCLUSION

With an increased emphasis on multidisciplinary studies and real world experience in higher education, the Entrepreneur in Residence course provides a distinct teaching and learning opportunity for faculty and students. This class has proved to be very successful within the university and the business community. It is likely that this course will be modified somewhat in the future to meet the ever changing needs of the clients and the students. As this case study illustrates, the course can be replicated easily at another school of business. As this course matures, it may even inspire other similar courses to be created that use innovative and collaborative learning techniques. Using EIR as a base, there many possibilities to create inspiring and rewarding classes using this pedagogical approach.

The limitations of the study are minimal. The course has been offered only a few semesters, so there may be issues with follow-up project requests that could present in the future. The course is only offered in one school. Additional locations would add more variety to the project and might add more learning opportunities. Since this is a case study, issues of reliability and validity are not reported. However, if the program is duplicated and enough data becomes available, then possible quantitative analysis may be possible.

The implications of this study are positive for any school of business that desires to implement a similar program. This unique course offers students an alternative to the typical book-based entrepreneurship courses. It also would appeal to students who are interested in service-learning, or those who may need the volunteer hours for a graduation requirement. We

see the critical thinking component as an added benefit that will challenge students to think on a higher level, while hopefully enjoying the collaborative nature of the course in the process. The business school that sponsors this course will accrue benefits with local business people through networking and relationships that may lead to student internships or guest speakers. The university could also receive positive publicity if newspapers, magazines or television stations cover the story of the students working with local organizations to solve important issues.

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TRAINING STUDENTS FOR ENTREPRENEURIAL ACTIVITIES: LESSONS FROM A SOCIAL VENTURE PLAN COMPETITION

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ABSTRACT

This research examines the attitudes towards entrepreneurship by a sample of 65 students and alumni who participated in a Social Venture Plan Competition (SVPC) hosted by a business school at a university in the western United States. The competition seeks to encourage students to think of creative ways of using business to create good in the world. Students and alumni who had participated in the SVPC were contacted using an online questionnaire and asked to elaborate on their reasons for participating in the competition, what they learned from the competition, and their willingness to consider social ventures or other entrepreneurial activities as a way to enact positive change in the world. Survey respondents were also asked to complete a scale of proactivity to measure the extent to which they possess the personality characteristics that are associated with a strong likelihood of pursuing entrepreneurial activities. The overall sample mean for the proactivity scale for the students who had participated in the SVPC was substantially higher than the proactivity score of the sample used by Crant (1996) to measure the entrepreneurial intentions of undergraduate and MBA students at a Midwestern university. As the proactivity scale was administered after the SVPC, it is not possible to know if the sample for our study were more proactive than Crant's (1996) sample prior to participating in the competition, or if the higher proactivity ratings were due to their participation in the social venture competition. Follow up questions regarding the SVPC competition revealed that participants' desire to be involved in future entrepreneurial activities was higher than their desire to participate in future social ventures.

INTRODUCTION

The Association to Advance Collegiate Schools of Business (AACSB) regards innovation as an essential part of finding solutions to global problems and providing value for businesses and consumers in the United States and around the globe. Although entrepreneurship is not synonymous with innovation, it provides the tools needed for bringing innovative ideas to

market. The need for promoting entrepreneurship in business schools appears to have been accepted by many business school deans (Hazeldine & Miles, 2007). Moreover, interest for entrepreneurship among students has grown in recent years. A study by the Kauffman Foundation documented that interest in starting one's own business peaked in the 1980s, dropped in the 1990s, and has subsequently grown again (Rocca & Pruitt, 2009). Additionally, there is anecdotal evidence of an increased in entrepreneurship in many universities such as Michigan State (Cassella, 2011), Georgetown (Newman, 2012), and Harvard (Massari, 2012).

