AC 2007-2761: BEYOND THE BACHELOR OF SCIENCE

Terrance Boult, University of Colorado-Colorado Springs

Dr. Boult is the El Pomar Endowed Professor of Innovation and Security at U.Colorado at Colorado Springs. Before joining UCCS in 2003, he was an endowed professor and founding chairman of Lehigh University's Computer Science and Engineering Department. He received his BS in Applied Math (1983) MS in CS (1984) and Ph.D. in Computer CS (1986) all from Columbia University. He then spent 8 years on Faculty of the Columbia CS Department.

Dr. Boult is the driving force behind UCCS's new Bachelor of Innovation™ family of degrees. He as won multiple teaching, IEEE service, research and innovation awards, including an NSF PYI, IEEE CVPR Best Paper 2004 and U. Colorado's Innovator of the year. He is chair of the IEEE PAMI TC and in 2006 was inducted into the IEEE Golden Core.

Dr. Boult's research spans computer vision, image processing, medical imaging, biometrics as well as Computer Networks and wireless sensor networks. Dr. Boult's Vision and Security Technology Lab as over $2M in research funding, with 1 postdoc, 9 graduate students and 16 paid undergraduate students. He has been the primary advisor for more than two dozen Ph.D. students; has published over 150 Papers and holds 5 patents with 8 pending. He has been involved in 3 startup companies, all of which are still in business, and is currently CEO/CTO of Securics Inc which has been selected by the US Military to develop long range facial biometrics systems.

Jeremy Haefner, University of Colorado-Colorado Springs

Jeremy Haefner has been a professor of mathematics at the University of Colorado at Colorado Springs since 1989. He spent three years at the University of Tennessee - Knoxville before joining the faculty at the University of Colorado in 1989. Since 2002, he has been Dean of the College of Engineering and Applied Science. In addition to leading the College, Dr. Haefner also directs the Colorado Institute for Technology Transfer and Implementation, a campus-wide unit dedicated to supporting the campus and Colorado Springs community in economic development through technology innovation. He also currently serves as interim director for the Center of Science, Technology, Engineering, and Mathematics Education, which serves to connect the University with the K-12 community.

Professor Haefner has been recognized with a National Security Agency Young Investigator Award, a research fellowship from the Universidad de Murcia in Spain, and numerous research contracts with the National Security Agency, the University of Colorado and the University of Tennessee. In 1998, Dr. Haefner won the inaugural Innovations in Teaching with Technology award from the University of Colorado at Colorado Springs and the inaugural University of Colorado President's Faculty Excellence Award for Advancing Teaching and Learning through Technology. Dr. Haefner's research interests include integral representation, module and matrix theory while emphasizing a broad range of teaching interests. He has numerous refereed publications in these fields as well as within the field of technology-enhanced instruction. He co-developed the MathOnline program and the system-wide CU Online Tutoring program, which provides university-level mathematics courses and tutoring over the internet to high school students across the State of Colorado.

Beyond the Bachelor of Science

Terrance E. Boult and Jeremy Haefner
College of Engineering and Applied Science
University of Colorado at Colorado Springs

Abstract

This paper summarizes a novel approach to multi-disciplinary engineering education that moves beyond the BS in engineering fields. It introduces the Bachelor of Innovation™ (BI) family of programs and some of the challenges faced as we successfully defined and sought approval for this non-traditional program.

The paper briefly examines the motivation and need for a radical new approach, not a new major or a new course, but a new common core and new family of degrees. The BI is a unique multi-disciplinary undergraduate program supported by the College of Engineering and Applied Science (EAS) and College of Business (COB) at the University of Colorado at Colorado Springs (UCCS). The Bachelor of Innovation™ (BI) is a family structure, much like a bachelor of science (BS) or a bachelor of arts (BA), in which particular majors are defined. The BI degrees have been designed, where appropriate, to be consistent with ABET and AACSB accreditation guidelines. We expect to seek formal accreditation as we graduate our first class of students. Included in the initial offering are (in alphabetical order) *BI in Business Administration, BI in Computer Science, BI in Computer Security, BI in Electrical Engineering, and the BI in Game Design and Development* Each member of the family is composed of an emphasis/major, an innovation core, a cross-discipline core, and the general education requirements.

