Components of a Comprehensive Engineering Entrepreneurship Program

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1. Introduction

This paper is based on the Hinman Campus Entrepreneurship Opportunities (CEOs) Program at the University of Maryland. A former Dean of Engineering created the original concept for the program, and the benefactor, after whom the program is named, is an engineering alumnus and successful entrepreneur. A committee having strong representation from the business and engineering schools and resident life accomplished the initial planning for the initiative, and the operating program is co-managed by the engineering and business schools. The program was designed to attract undergraduate students with a strong entrepreneurial spirit, to create a sense of community and cooperation among these like-minded students, to impact the way that they think about their careers and destinies and to prepare them to start businesses.

Academic year 2001-2002 is the second year that the program has been operating. In the first year, 65 students were admitted, and in the second year the number grew to 108 students. It is not envisioned that the program will involve a larger number of students, but rather that the admission requirements will continue to be raised so that only students with an exceptional interest and dedication to starting companies and who will contribute to furthering the program will be accepted. Admission is based on GPA and essays discussing reasons the applicant wants to be admitted to the program, the applicant's business ideas, and contributions that the applicant can potentially make to the program.

Although primarily designed for juniors and seniors, some outstanding sophomores are gradually integrated into the program. Academic disciplines of the current class are almost evenly distributed in thirds among engineering, business and all other majors combined, and there is considerable ethnic and gender diversity among the class. Because the first cohort of CEOS are now seniors with a year's experience in the program, more governance is being given to the students, and this is expected to expand in the future.

2. Components of the Program

When the program was planned, the primary program components were envisioned to be a community environment, a seminar series and a series of entrepreneurship courses; however, as the program has evolved, many other important components have been added, primarily because of demand from the students. The components of the comprehensive program that have resulted are listed in Table 1. The program has evolved significantly since its inception, and some of the components were discussed in an earlier paper. [1] Newer components will be emphasized in this paper.

Table I Program Components

Community Environment
Technology Environment
Seminars and Workshops
Mentoring Service
Product Development Opportunities
Technology Opportunities
Entrepreneurship Education
Business Plan Competition
Partnerships
Funding Opportunities
Incubator Opportunities

A. Community Environment

The cornerstone of the CEOs Program is the community environment in which all of the CEOs live together in a special section of a centrally located, on-campus residence hall that the CEOs consider to be their home. The technology available to the students living in the residence hall is discussed in the next section, but there are additional important elements to the community environment beyond the technology. Students interact in informal settings thus facilitating the development of deep relationships beyond business ventures. Students attend activities in this home setting that focus on networking and skill building. Informal weekly sessions are scheduled at the end of the week of classes; i.e., the "Friday at Four" series, and agendas include brainstorming sessions, discussion of program governance as well as opportunities for purely social enjoyment among like-minded students. Thus, this community environment facilitates sharing of ideas, developing camaraderie, and team building.

B. Technology Environment

The CEOs' section of the residence hall has conference rooms and workrooms equipped with copy and fax machines and computers with extensive business and technical software. The technology environment in the CEOs residence hall is more sophisticated than that found in many companies.

One of the program's corporate partners has provided videoconferencing equipment and a wireless communication system that allows the CEOs to connect to the university's high-speed wired data network anytime, anywhere in the residence hall and at designated places on campus as well as voice, data, and video communications capabilities installed on each resident's PC. These capabilities enable the CEOs to conduct professional briefings and consultations with potential partners anywhere in the world from conference rooms located in the residence hall.

C. Seminars and Workshops

CEOs attend weekly seminars and workshops, which constitute a one-credit engineering course. Seminar topics were in three categories: education, resources and experiences. Examples in the education category are business plan writing and intellectual property. Examples in the resources category are a market analysis workshop conducted by the university library staff and a discussion of the on-campus incubator. The experiences category consists of lectures by successful entrepreneurs.

Early in the program, it was recognized that the seminars would also be valuable to students outside of the CEOs program as well as faculty, and these seminars are now open to the campus community, especially engineering graduate students and faculty. This provides opportunities for the CEOs to interact with individuals who, in many cases, have developed technology that can be commercialized.

A workshop of special importance that was conducted at the beginning of the fall semester and is planned as an annual event is the "Boot Camp for Starting Technology Companies". This boot camp consisted of two half-day sessions of lectures and panel discussions by faculty and by representatives of the local business and investment communities. The goal of the boot camp was to provide basic training regarding technology startups. It was attended by the CEOs as well as 60 graduate students and 40 faculty, mostly from engineering. A highlight was a panel discussion about lessons learned from starting technology companies that included the Deans of the Engineering and Business Schools, both of whom have started technology companies.