In the last fifteen years, there has also been increasing interest in a special type of entrepreneurship; developing businesses for the common good. "Doing good" has become a rallying cry for many students, consumers, and businesses. Developing business ventures for the common good has received so much attention that the whole November 2010 issue of US News & World Report was devoted to this topic. Reflecting the same interest in "doing good," the Aspen Institute has published a guide to the top 150 MBA programs around the world that have curricula focusing on the social, ethical, and environmental issues (Aspen Institute, 2010). Within this broader societal emphasis to making a difference a new type of organization has been created to provide aid in areas where traditional non-profits or government supported organizations have had limited success. Social enterprises, also called social ventures, aim to provide needed services for a variety of social and environmental problems in a new way. While the traditional nonprofit model involves raising funds from charitable donations made by individuals, businesses, foundations, and governmental organizations, social entrepreneurs use business skills and innovative technologies to aid social and environmental causes (CASE, 2008). By thinking about new ways to approach the world's problems, social entrepreneurs seek to become self-sustaining and not subject to changes in the economic environment that impact nonprofit organizations.

For this study, we contacted previous years' contestants of a university social venture competition to determine their level of interest in continuing work on their social venture plan, as well as find out if they have plans for other entrepreneurial ventures. Social venture competition participants were asked to complete an online survey that focused on the reasons for entering a social venture competition, their assessment of the potential success of their social entrepreneurship plan, their future plans for pursuing social ventures and other entrepreneurial activities, as well as dimensions of their personality related to proactivity. The proactive personality scale was developed by Bateman and Crant (1993) and includes the dimensions identified by Martin and Osberg (2007) as essential for those pursuing entrepreneurial ventures. The proactive personality is characterized by a willingness to identify opportunities in the environment, a desire for action, the enjoyment of resolving challenges, and persistence. This research measures student proactivity and examines student attitudes towards entrepreneurship after having been involved in a Social Venture Plan Competition (SVPC) sponsored by a university.

THE NATURE OF SOCIAL ENTREPRENEURSHIP

The United States has always been a nation where charity and volunteerism are very important. Currently, the number of people who volunteer to make a difference makes up 26.8 percent of the population, about 63.4 million people (Bureau of Labor Statistics, 2010). What is new, however, is the realization that older models of doing good, need to be modified to utilize new technologies and novel ways of thinking. Social entrepreneurs draw inspiration from innovators who have made significant impact on communities around the world without needing a constant supply of donated funds. A well known example of social entrepreneur is Muhammad Yunus. Yunus' Grameen Bank in Bangladesh has provided loans to 7.34 million people who did not have access to other forms of capital to start a business. Interestingly, the vast majority of loans made by Grameen Bank have been repaid, though some loans have had long repayment periods. No collateral is required to get a loan from Grameen Bank as many loans gave been given to the poorest of the poor, including beggars. Muhammad Yunus received the Nobel prize in 2006 for his efforts at alleviating poverty.

The need to find alternative sources of capital for non-profit organizations has become more urgent after the onset of the 2007 recession. After a period of growth in philanthropic giving from 1996 to 2006, charitable donations to non-profit organizations in the United States saw a decline from about $315 billion in 2008 to about $304 billion in 2009, to 286.91 billion in 2010 and an estimated $298.42 billion in 2011 (Center on Philanthropy News, 2012). This decline in giving was attributed to the effects of the recession as individuals and corporations attempted to reduce spending in all areas. As social enterprises do not exclusively rely on donations for operating funds, they have become an important avenue for providing help to areas where there is need of assistance.

There is disagreement, however, as to the exact meaning of social entrepreneurship. Hockerts (2006) classified social entrepreneurships into three categories. One category of social entrepreneurships consists of cooperatives with a social purpose such KickStart, an organization that markets low priced tools to local entrepreneurs in Africa. By December 2010, Kickstart had facilitated the creation of 104,600 new businesses in Africa resulting in $105 million a year in new profits and wages for these businesses (Kickstart, 2010). Another type of a social venture is a merchandising arm of an existing non-profit organization. The World Wildlife Fund can be categorized as such a social venture because the profits from licensed toys benefit this noon-profit organization. The third type of social venture is a for-profit business with a social purpose. A good example is Newman's Own, a for-profit company, that has donated over $300 million, all of its profits, to charities since its founding in 1982. Tom's Shoes, also a for-profit company, gives a pair of shoes to a child in need for every pair sold. The company was founded in 2006 by Blake Mycoskie.