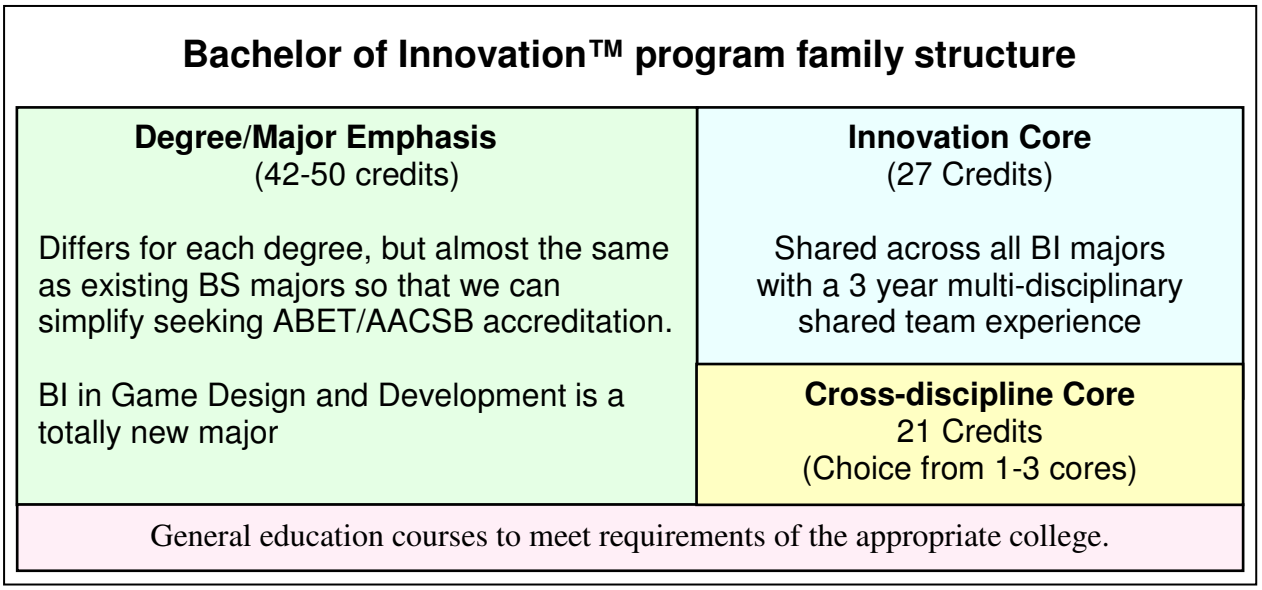
The paper summarizes the unique aspects of the program and the rational behind them, from the 3-year multi-disciplinary team experience to the trademarked name. It reviews the key challenges we faced, so hopefully others can anticipate them as well. The papers ends with our lessons learned.

1.0 Introduction

The Bachelor of Innovation™ family of programs is an interdisciplinary undergraduate program with a family structure, much like a bachelor of science or a bachelor of arts, in which particular majors are defined. The program is very structured with a common core in innovation, a cross-disciplinary core to help ensure the breadth needed for innovation, and an in-depth major field of study. After a brief overview of the program we address the motivation for such a radical new approach.

Similar to the way in which schools have collections of common requirements for a Bachelor of Arts in various fields or for a Bachelor of Science in other fields, the Bachelor of Innovation™ (BI) does not specify the content of a major. Rather the BI specifies the common elements for a family of degrees, where specialization areas define the details of their major. The goal of this

family is to define the common cores, leaving the disciplines to define the majors. The BI Program has four significant "components" in each degree, as shown in the following diagram:



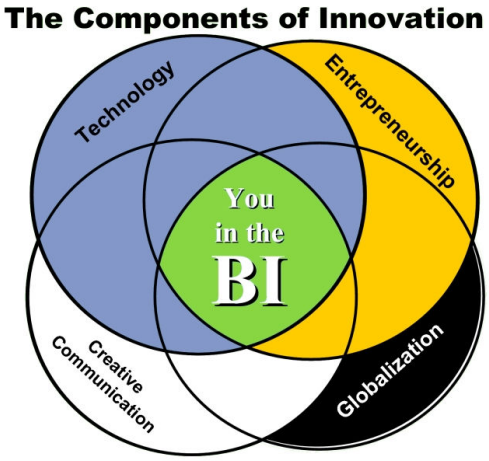
The **Innovation Core** is 27 Credits, geared toward innovation and entrepreneurship; a key component is the multi-disciplinary, long-term team activities over the sophomore, junior and senior years. Teams are expected to include students from all years, possibly including graduate students. The teams will have dynamic membership and the roles of team members will change on a regular basis. The innovation core also includes an overview course of innovation, a course on entrepreneurship, a variation on the technical writing course focused on proposal preparation, a course on business and intellectual property law, and a course on international business and policy issues. Each of the more traditional courses is integrated back into the longitudinal team experience. As an example of the difference, and integration, the proposal preparation course will work on real proposals, e.g. Small Business Innovation Research proposals with local companies or teaming with international partners, which will then help fund the team efforts.

Each **Cross-discipline core** is a coherent collection of 21 credits from one "cross over" area the individual will include in the degree program. The initial cross-discipline cores are:

- **The Technology Core** (for non-technology degrees) will provide a broad coverage of engineering and technology. These may be new courses (if resources permit) or may be a collection of existing "introductory" courses in engineering.
- **The Business Core** (for non-business degrees) will provide a broad coverage of business topics, likely to be based on the core business courses of marketing, management, finance and economics.
- **The Globalization Core** (for any BI major) will provide a selection of courses on internalization issues. It requires passing a foreign language at the second year level and a collection of international business and policy courses. Students in this option are required to demonstrate at least a three month residence in a non-English speaking country. A one-semester study abroad will be facilitated and

strongly encouraged. While abroad, involvements in the Innovation team projects will be "virtual", but will be required.

The Creative Communication Core (for any BI major) will provide coverage of a variety of communication mechanisms including both traditional (e.g., oral communication) and non-traditional (e.g., visual arts) communication approaches.



1.1 Why innovation?

In its report, *Innovate America*, the National Innovation Initiative (NII) calls for an "innovation infrastructure" as the foundation for the nation's future productivity and competitiveness. The report notes: "Innovation generates the productivity that economists estimate has accounted for half of U.S. GDP growth over the past 50 years. ... It's not only about offering new products and services, but also improving them and making them more affordable."

The National Academy of Engineering (NAE) report, Educating the Engineer of 2020[1], concludes (p5):

> "If the United States is to maintain its economic leadership and be able to sustain its share of high technology jobs, it must prepare for this wave of change. While there is no consensus at this stage, it is agreed that **innovation is the key** and engineering is essential to this task; but engineering will only contribute to success if it is able to continue to adapt to new trends and provide education to the next generation of students so as to arm them with the tools needed for the world as it will be, not as it is today."

The NAE report also states (p15) that there is

> "an undercurrent of awareness that current complexities are so daunting that tinkering at the edges—reforming one course, one program, one department at a time, developing isolated instances of success here and there — is no longer a viable response if we are to build the kind of robust programs in research and education now needed to strengthen the U.S. engineering community by 2020."

The need for a dramatic reform in engineering education is not something we are *claiming*, it is a nationally recognized need to which we are responding. The comprehensive nature of the proposed Bachelor of Innovation™ is directly in line with the NAE engineering 2020 guidelines. At a recent NAE-sponsored leadership event, to which a team of UCCS Engineering and Business faculty was invited, the ideas in the proposed BI program became a central focus of the meeting.

The technology revolution and globalization also have had a major impact on business; it is commonly acknowledged that business degrees need to adapt to incorporate the ever-changing technology landscape and the impact of globalization.

A 2006 survey sponsored by the Business Roundtable[2] found:

- 33% of opinion leaders and 18% of voters said improving U.S. science and technology capabilities to increase U.S. innovation and competitiveness is our country's single most important objective;
- 62% of both groups said that addressing this problem is equally important to other challenges such as national security, transportation, health care, energy and the legal system;
- 76% of opinion leaders and 51% of American voters rank a focus on education as the most important way to solve the problem;
- Only 5% of parents said they would try to persuade their child toward careers in STEM (Science, Technology, Engineering, and Mathematics), while 65% said they would allow the child to pursue whatever career path he/she prefers and 27% said they would encourage the child to pursue a STEM career but balance it with the child's preference.