D. Mentoring Service

The CEOs Program has established a mentoring service for all students across the campus. The service utilizes a database that contains contact and expertise data for volunteer mentors and also has a means of rating the value that specific mentors offer. Additionally, the database has a means of tracking the number of times a specific mentor is contacted so that no mentors are overstressed by multiple requests. An MBA graduate assistant coordinates the mentoring service. Three types of mentoring are provided. The first involves answering specific questions and providing advice, and the graduate assistant and the CEOs program manager provide this service. The second involves issues for which professional advice is needed, and is provided by faculty and by volunteers from law firms, investment organizations and other service providers. The third type of mentoring involves mentors that stay with a team for the time the team is in the CEOs Program and is also provided by faculty and by volunteers from law firms, investment organizations and other service providers.

E. Product Development Opportunities

Often teams need small sums of funds to develop breadboards of potential products or to perform prototyping. The program was successful in obtaining funds from the National Collegiate Inventors and Innovators Alliance (NCIIA) for this purpose. Some examples are as follows:

TRX Systems, Inc. is a seventeen member multidisciplinary team of undergraduate students that is developing intelligent location technology and data management systems for the tracking and recovery of individuals, equipment, and systems. The NCIIA seed fund has provided the company with needed hardware, software, and technical manuals that have brought TRX Systems to the prototype stage of development. The company plans to begin test marketing in the second quarter of 2002.

Articulation Innovations, LLC is a partnership between faculty at the University of Maryland Dental School and two Hinman CEOs. The dentists have developed patented devices for clinical and laboratory procedures in Prosthodontics and related dental specialties and the CEOs have joined the team to improve the engineering of the design and to develop a marketing plan for the product. NCIIA seed funding has provided professional level engineering and business software that is facilitating the team in improving the design and getting the product to market.

F. Technology Opportunities

Some of the CEOs have definite business ideas when they enter the program and develop businesses while in the program. Others would like to be involved in technology startups but lack connections with the technology community. A new component, Technology Opportunities, or TechOps for short, has been added to the CEOs Program. The purpose of TechOps is to network CEOs and other students, primarily in the business disciplines, with graduate students and faculty in engineering and other technical disciplines with the goal of forming teams that will evolve into technology companies. A number of such companies have been formed in an ad hoc manner, and TechOps puts this on a more systematic and formal basis. Graduate students and faculty who have generated technology through research give presentations to interested students, and the CEOs management team facilitates matches. TechOps is expected to play an important role in generating companies to commercialize campus technology.

G. Entrepreneurship Education

As discussed in our previous paper [1] the Entrepreneurship Department of the business school provides courses on entrepreneurship that CEOs may take, and the CEOs are encouraged to take them. There are five undergraduate entrepreneurship courses that are available for all qualified campus students who have taken prerequisite courses. Four of the courses are part of the Entrepreneurship Citation Program, a selective program with four sequential courses. A fifth entrepreneurship offering is a survey course that combines content offered in the Citation Program courses. CEOs may elect the survey course; however, they are encouraged to take the Citation Program. Students are selected for the Citation Program based upon their academic performance (3.0 GPA or higher) and a written essay about their entrepreneurial intentions. These standards are identical to the requirements for admission to the CEOs program. Thus, CEOs are freely admitted to the Citation Program if they have sufficient elective opportunities within their academic discipline.

H. Business Plan Competitions

The CEOs Program sponsored and managed the first University of Maryland 50K business plan competition in the spring of 2001 and is conducting the second competition in 2001-2002. This competition is a 100K competition supported by several corporate sponsors and consists of two phases. The 1K phase was completed in November with 73 entries. This first phase was based on executive summaries, and sixteen entries were selected in three categories to go forward to the next phase, which will be based on full business plans. The three categories are: emerging companies, concept stage companies and small business companies. The emerging company category represents the most mature companies, and the concept stage represents companies that are less mature, and both of these categories tend to be technology oriented. The small business category was added because many of the entries in the last competition involved business concepts that could conceivably have revenues of several million dollars but without the leverage of companies based on technology. This category was added because it is important to encourage students to get started, even though it may be on a small scale.