For-profits and social enterprises both earn revenues. According to Alter (2006), the difference between the two is how the excess revenues are used. Unlike traditional for-profit

businesses, social enterprises reinvest all their surplus revenues into their businesses or the social issues they are addressing, and do not return the profits to shareholders or owners. The central focus of social enterprises is its mission, a core effort that concentrates on redressing a social problem. Earning revenues and making a profit sustains social enterprises and allows them to keep working on the social issue that is the core of their purpose. In short social enterprises are in business to "create good" by providing funds and resources for social and environmental problems.

However, in spite of the growing enthusiasm in the field of social entrepreneurship, there are concerns that social enterprises often do not produce the desired results. Strom (2010), writing for The New York Times, provides numerous examples where social ventures that initially raised substantial capital to provide services around the world collapsed because they were unable to generate the funds needed. Other high profile social ventures like the Pura Vida Coffee Company were taken over and converted into for profit organizations. In 2007, Casselman writing for The Wall Street Journal had raised similar concerns about nonprofits that tried to generate profits through commercial projects with mixed results. It is likely that individuals and organizations that move into the social enterprise arena without an understanding of the business function of entrepreneurship may have to overcome significant obstacles. So, while there are several proponents of the view that social entrepreneurships represent a different area of knowledge than traditional training for entrepreneurs within the discipline of business administration, others believe that social entrepreneurship is fundamentally entrepreneurship. So, rather than training students to become social entrepreneurs, it may be more important to first train them to develop traits that have been shown to be predictive of entrepreneurial success.

UNIVERSITY ENCOURAGEMENT OF SOCIAL ENTREPRENEURSHIP

In order to foster the development of social entrepreneurs, several universities around the world are sponsoring social venture competitions whereby groups of students develop a business plan for a proposed social venture and winners are rewarded through seed capital to start their social enterprise. The Global Social Venture Competition (GSVC) is hosted by the business school of UC Berkeley, in partnership with Columbia University, the London Business School, the Indian Business School, Thammasat University in Thailand, and ESSEC Business School in France. GSVC's outreach partners in the USA, Korea, Italy, and China ensure the truly global nature of this competition. GSVP provides $45,000 in prize money each year (over a quarter of a million dollars since the inception of competition in 1999). The GSVC website claims that close to 25% of past competition entrants are now operating companies, though it is unclear whether they are operating social ventures. A sample of business schools accredited by the Association to Advance Collegiate Schools of Business (AACSB) found that 17 percent of these schools offer courses in social entrepreneurship, while 55 percent encourage their students to participate in social ventures (Schlee, Curren, & Harich, 2009).

After unsuccessful attempts to engage our students in entrepreneurial efforts, the Social Venture Plan Competition (SVPC) was founded at our university in 2007 as a means of introducing our students to business basics and entrepreneurship by drawing on their passion for service to others. SVPC allows our students to consider how their interest in social issues can be addressed through a social enterprise, in a way that financially sustains their social effort. Over half of the students who participate in the competition are not business majors. In the first two years sixteen teams competed in SVPC. But, interest in the SVPC has quadrupled in subsequent years. Student teams from other universities have also chosen to participate in the SVPC competition.

PERSONALITY CHARACTERISTICS OF SOCIAL ENTREPRENEURS

Just as there is no consensus on the characteristics of social ventures, there appears to be no consensus as to the type of person who becomes a social entrepreneur. A social entrepreneur is thought to be motivated by a desire to change the world, while a business entrepreneur is motivated by profit. However, researchers who understand the motivations of business entrepreneurs know that earning income is often not their primary motivation. Entrepreneurship presents greater challenges than working for a business, and if someone who solely interested in earning money, he or she would seek to enter into a high paying occupation within a business. Similarly, the motivation of social entrepreneurs is not simply to make a difference. Those wishing to make a difference will find it much easier to help those in need within the parameters of an existing nonprofit organization. An entrepreneur is motivated by creativity and challenge.

