Educating the Next Generation of Young Entrepreneurs

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ABSTRACT

A variety of factors have aligned that make it possible for recent graduates to start their own high-tech enterprises, provided that their education equips them with the proper skills and motivation. This paper illustrates the opportunities first by reviewing seminal businesses started by young entrepreneurs, then by reviewing the skills and a potential course of education known as Virtual Enterprise, and finally by touching upon the emerging opportunities afforded by progress in fields such as gadget-app development and biotech.

INTRODUCTION

There is currently an increased emphasis on stimulating innovation and supporting future entrepreneurs in the United States, especially in areas of emerging technologies. The American Recovery and Reinvestment Act of 2009 provides incentives such as tax-breaks for small businesses and increased funding for research and science. Recognizing the critical need for technological innovation and advances, U.S. corporations are also investing in Science, Technology, Engineering, and Math (STEM) education. It is necessary to provide the proper foundation for the next generation of entrepreneurs to enable them to transition their innovative ideas into successful products and business ventures. This requires a renewed focus on education in the STEM areas, as well as promoting multidiscipline cooperation and embedding business and entrepreneurial skills into curricula. The U.S. Bureau of Labor Statistics projects that five of the fifteen fastest-growing occupations in 2006-2016 are computer or IT related, which indicates that these skills will be of increasing importance (U.S. Dept. of Labor, 2007). Students who are able to apply their computer or engineering knowledge to other fields will have a competitive advantage.

Emerging technologies present opportunities for entrepreneurs to contribute to the solutions for many existing problems and to the fulfillment of unmet needs. Many future firms will require innovation that comes from emerging or converging technologies. Large existing firms can also utilize entrepreneurial activities for advancement in various technologies, such as use of technology to monitor and conserve energy use. Entrepreneurial skills are also of value to students who may work in a large corporation. Entrepreneurial ventures within an established corporate framework have been successful in companies such as 3-M, IBM, Hewlett-Packard, and General Electric (Kuratko, 1993). Intrapreneurship is the creation of new products within a large organization using existing employees (Chang 2000).

Currently, some of the most innovative companies include those in the biotechnology, pharmatech, alternative energy, and green technology industries (Fast Company, 2009). There have been several promising advances in the field of bioinformatics such as high-throughput sequencing for genetic analysis and personal genomics. The field of health information technology is also growing in response to the need for electronic medical
records and personal health records. Many IT startups will face the challenge of implementing new ideas which involve collaboration with other industries.

Today’s entrepreneurs do not necessarily need to develop or manufacture a product. Many entrepreneurial ventures of the past two decades involve computers, the Internet, and an exploitation of opportunities afforded by technological advances – we note that today’s entrepreneurs must have a strong technological background. Inventions may present a new methodology of finding, organizing, conveying, or transferring information, or bringing a product to market. Such techniques can have a huge impact on how commerce/business, education, society, medicine, and life in general are conducted. Household names that are representative examples are Amazon, eBay and Google – each impressive, novel, pervasive, with a proven track record of success, and dominant in its own domain.

FROM CLASSROOM TO VENTURE: SEMINAL IT AND BIOTECH ENTERPRISES

Some of the most successful social networking sites originated as student start-ups. Sites such as Facebook and Twitter have revolutionized the way individuals and organizations inter-communicate. Mark Zuckerberg began Facebook while a college student at Harvard University (McGirt 2007). Though it began as a social networking site for college students, Facebook is now utilized by a broad base of users including government agency employees and Fortune 500 companies. Twitter is a social networking and micro-blogging service that allows users to post and track other users’ short text updates. Jack Dorsey, then college student as well, created Twitter by taking advantage of improvements in mobile computing to provide a novel way of communicating and conveying a person’s updates and activities to one another (Lynch 2009).

There have been numerous successful Internet companies have emerged out of research by graduate students. A primary example is that of Google and founders Sergey Brin and Larry Page. Rarely has a graduate student research project been such a viable tool, with broad impact on society and the economy. Brin and Page, as Ph.D. students at Stanford University, produced a seminal paper exploiting their joint interest in data-mining entitled “The anatomy of a large-scale hypertextual Web search engine” in 1998 (Brin and Page 1998). By then search engines were already capable of gathering vast amounts of information, but the challenge was to rank the web pages that search engines found in a more meaningful way. The main difference between Brin and Page’s search engine and the others of that time was that their large scale search engine would rank web pages based on how well they were linked (cited) by others. Google dominates web searches as well as the market for advertising on websites. The company continues to be one of the most innovative and successful ventures of the world wide web.