As before, the goals for the competition are to provide education and networking opportunities for students, to foster new venture ideas and to provide new opportunities for students and recent alumni to compete for funding that will enable them to start or further existing businesses. The competition is open campus-wide to undergraduate and graduate students. Eligible teams must have at least one team member who is a current University of Maryland student or recent graduate (within five years) having a material role in the team, and the team cannot have received institutional funding.

In the next phase of the competition, the sixteen teams that survived the 1K competition, plus other entries that are judged to be as good or better than the sixteen, will have their business plans evaluated by a panel of professionals from the investment community, and the top teams will make presentations to the panel at which time winners in each category will be selected. Funds awarded must be used to start a business or to further an existing one.

I. Partnerships

Partnerships with units within the university and with external organizations are vital to the program. The CEOs Program, itself, represents a partnership of the engineering and business schools, with the offices of resident life, information technology and technology commercialization also being important partners. Funding for the program is provided by a corporate foundation, and a corporate sponsor provided the communications technology infrastructure for the residence hall. A law firm conducted the boot camp, and multiple partners support the business plan competition. Many firms in the region are taking notice of the CEOs program and are expressing interest in being involved, and such partnerships provide great potential opportunities for both the program and these firms.

J. Funding Opportunities

One of the primary issues for a startup company is raising initial funding, and the CEOs Program provides information about and couples the fledgling companies with potential sources. The

University of Maryland's engineering school conducts a program called the Maryland Industrial Partnerships (MIPS) Program. MIPS can provide funds to match company funds to support R&D projects to develop products or services. Such projects are conducted on campus by faculty and graduate students. Project proposals are competitively evaluated for technical merit and commercial potential, and successful proposals by startup companies can result in projects with budgets of up to $77K with MIPS paying 90 % of the cost.

The State of Maryland and its quasi-private corporation can also provide funds to further the commercialization of university intellectual property.

Agencies of the Federal Government that support R&D work, also have set-aside funding for Small Business Innovation Research (SBIR) Program that can assist startups in bootstrapping the development of products and services through the competitive SBIR proposal process.

Many startup companies have raised up to $1M through sources such as these, and such funding is often enough to get a company in a position to attract angel or institutional funding.

K. Incubator Opportunities

The Clark School of Engineering of the University of Maryland has conducted an on-campus, technology-oriented incubator program for 17 years, and has graduated 41 companies that populate the region. Faculty founded four of these companies. The incubator is housed in a 25,000 square foot building that was specifically designed to be an incubator, and companies in the incubator have professional space in which to conduct R&D, carry out business and to meet with customers and potential investors. The acceptance process is rigorous with applicant companies presenting to technical and business panels that evaluate technical viability and business potential. Incubator space is available, on a competitive basis, to companies that emerge from the CEOs Program, and one such company is currently applying.

3. Summary and Conclusions

The CEOs Program is committed to enhancing opportunity recognition, evaluation, and exploitation for the select group of students who demonstrate entrepreneurial vision, passion, and tenacity. Establishment of a sense of community among these students in a technology rich environment continues to be the cornerstone of the CEOs Program.

The program has matured horizontally with several new components and activities being added to enrich the undergraduate experience. Among these are: mentoring, business plan competitions, and product development opportunities. While the CEOs Program was originally conceived to be strictly for undergraduates, it has grown vertically by building networks with graduate students and technical faculty. This has occured in two primary ways: graduate students attending CEOs functions and networking with the CEOs, and graduate students and faculty being part of CEOs teams through TechOps and the business plan competitions. These involvements are very much encouraged because companies formed by CEOs are likely to be more viable if graduate students having somewhat more maturity and experience and faculty are involved.

In addition to the CEOs program activities, forming connections with the MIPS Program and the on-campus incubator has resulted in a continuum of assistance and education that can take students from knowing little about forming a company to having a company with substantial funding in an incubator.

Additional partnerships with external corporations have added significantly to the program, and a major effort will be made in the coming years to work closely with additional partners. It is expected that the program will continue to evolve as opportunities become available to connect with other activities that can add value.

Bibliography

1. Barbe, D.F., Baum, J.R., Thornton, K.S. Campus Entrepreneurship Opportunities, Proceedings of the 2001 ASEE Annual Conference
2. Barbe, D.F., The Hinman Campus Entrepreneurship Opportunities (CEOs) Program, NCIIA 5th Annual National Conference, Entrepreneurship: Beyond the Classroom, March 6-9, 2001, Washington, DC

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