Martin and Osberg (2007) elaborate on the importance of the entrepreneurial personality in the success of social entrepreneurships. They write, "To understand what differentiates the two sets of entrepreneurs from one another, it is important to dispel the notion that the difference can be ascribed simply to motivation – with entrepreneurs spurred on by money and social entrepreneurs driven by altruism. The truth is that entrepreneurs are rarely motivated by the prospect of financial gain, because the odds of making lots of money are clearly stacked against them. Instead, both the entrepreneur and the social entrepreneur are strongly motivated by the opportunity they identify, pursuing that vision relentlessly, and deriving considerable psychic reward from the process of realizing their ideas" (Martin & Osberg, 2007:34). After an examination of the personality traits of successful entrepreneurs and social entrepreneurs such as Steve Jobs and Muhammad Yunus, they identified the following essential personality traits for entrepreneurial success: motivation for action, creativity, the propensity for direct action, courage, and fortitude or perseverance. Without these traits, the desire to "do good" does not become an effective social venture.

Thompson, Alvy, and Lees (2000) posit that social entrepreneurs have similar personality traits as business entrepreneurs, but their focus is helping others. As such, social entrepreneurs must identify opportunities to satisfy social needs that are currently not met and successfully

bring together the necessary resources to satisfy these needs. Social entrepreneurs must be willing to relentlessly pursue new opportunities and act boldly (Dees, 2001). Barendsen and Gardner (2004) similarly identify the need for both having a vision, having the organization skills, but also the perseverance to continue working on a project "in the face of odds."

Bateman and Crant (1993) identified a set of personality traits that predispose a person to directly alter their environment. They referred these characteristics as the "proactive personality." Proactivity is different than empathy. A person may demonstrate empathy if he or she cares for others and sympathizes with others' plight. However, empathy by itself is not enough for an individual to persist in effecting change in the environment. Bateman and Crant (1993) developed a 17 item scale of proactivity that has been subsequently used to predict success among real estate agents (Crant, 1995), as well as the entrepreneurial intentions of students (Crant, 1996), entrepreneurial behavior among presidents of small companies (Becherer & Maurer, 1999), and was predictive of small firm innovation (Kickul and Gundry, 2008).

RESEARCH QUESTIONS

This research in students' attitudes, personality, and future plans for social ventures and other entrepreneurial activities is exploratory. While there have been several research studies on the characteristics of entrepreneurs, no research currently exists on the characteristics and future plans of social venture competition participants.

Our first research question focuses on the motives of students who choose to participate in social venture competition. It is generally assumed that students who participate in social venture competitions do so in order to find a way to benefit the world. In our survey, we asked students specific questions related to their motives for participating in a social venture competition such as: participation was a requirement either for a specific class or for graduating with a business degree, it was an opportunity to help those in need, it was an opportunity to learn how to put together a business plan, or they participated for social reasons.

R1 What are the reasons for participating in a social venture competition?

Our second research question focuses on the participants' assessment social ventures as a means of "doing good" or solving the world's problems. After participating in the competition, are students be more or less confident about the effectiveness of social ventures?

R2 What are students' assessments of social ventures as a means of solving social or environmental problems?

The third research question examines student scores in the proactivity scale developed by Bateman and Crant (1993).

R3 *How do business majors and non-business majors compare in terms of proactivity?*

The fourth research question examines whether students want to continue working on a social venture after end of the competition.

R4 *Are students interested in participating in other social ventures after the end of the competition?*

The fifth research question examines the students' entrepreneurial intentions.