Many biotech companies have also been incubated from research conducted at universities around the world. Advancements in the thriving area of biotechnology are inspiring to entrepreneurs, producing companies such as OrthoMimetics, which was started by graduate student Andrew Lynn (Waltz 2005). Lynn, along with other students and faculty at the University of Cambridge and the Massachusetts Institute of Technology, worked to develop a material that can be incorporated into devices for cartilage, meniscus, ligament and tendon repair. This material, called chondromimetic, is a porous, resorbable implant, which promotes regenerative repair of damaged joint surfaces and bony defects caused by degenerative diseases. Orthomimetics is a company that exemplifies a successful merging between two technologies - in this case bone and soft tissue repair. The company currently designs, develops and manufactures cutting-edge treatments for the repair of damaged joints following sports injuries and other orthopedic trauma.

ENTREPRENEURIAL EDUCATION AND SKILLS

Virtual Enterprise (VE) is active-learning pedagogy that can exist as a free-standing course or be embedded within a content course of any discipline – not merely business courses. The premise is that students form and run a simulated business in the classroom, through which they put their acquired interdisciplinary knowledge and skills into practical use. VE engages and motivates students because they are able to clearly understand the connection
between what they’ve learned and how the “real world” makes use of it. It also obliges students to actively participate in their own learning through projects, group work, and discussion (Schulman 2004).

In a free-standing course, VE students spend an entire semester running all aspects of the business. Student teams are tasked with the conceptualization and administration of a realistic project within the confines of a classroom. Students interact locally as divisions of one enterprise facilitated by a trained instructor and support materials. Each classroom can connect with an international community of simulated firms (the IVE Partner Network) through a virtual economy (the IVE MarketMaker), an articulated series of events, and web-based community tools (IVE 2009).

An exemplar of a VE engagement embedded within a larger course is its use in an introductory college skills course at CUNY’s Kingsborough Community College. When learning about proper resume writing and interview techniques, students live through the process instead of being told about it. The class forms a job-recruitment firm which drafts virtual employment ads and solicits their colleagues to apply for these positions. Students interview their peers and make hiring decisions. This allows all students to reflect on the successes and mistakes made.

The embedded version of VE can be used in a multitude of content courses. It works best with topics that are directly applicable to the career world, and especially when the learning involves group work, interaction, and hands-on tasks. In an English literature and composition course, for example, the students could be employees of a literary magazine. As a company, they would have to read and report on a genre of works, keeping in mind that their audience expects high-quality, peer-edited, and original reporting. The semester would culminate with a group assembling all the writing into a deliverable magazine to be presented to the course’s instructor and even the College community.

Recent funding from the National Science Foundation\(^1\) has allowed for extending the Virtual Enterprise program to the information technology (IT) and biotechnology (BT) fields to address the soft- and entrepreneurial-skill needs of technicians (Schulman 2009). The project is actively developing three courses:

1. **ve²-Careers** is for entry-level IT students. The primary goal is to motivate students to pursue an IT career, and to give them an idea of the breadth of jobs in the industry and the underlying education and skills needed to achieve their desired position. In the engagement, the students form the staff of an IT department within an existing firm. The hierarchy of positions would be predetermined; the students would research those positions, apply for one and solve basic predetermined problems within that capacity.

2. **ve²-Capstone** is meant for the graduating IT student. The primary goal is to put into practice their IT skills, while developing an entrepreneurial mindset. Here, the students would create an IT consultancy centered around a product or service that is IT related. While evolving the technical aspects of the product/service, they would also handle the marketing, accounting and other facets of the business. Business structure would revolve around different departments (marketing, R&D, etc.) and would not be preset for the students. The instructor could predetermine the product or IT-subfield, if desired, to move the class in a particular direction; it's also possible to structure the business as a "new product team" within an existing enterprise.

3. **ve²-Capstone** is the Bio-Technology Virtual Enterprise. Its goals are similar to that of ve²-Capstone.

