New Venture Design – Interdisciplinary Capstone Projects at UBC

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Abstract

New Venture Design is an interdisciplinary project course across Engineering and Business at UBC, whose primary goal is to provide students of both faculties with knowledge and practical experience related to the formation of an entrepreneurial venture based on the development of a new product or process. Working in teams of 6 students (3 engineering students and 3 business students), the end-goal in the course is to produce a viable product prototype (the primary responsibility of the engineering students) and the necessary business plan (the primary responsibility of the business students) to ensure its success in the marketplace. This course is a combination of both lecture instruction (on creativity, business plans, patents, prototyping, fabrication, funding, tax credits, etc.) and dedicated lab-time in which student teams will advance their new venture concept toward market introduction. The teams enter many business plans competitions in the province, across North America (and beyond). Some teams go much further and file provisional patents, or incorporate a company. Starting in 2003, the course has now run for 8 years; several of the project teams have actually started a company based on their idea, or have created other new ventures. This paper summarizes the course, its motivation, details the current framework and syllabus, and reflects on lessons learned.

1 Introduction

New Venture Design is a final year project course jointly offered by the Engineering School and the Sauder School of Business at the University of British Columbia [1]. The course permits student teams of approximately equal numbers of business and engineering students to work together to propose a

product, develop a business plan for it, and design and build a demonstrable prototype of it. Fourth year students from any program within Business or Engineering are encouraged to apply for entry to the course.

There were several motivations for the development of this course in 2003. At that time, final year engineering projects were primarily: a) a capstone project based on the needs of faculty research within the student's program, b) a competitive design project set by faculty or c) a client project defined by the design needs of an existing company. The definition of what comprised a final year project was, and still is, completely determined by each individual department and program within the faculty.

Several forces were at play:

1. Academic credit for a project involving entrepreneurial experience is needed. In 1998 in the United States, the ABET accreditation requirements, and more recently in Canada the new CEAB program requirements required Engineering programs to show evidence that students and student teams were becoming better at fulfilling client engineering design requirements. That may be a necessary and sufficient experience for many engineering students, but for students looking for an entrepreneurial challenge there was still no opportunity to gain experience and gain academic credit for designing an innovative and marketable product.

2. Neither Engineering nor Business courses alone can prepare engineers for a company start-up. Although engineering students could take accounting, marketing and economics courses for credit within their program, a concrete application of that knowledge to a corporate start-up was not a part of that experience.

3. *Multidisciplinary (Business/Engineering) team experience is valuable to companies.* Despite the fact that many real products developed by companies in the world require multidisciplinary skills, university curricula were largely organized by knowledge and skills within a circumscribed discipline. The result at that time was that:

- It was rare for a project team to bridge engineering programs. Exceptions to this were the not-for-credit international competition team projects (e.g. supermileage or solar car projects).
- It was also rare for a project team to bridge faculties. In biomedical or clinical engineering, faculty supervisors often came from two departments but the students most often came from only one engineering discipline.

Personal working experiences with students from other disciplines would prepare one better for real companies.

4. *The right time for such an experience.* It was perceived that it could be a big advantage to a student in either Business or Engineering to make close connections to a counterpart in the other faculty at a sufficiently early time in their lives that they would be relatively uncommitted financially and personally, their university acquisition of knowledge and skills would be almost complete, and they would seeking a new challenge.

5. *Outsourcing.* Due to increased outsourcing of routine engineering hardware and software design and manufacturing, North American companies have been increasingly looking for interdisciplinary team skills, an ability to integrate with business and engineering colleagues, an ability to innovate and an appreciation of value-added engineering.

The goal of this paper then is to show how we addressed the above issues in a unique course structure and to identify some of its successes and limitations. A year-long project course entitled New Venture Design (APSC 486/ COMM 466 [1]) was established in both faculties starting in September 2003.

2 Course Framework

This 6-credit, 2-term capstone project course runs once a year from September to April. Admission is limited to 15 students from the engineering school and 15 students from the Sauder school of business and

therefore competitive. Students completing their 3rd year submit their application: CV, transcript and a letter of motivation, in April and the selection of students is finalized by mid-June.

The first challenge at the beginning of the course in September is to form exactly 5 groups of 6 students: 3 from engineering, 3 from business, and have them brainstorm initial ideas of products.