R5 *Are students interested in participating in other entrepreneurial activities after the end of the competition?*

THE SAMPLE

All past participants in SVPC in the previous four years were contacted by email using their university email addresses. As most SVPC participants had already graduated from the university, it is not known how many were continuing to check their email addresses or were forwarding their university email to a new email address.

A total of 65 prior SVPC participants responded to the email invitation and completed the online survey. Sixty-four percent of the respondents were female and 36 percent were male. Forty percent were still students at the university, while 60 percent had already graduated. While they were students, over half (54%) were not business majors (some were business minors), with the remainder divided among the different business concentrations. Over half (51%) of the individuals in the sample indicated they worked full time, five percent were not in the labor force, with the remainder reporting that they worked part time (37%), or that they had an internship (8%). Of those who were employed, about a quarter (24%) reported they worked in business services (accounting, marketing, etc.), 15 percent worked for non-profit organizations (excluding churches), 10 percent worked in other services, and the remainder were divided among a variety of employment categories.

FINDINGS

RQ 1: Respondent Reasons for Participating in the Social Venture Competition

Our first research question examines the reasons why students chose to participate in the social venture competition. To our surprise, only 37 percent of respondents indicated that entering the competition was very important to them because "it was an opportunity to think of

ways to help those in need," as compared to 72 percent who indicated that learning to put a business plan together was very important to them (Table 1). In addition, many respondents indicated that they took part in SVPC either because it was a class requirement (for students enrolled in the Social Enterprise course) or because it was a signature experience. While SVPC is one of the signature experiences the school of business, there are several other signature experiences that are available for business majors. However, Global Development majors (that's an interdisciplinary program) are all required to participate in the social venture competition.

Table 1: Reasons for Participating in the Social Venture Competition

	Very important	Somewhat important	Not important	N/A
It was a class requirement.	28 (43 %)	7 (11 %)	16 (25 %)	14 (22 %)
It is an SBE signature experience required for graduation.	13 (20 %)	4 (6 %)	24 (37 %)	24 (37 %)
It was an opportunity to think of ways to help those in need.	24 (37 %)	30 (46 %)	10 (15 %)	1 (2 %)
It was an opportunity to learn how to put together a business plan.	47 (72 %)	12 (18 %)	6 (9 %)	0 (0 %)
I was invited to participate by my friends.	7 (11 %)	13 (20 %)	23 (35 %)	22 (34 %)

R2: Participants' Views of Social Ventures as a Means of Solving Social and Environmental Problems.

Respondents were asked to indicate whether they strongly disagreed, somewhat disagreed, neither agreed nor disagreed, somewhat agreed, or strongly agreed with eight statements that assessed the effects of participating in the social venture competition (Table 2). Respondents felt that participating in the social venture competition helped them learn more about business planning than what they had learned in their other classes (64% strongly agreed) and most either strongly agreed (42%) or somewhat agreed (42%) with the statement, "as a result of participating in the social venture competition, I am more likely to view business as one of the principal ways that can be used to solve serious social problems." Students were ambivalent about the effectiveness of social ventures as an essential means of solving the world's problems (27% strongly agreed while 58% somewhat agreed), but about 60 percent either somewhat disagreed (41%) or strongly disagreed (19%) with the statement that social ventures can only make a small dent in solving the world's problems. Respondents also seemed to be guardedly optimistic about finding solutions to the world's problems with 25% strongly agreeing with the statement and 46 percent indicating that they are somewhat optimistic. Thus, it appears that participating in a social venture provided a greater personal benefit to participants (understanding

how to put together a business plan and sharpening their leadership skills) than a social benefit. While this finding may be discouraging at first sight, many students indicated that they continue being interested in changing the world for the better, even though they perceived flaws in their initial social venture plan.