**EMERGING OPPORTUNITIES FOR YOUNG ENTREPRENEURS**

Biotech and gadget-app development (the development of small software applications that plug into handheld devices and existing websites) present the two best opportunities for new entrepreneurs. In the fields of IT and biotech, governments, universities and large corporations have already developed the infrastructure to provide the foundation and support for the realization of a new concept or product. Thus one does not need to be entrenched in corporate infrastructure in order to found a successful enterprise. Current undergraduate or graduate students with
an idea can pursue it without access to vast sums of capital. The infrastructure comes in the form of hardware and websites that are open to third-party developers and biotech incubators:

1) IT: Application Programming Interfaces (APIs) have cropped up for Google’s website and phone, Apple’s iPhone, and Facebook. These allow third-party developers to implement an application that supplements an already popular product. It also provides a distribution channel that skips the expense of a factory to burn to disk and package the software.

2) BioTech: Municipalities and universities have put significant resources toward incubators that support start-ups and early stage biotech companies. In the downstate New York area alone, SUNY’s Downstate Biotech Park, Long Island High Technology Incubator at SUNY Stony Brook, and Columbia’s Audubon Business & Technology Center provide the equipment and facilities for start-ups in biotechnology, especially those that improve health care or manufacture biomedical products.

In the early days of computing, plenty of enthusiasts released their own simple games and applications. As processor power and task complexity increased, applications gravitated to being released by large corporate entities. Microsoft has been associated with providing office productivity software, Symantec with solutions to malware, Electronic Arts with games; and while other companies do exist, these companies have significant market share. The high cost of entry to developing large-scale applications, including salaries to develop large amounts of code, then packaging and distributing software has kept smaller players out. With gadget-apps, those small-scale applications designed for integration into existing hardware and websites, there’s been a clear break from the entrenched dominance of corporations and a return to what is reminiscent of the time of enthusiasts. The applications are smaller, filling specific niches, and are distributed entirely electronically.

The prevalence of gadget-apps is in social networks and on cellular telephones. Social networking website Facebook boasts 200 million active users (30 million of whom use the site from a mobile device) with 52,000 independently authored applications (Facebook 2009). Apple’s iPhone™ store recently delivered its one billionth application from its library of over 33,000. Google’s G1 phone runs network-enabled applications on Google’s Android™ platform. HTC’s Touch Pro is one of many phones that run applications on Microsoft’s Windows Mobile platform. Application Programming Interfaces (API) are provided by each of the companies to allow for small, third-party developers to get into the market; in fact, many in the industry welcome developers with open arms, as it helps drive customers toward their core product (website or phone). Many institutions have embraced this by offering gadget-app programming courses; for example National University of Singapore offers Facebook programming in CS3216 (Leong 2009), and Stanford offers iPhone application programming in CS193P (Doll 2009).

Umesh et al evaluate the opportunities for entrepreneurial ventures in emerging technology fields such as ubiquitous computing and information security which are expected to have high growth rates (Umesh 2005). Entrepreneurs with limited resources should focus on services in growing fields rather than development of new technological tools to increase the likelihood of quick revenue. Gadget-app development for ubiquitous computing will continue to be in demand due to the proliferation of wireless devices. Information security is another area of growth which concerns the privacy of data, integrity of software, and secure transmission of data over networks (cyber security). Since businesses rely heavily on the cyber infrastructure for their operations, it is necessary to ensure the security of their data and transactions. Information security will be of increasing importance to the medical and health informatics fields as more information is being stored and transmitted between organizations. In any computing or IT venture, entrepreneurs must design products that are compatible with existing and popular hardware and software - for example those related to security and networking (Umesh 2007).

CONCLUSION

Incorporation of Virtual Enterprise (Information Technology, Bio-Technology, and Computer Engineering) into STEM areas will cultivate an entrepreneurial environment where students gain exposure to and hands on experience with the business skills and components required to set up an IT or other type of technology firm. VE also facilitates collaboration between students of multiple disciplines, such as computer engineering and biology.
VE aims to enhance students’ preparation to work in an IT and/or emerging technology environment and to equip the next generation of entrepreneurs with the skills necessary to turn their innovations into practice. Given the necessary skill set and knowledge of existing infrastructures, opportunities for IT entrepreneurs in fields such as gadget-app development and biotechnology are abundant.

REFERENCES


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