The first term is dedicated to the identification by each group of a novel product or service for which there is an assessable market need, and with enough "I.P. space", i.e., not infringing on existing products, patents or copyrights. Students' proposals are "pitched" to the instructors and criticized, in manner not too remote from the Dragon's Den TV show. Usually each team ends up with a target product or service shortly before the Christmas break, has developed an initial business plan and sketched plans for prototyping an engineering solution.

During the second term, the student teams develop marketing, communication and financial plans, build prototypes, get market feedback on their prototypes. Some may file provisional patents, and most submit their business plans to various competitions across North America. They practice presentations of various formats and lengths, and their plans and prototypes are further critiqued by instructors and additional industry guests, or mentors.

The course concludes with a New Venture Design Open House which is an opportunity to showcase their accomplishment to a wider audience, and attract new students for the next cycle.

It is important to note that the ideas of products must come from the students in each team alone and not from any other outside source. Ideas are not picked out of a list provided by the instructors as is often the case in comparable courses, and the instructors do not influence the decisions of the team; this is to ensure that the resulting IP is completely under control of the students and free of any ties with the university or other outside individuals or entities. The ventures that may eventually be created by the students will be free to patent, license, and sell their product.

3 Syllabus

3.1 Outcome

The output from the course is the development of a comprehensive business plan for a proposed new enterprise, and the demonstration of a prototype of the product or service offered by this enterprise. In the course of producing these, we try to expose students to all aspects of a new venture creation.

3.2 Set up

There is one 3-hour slot meeting or class each week, on Tuesdays from 6 to 9pm. The timing may be inconvenient to some, but the timetables of both faculties are not compatible.

These meetings are a mix of

- formal classes delivered by UBC faculty, from both the engineering and the business sides, on creativity, design, market research, business plans, company valuation, prototyping, ...
- invited presentations from people in the local industry on patents, funding, fabrication and manufacturing, distribution etc..
- presentation by alumni of the course on their own experience
- and, at regular intervals throughout the year, presentations by each team of their progress: market, finance, prototype, etc.

3.3 Evaluation

The 2 key milestones are the mid-course proposal, and the final proposal, which represent the main input for student evaluation.

The mid-term proposal (both presentation and document) should cover the following areas at a minimum :

- *Feasibility* – is the product feasible to produce? What types of research and testing has the group conducted to ensure technical viability? What does the product concept currently entail? Provision of sketches and block diagrams for development is encouraged.
- *Market* – is there a market for this product? What evidence has the group gathered that would indicate this? Who is the customer for the product? What defines the market? What market characteristics are critical to success?
- *Competition* – is there currently a competitive product on the market? Who are the competitors? Is the product patentable? Has an exhaustive patent search been conducted?
- *Strategy* – What is your competitive advantage? How does the team plan to proceed? What is the path the team is forecasting for the venture?

The final proposal should resolve most of the issues raised, be supported by more in-depth research, and must be accompanied by the demonstration of a prototype.

Students' grade are a combination of:

- marked individual assignments
- group mark for the written proposals and oral presentations

- peer evaluation, using UBC's iPeer (see: www.ipeer.apcs.ubc.ca)

3.3 Textbook

The following textbooks (see [3-6]), are suggested but they are not followed closely in the course. Each student has to submit a book review, drawing from a list of books supplied by the instructors.

4 Funding

This course has been endowed with a financial gift from Dr. Ken Spencer, founder and former CEO of Creo. Each team has a budget of \$1,500 to do market research and to develop their prototypes. They may also use these fund to enter business plan competitions, though this often has to be complemented by other funding from various sources at UBC. The total budget is about \$10,000/year for 30 students. The most successful teams have been able to leverage their early prize money to enter other competitions. Some have collected up to \$30,000 in prize money (e.g., EasyPlug in 2009).

5 Impact

We can judge the impact of the course in terms of *actual business ventures* that it led to.

a) Companies that are the direct result of this course, i.e., the students found additional funding, incorporated a company, filed patents, and commercialized the product they had developed during the course. For example:

- *PeerFX* (see www.peerfx.com/) incorporated in 2007 and they have developed a service of peer-to-peer foreign exchange, initially targeted at students, but now offered also to small business.
- *EnergyAware* (see www.energy-aware.com/) has developed a device which allows individual households to monitor their energy consumption. They incorporated in 2005. They currently have 7 employees, and generated last year sales of \$1 million.

b) Fledgling companies; some of our alumni are still in the "incubation" stage, looking for additional funding, office space, or further validation. For example:

- *EasyPlug* had developed a 110-120 v. safety plug that separates from the wall outlet easily, reducing the hazards of tripping on a power cord.
- *Aeos Biomedical* has developed a medical tape, used in radiology, and is currently going through clinical trials.
- *Socialappetite* has developed Weev, a location-based, social networking application on smartphones targeted at students on a campus.

c) Other new ventures.