Table 2: Respondents' Assessment of the Effects of the Social Venture Competition

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
As a result of participating in the social venture plan competition, I am more likely to view business as one of the principal ways that can be used to solve serious social problems.	0 (0 %)	1 (2 %)	9 (14 %)	27 (42 %)	27 (42 %)
Social ventures are essential to solving the world's problems.	0 (0 %)	2 (3 %)	8 (12 %)	37 (58 %)	17 (27 %)
Social ventures can only make a small dent in solving the world's problems.	12 (19 %)	26 (41 %)	14 (22 %)	10 (16 %)	2 (3 %)
I have become a more caring person as a result of participating in the social venture plan competition.	11 (17 %)	15 (23 %)	20 (31 %)	15 (23 %)	3 (5 %)
After participating in the social venture competition, I am more likely to think of creative/innovated solutions to world problems.	1 (2 %)	4 (6 %)	13 (21 %)	29 (46 %)	16 (25 %)
After participating in the social venture competition, I am optimistic that we can find solutions to world problems.	1 (2 %)	3 (5 %)	18 (28 %)	27 (42 %)	15 (23 %)
I learned more about business planning through the social venture competition than through most of my regular courses.	2 (3 %)	7 (11 %)	4 (6 %)	10 (16 %)	41 (64 %)
Participating in the social venture competition has sharpened my leadership skills.	0 (0 %)	2 (3 %)	14 (22 %)	26 (41 %)	22 (34 %)

RQ3: Differences in Proactivity Between Business Majors and Non-Business Majors

As the psychological component of proactivity has been identified as a key element in one's desire to pursue entrepreneurial activities as well as social ventures, respondents were also asked to complete the 17 item proactivity scale that has been developed by Bateman and Crant (1993). The scale utilizes seven answer points from Strongly Disagree to Strongly Agree. Most statements making up the scale express a positive desire for entrepreneurial activities such as "I feel driven to make a difference in my community, and maybe the world, "Wherever I have been, I have been a powerful force for constructive change," "No matter what the odds, if I believe in something I will make it happen," and "I am great at turning problems into

opportunities." In such statements, a score of 1 would indicate the lowest rating on proactivity and a score of 7 would indicate the highest rating on proactivity. One statement in scale was expressed in the opposite direction, "I tend to let others take the initiative to start new projects." Summary scores on each item as well as on the proactivity scale allowed to compare the entrepreneurial tendencies of participants in SVPC as compared to groups of students in other universities, as well as between groups of SVPC participants.

Table 3 presents the average scores (means) for business students and non-business students who participated in the social venture plan competition. Overall, SVPC participants scored fairly highly in almost all dimensions of proactivity. The overall sample mean for the proactivity scale is 94.05. This score is substantially higher than the proactivity score of 88.10 for the sample used by Crant (1996) to measure the entrepreneurial intentions of undergraduate and MBA students at a Midwestern university. Only responses to the statement, "I tend to let others take the initiative to start new projects," indicated a low rating for a component of proactivity. The sample mean of 3.23 registers on the agree side of scale where 1 stood for strongly disagree and 7 stood for strongly agree. Surprisingly, there were few statistically significant differences between the business and non-business majors who participated in the SVPC. The greatest difference between the two groups was in the ability to see opportunities. Business students received an average score of 5.88 on the scale from 1-7, compared to the score of 5.1 for non-business majors. However, non-business majors appear to be slightly more motivated (driven) "to make a difference in my community, and maybe the world" (business student score of 6.04 vs. non-business student score of 6.35).

Table 3: Proactivity Scale Scores for Business Students and Non-Business Students