The last of these survey results may be the most disturbing. While the problem of declining student enrollment in STEM areas is widely acknowledged, parents will be giving their children's preference total, or at least a strong weight, in their career choices. Thus, it is critical, if we are to change the tide flowing away from technology degrees, that we find a way to change the attractiveness of these fields. Many of today's students are not choosing majors based on potential careers but rather on their own personal interest. It is not enough to teach well, we must motivate students as well as develop and market programs that are attractive to today's students. In a 2003 national survey commissioned by General Electric, **only 9% of college students polled indicated that they felt the United States is doing enough to foster innovation among young people**.[3]

Central to the educational uniqueness of this program is the multiyear, multidisciplinary "teaming" experience that students will have. Students from different emphasis areas will be assigned to teams that will work on projects identified by local industries. These teams will work together towards a solution and a technology product that will impact society. The Bachelor of Innovation's unique long-term teaming will attract a different type of student. For example, the Bachelor of Innovation in Game Design and Development will attract students into a program that at first glance may not seem like a technology degree, but which contains significant technical rigor, particularly in computer science. The social and fun factors of these new degrees reflect the changing demographics and preferences, yet the programs retain the rigor and self-learning abilities needed in tomorrow's leaders.

The Bachelor of Innovation™ family of programs directly addresses this national need and provides a unique program in the state and in the nation. The uniqueness of the program, and the strong teaming nature, is expected to attract students that might otherwise forego technology degrees and, at the same time, to expose non-technology students to enough technology to make them better team players when working with technologists. The Bachelor of Innovation™ program is not just a preparation for a career; it is about teaching critical thinking and transforming the students for their own continuing self-innovation. This family of degrees is

unique enough that we propose to trademark (or more properly service mark) the name Bachelor of Innovation™ to protect it as a marketing advantage. Innovation is a commonly overused term, often confused with creativity, invention and research; innovation is something more. Before describing the program in detail and its goals, we briefly introduce innovation.

1.2 What is innovation?

A simple definition of innovation is "introducing something new" (Merriam Webster dictionary). Note how this differs from invention, which is defined as "discovery or a device, contrivance or process originated after study and experimentation". The key difference is that innovation means introducing the new thing to a group or to society. It is not enough to invent-- the invention must be adopted to become an innovation. Consider the more detailed definition

> Innovation is the sequence of activities by which a new element is introduced into a social unit, with the intention of benefiting the unit, some part of it, or the wider society. The element needs not to be entirely novel or unfamiliar to members of the unit, but it must involve some discernible change or challenge of the status quo.

Innovation need not involve a technological novelty. For example, when McDonald's applied the production line concept to producing restaurant food, it could use lower-skilled workers and known technology to produce food quickly - thus innovating and changing our society. Today there are many US Business Method Patents, protecting business innovations with little or no technological novelty, just novel combinations and applications of technology to improve business and society.

The CBI Innovation and Trends Survey[4] provides this definition:

> "The innovation process is the combination of activities - such as design, research, market investigation, process development, organizational restructuring, and employee development and so on - which are necessary to develop and support an innovative product or production process."

Clearly, innovation has a multi-disciplinary nature. The goal of these new Bachelor of Innovation™ majors is to go beyond simply teaching students about the innovation process. It will involve them directly in the interdisciplinary nature of innovation projects working with real companies. This experiential learning is a critical part of the program design because the innovation *culture* is critical to effective innovation, and to transforming the people involved. *Innovation is a team sport, and is best learned that way.*

But innovation is also an attitude, a state of mind, and a creative process, as much as a specific task or action. Effective innovation is more than just changing organizations. As observed by Ralph Ardill[5] :

> “Once you've worked on a truly innovative project you realize how important transformation is to the success or failure of a project. Your way of thinking changes, your priorities change, your company changes and your way of working changes forever. True innovation is not just about changing a product, a service or even a marketplace; it's also about recognizing and relishing the need to change yourself.”

Through the long term teaming experience in the BI, and by working on real projects for real companies, students get multiple chances to experience that transformational change. A single term capstone course might provide this, but often it is more discouraging than encouraging because things don't always go as the students plan, and there is not enough time for another iteration. Three years of teaming increase the chance of a base hit, instead of either striking out on the full swing or bunting because it is safe.