In a few cases, the students did not go forward with the product or service they had initially developed in the class, but turned around and developed another product or service, using all the lessons learned, positive and negative, in their original class experience. For example:

- *ClinicBook* (see <http://www.clinicbook.ca/>) is offering a service of on-line appointment management for medical and dental groups. (Their original idea was on-line support for communication between parents and teacher in elementary schools. This market proved to be already too busy with similar products.) There are 4 employees, but they still survive on venture capital funding.
- *ReFlex Wireless Inc.*: wireless integration of medical instrumentation in hospitals; this team won several prizes, including the New York City Next Idea Business Plan Competition. (Their original idea was an electronic tablet for sports coaches; the market was small and the technology too sophisticated.)
- *RedLabel Communications* is a creative/marketing company in Vancouver, Calgary and Toronto, employing now more than 25 people. It was created by alumni of the course, and also on a different venture than the one they had developed in the course (see <http://www.redlabelcom.com/>)

6 Lessons learned, Limitations and Difficulties

There are limitations to the course as it is currently offered. Many of these issues are associated with the need to compress all student learning and all their efforts into 2 terms, while at the same time carrying

out a normal course load, meeting their extracurricular commitments (which are often many for this group of students), and traveling to Business Plan competitions.

1. One term is spent in forming teams, evaluating potential product market opportunities, and existing products and patents. That only leaves the second term for prototype design and implementation. The team may not have all the necessary skills in the existing members to carry out the implementation of a high-quality prototype, or the work may have to be done by placing an unfairly high burden on an individual member of the team.
2. Although, a review of the current state of the patent literature is required by each team, it has happened several times that a team has overlooked or misinterpreted an important US or international patent. This usually causes the team to refocus their product when time permits.
3. The success of the students in their Business Plan proposals and prototypes, has led to difficult searches for seed capital for these nascent companies virtually immediately after graduation. This has been difficult and has on one occasion led to success outside of Canada. Recently, a \$10 million fund (through entrepreneurship@UBC) was set up to assist this and other UBC startups.
4. A significant effort and expense has been focussed on only 15 students from each faculty each year. It has been clear that the demand is there from third year students to expand this course. Thanks to the original donor, the funds have been increased to double the student intake next year.

6 Similar initiatives

There are many offerings in entrepreneurship, innovation or new venture creation [6], but it seems that overall few offer the richness of *New Venture Design*. Looking at some of the best [6]:

- New Venture Design (NVD) is a 6-credit team project course for accepted students unlike the extracurricular workshops and mentoring of the University of Miami's *Launch Pad* [8].
- NVD is not about studying MBA case studies as in Harvard's *Founder's Dilemma* [9, 10], but actually doing it.

- Student develop their idea themselves, and do not harvest un-commercialized ideas from other labs in the campus, as in Ohio State University's MBA course - *Technology Venturing* [11].
- NVD is an attempt to establish a balance between the business side and the engineering side, unlike University of Chicago's business-school course led by C. Wortman: *Entrepreneurial selling* [12] or Stanford's Mayfield Fellows Program [13] led by T. Byers and offered for engineering and science students.

8 Conclusions

The course has been very successful in terms of the achievements of its graduates.

- Many national and international business plan competitions were entered and every year one or more prizes have been won by student teams.
- Each year for 8 years, there have been 15 Engineering graduates and 15 Business graduates on average, who've had some significant exposure to topics outside of their regular curriculum, and worked in truly interdisciplinary teams.
- Companies were formed and operate today based on products developed in the course.
- Companies were formed by our graduates based on new products conceived after the course was concluded.

Most students accepted job offers with existing companies or went on to graduate school.

Based on the success of the course, and thanks to additional funding provided by Dr. Ken Spencer, the course will be expanded to support 7 groups of 6 in 2011, and 10 groups of 6 in 2012.

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