Proactivity Scale Statements	Business Student Means (scale 1 = SD, 7=SA)	Non-Business Student Means (scale 1 = SD, 7=SA)	Sample Mean (scale 1 = SD, 7=SA)	Significance Level
I feel driven to make a difference in my community, and maybe the world.	6.04	6.35	6.18	.072
I tend to let others take the initiative to start new projects.*	3.40	3.01	3.23	.293
I am constantly on the lookout for new ways to improve my life.	6.28	5.85	6.09	.114
Wherever I have been, I have been a powerful force for constructive change.	5.08	4.96	5.03	.691
I enjoy facing and overcoming obstacles to my ideas.	5.56	5.40	5.49	.551
Nothing is more exciting than seeing my ideas turn into reality.	6.04	5.80	5.93	.434
If I see something I don't like, I fix it.	5.84	5.74	5.80	.765
No matter what the odds, if I believe in something I will make it happen.	5.56	5.60	5.58	.906
I love being a champion for my ideas, even against others' opposition.	5.56	5.05	5.33	.138
I excel at identifying opportunities.	5.88	5.10	5.53	.016
I am always looking for better ways to do things.	6.32	6.00	6.18	.207

Table 3: Proactivity Scale Scores for Business Students and Non-Business Students				
Proactivity Scale Statements	Business Student Means (scale 1 = SD, 7=SA)	Non-Business Student Means (scale 1 = SD, 7=SA)	Sample Mean (scale 1 = SD, 7=SA)	Significance Level
If I believe in an idea, no obstacle will prevent me from making it happen.	5.24	5.30	5.27	.860
I love to challenge the status quo.	5.00	5.50	5.22	.155
When I have a problem, I tackle it head-on.	5.84	5.55	5.71	.328
I am great at turning problems into opportunities.	5.13	5.23	5.18	.742
I can spot a good opportunity long before others can.	4.88	4.51	4.72	.261
If I see someone in trouble, I help out in any way I can.	5.91	6.17	6.02	.258
Proactivity Scale Score	94.75	93.18	94.05	.600

R4: Are SVPC Participants Interested in Continuing to Work on Their Social Venture Plan?

When respondents were asked if they continued to work on their social venture plan after the end of the competition, only 17.5 percent responded affirmatively. Similarly, when they were asked if they thought that their social venture plan could become a reality someday either by themselves, or by their group, or by someone else, only 19 percent believed that it was very likely that their plan become a reality someday, while 44 percent thought that it was somewhat likely, and 38 percent thought that it was not likely. Sixty respondents gave detailed responses explaining the reasons for their answer. About three quarters of these responses described the lack of funds or lack of time. Besides the need for more money to continue their work, 73 percent wished they had more industry connections, while close to two thirds (64%) wished they had more free time and more supportive partners. Other responses focused on the lack of control over the project as it was a group project and it was not up to the individual respondent to go forth with the idea (ex. "It was a workable plan that we thought through well. None of my group members intend to move forward with it, though, since we have other interests and plans," or "group members not interested in pursuing it." Most interesting were some responses that indicated that they realized the flaws with their social venture idea, but were excited about the possibility of other entrepreneurial endeavors (ex. "I'm not sure I would start the same venture I competed with – in fact I'm 100% sure I wouldn't – but the competition/preparation itself was invaluable to the experience of starting a business, …when I look back at SVP I think it's a great stepping stone to more complex competitions. With my plan, and passion at that time, had I had more financial resources I truly believe it could become a reality (in fact today – there are actual successful venture like mine in other cities."

When respondents were asked if they were interested in participating in other social ventures in the future a different set of responses emerged. The respondents who were interested in working in a social venture at a later time in their lives mentioned the unique ability of social

ventures to combine business skills with a desire to improve the lives of others (ex. "I would be interested because it more clearly aligns one's work with the greater goal of serving people. This can be achieved through most jobs, but is sometimes difficult to envision," "I love the idea of having a successful business that not only benefits those directly related to it, but also gives back to outside people and sources." or "It's the perfect way of combining business principles with the desire to help people and do something "good" for the world.") Those who were not interested in pursuing a social venture in the future generally focused on their desire for less risk and more structure (ex. "I am not really a business person, as I came to realize in this competition. It was a lot of hard work and I lacked a lot of the knowledge to make a business plan. I think my ideas were great, but I definitely depended on my business-major partner on a lot of the business end," "I found out that I prefer stable companies and am not a huge fan of living the stressful life of an entrepreneur," or "It is not my passion. Although I believe it had a strong and solid foundation, I would like my time and efforts to be spent helping others in different ways.")

R5: Student Interest in Participating in Entrepreneurial Activities in the Future

Remarkably, students who participated in SVPC were more interested in participating in an entrepreneurial activity than in a social venture in the future. More than half (56%) of the sample indicated they were very interested in participating in future entrepreneurial activities, and another 32 percent said they were somewhat interested in participating in an entrepreneurial activity. Only 12 percent were uninterested in future entrepreneurial activities. Those who were interested in entrepreneurial activities were asked to explain why they were interested. Many of the responses dealt with the ability to exercise their creativity or to be innovative (39% of the responses). SVPC participants wrote, "There is a lot of creativity involved in entrepreneurship and I love the freedom of being able to imagine another way of doing something," "It is so much more fun to create new and innovative ideas and ventures rather than to join the humdrum of corporate America," and "Entrepreneurship gives the opportunity to bring a new product or a new way of delivering a product that betters the consumers." Other responses dealt with the desire for autonomy/being your own boss (25%), the excitement of the business challenge (17%), the desire for monetary gain (11%), while some indicated that they had an innate abilities or desire for entrepreneurship (ex. "It's just in my genes," or "I've always loved entrepreneurship. I sold ... when I was 7." Interestingly, though the SVPC was focused on social or environmental causes, several SVCP participants mentioned that people benefit from other new businesses, not just social ventures (ex. "Would love to own my own business someday. Positive impact on local economy, if successful." Those who were not interested in future entrepreneurial activities seemed were mostly concerned about the element of risk. Some of the responses of those who were not interested included, "For some reason, the thought of entrepreneurial activity is intimidating to me," "It's daunting to start out as an entrepreneur, and I don't think have that adventurous spirit," "Because it also would be scary to start a business

because it could fail," and "Close to 20% of businesses actually make it in the first 5 years, or some crazy statistic."

DISCUSSION

In order to properly interpret the findings from this survey of past SVPC participants, it is important to understand that the primary goal of the SPVC is to engage students to use business skills in the design of innovative businesses or organizations that have a social and/or environmental benefit. As most of the projects students complete while in college, the goal is to increase knowledge, understanding, and creative problem solving rather than the implementation of specific plans. It would be unwise for most students to try to implement their very first social venture plan. By having independent judges review students' social venture plans, students are presented with a realistic assessment of the obstacles they may encounter if they were to implement their plan. Many students realize that although their first social venture plan was flawed, they can create new ventures in the future.

The examination of responses given by business and non-business majors leads us to a few further insights. Non-business majors who enter SVPC appear to be highly motivated to change the world, but they are more easily discouraged by organizational and financial obstacles in the implementation of social ventures than business students. In contrast, business majors appear to enjoy the challenges of business competition and appear to be less intimidated by organizational and financial obstacles. Ultimately, a mixing of business and non-business majors in the SVPC may generate the ideal mix of compassion and drive as each of these groups bring different strengths to the design and implementation of social ventures.

Our findings also point to the need for providing additional resources for student groups who are interested in bringing their social ventures to reality. Providing access to legal experts and providing information on potential funding sources may allow some of the groups that felt that their social ventures plan was a great idea to continue working on their project after graduation. SVPC organizers are planning to introduce additional information on sources of information and resources to groups that are interested in pursuing their social venture plans further.

It is also noteworthy that the students who participated in SVPC also indicated a very strong interest in getting involved in future entrepreneurial activities. Because our surveys were completed after students and alumni had participated in SVPC, we do not know if so many of these students had a strong interest in entrepreneurship before participating in the social venture competition, or if that is something that grew out of participating in the social venture competition. We hope that future studies will measure the entrepreneurial intentions of students prior to participating in social venture competitions as well as after the competition. Nevertheless, the results of this study suggest that involvement in social venture competitions may generate new groups of young entrepreneurs.

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