1.3 Why teach innovation?

There are several reasons why it is critical to teach the innovation process. First, innovation is about applying ideas and knowledge to have a **real impact** in the societal unit. It is through innovation that engineering and business students can truly improve our health, welfare, and prosperity. Second, by producing graduates who are steeped in the innovation process, programs such as the BI will be fulfilling a national need for a technically skilled, innovative workforce. Third, and most importantly, innovation is fun and rewarding so students will be attracted to this field. It will help attract students focused on improving the world, rather than the dwindling group of students going into engineering because of their inherent interest in science and math.

2.0 Background and history

After 2001, Colorado, like many states, faced difficult financial challenges that translated into significant budget cuts for higher education. In 2002-03, for example, the University of Colorado system took a 28% budget cut in state appropriations. These cuts were felt at all levels of the university but particularly at so-called expensive professional programs such as engineering and business. Limits in the ability to raise tuition meant the cut was almost directly passed through to the academic units. The College of Engineering and Applied Science, for example, reduced its budget by 25%.

Not knowing what the financial future looked like, the University of Colorado at Colorado Springs began a series of discussions whose theme was transformational change. The idea being that the campus had to consider substantial change proposals in the event that there were further serious budget reductions. The College of Engineering and Applied Science and the College of Business were each tasked to form a working group that would brainstorm transformational ideas, assess and analyze the merits and demerits and then make recommendations to the campus leadership team.

The College of Engineering and Applied Science formed the Phoenix Taskforce, in reference to the Greek mythology tale of the Phoenix rising from the dead. The taskforce consisted of engineering and business faculty, representatives from industry, and administrators from the campus leadership team; the taskforce was chaired by dean Haefner. After several meetings over the summer of 2004, the Phoenix taskforce made a remarkable recommendation to merge the College of Engineering and Applied Science and the College of Business to form a single, aggregated college. This new college would be focused on innovation, or rather the innovation process, that clearly requires the both business and technology domain experts. New curriculum, the Bachelor of Innovation™ and Masters of Innovation™ would be developed and the uniqueness of the programs and the college would attract new students, new enrollments, and

therefore new revenues to the campus. In addition, with the merger of two colleges, the campus would realize cost savings through reduced administration staff. The recommendation for the College of Innovation was bold and transformational.

The taskforce was well aware of the challenges that lay ahead should the campus accept this recommendation. First, the cultures of the business college and the engineering college were significantly different, and therefore merging them posed a challenge to moving forward. Second, it was not clear how the rest of higher education or industry would react to a College of Innovation. Would the students from these programs be employable? Finally, it was not clear that the proposed radical change would be a significant financial aid to the campus, given that there would be some significant start-up costs to new programs.

While the recommendations were not widely vetted at the time, the campus leadership did favorably react to the College of Innovation. But bowing to the cultural obstacle of merging vastly different cultures, the campus leadership team chose to NOT form the College of Innovation. Instead, the decision was to form a division of innovation in which the two colleges would organizationally reside. While the charge to form this division was given, it was met with considerable hesitation by all parties concerned and it was eventually dissolved.

All was not lost however. The Chancellor was, by this time, convinced that the innovation concept held the future for the campus and she understood that the curricular ideas presented by the Phoenix team and within the College of Innovation needed to be implemented. As a result, the chancellor charged the deans of the College of Engineering and Applied Science and the College of Business to form a multidisciplinary taskforce that would craft a proposal for a new degree program around innovation, globalization, and entrepreneurship. It is this group that developed and designed the Bachelor of Innovation™ family of degrees which was finally approved by the Regents of the University of Colorado, on Nov 2, 2006.

3.0 Process and challenges

Developing and getting approval of the Bachelor of Innovation program involved several processes and faced a number of challenges.

3.1 Challenge #1*: Integrating the cultures of engineering and business to embrace innovation*. Bringing together the cultures of engineering and business to develop the BI program proved to be one of the biggest challenges. Not surprisingly, these are vastly different cultures with different values and processes so they don't automatically see eye-to-eye on curriculum. Nonetheless, the deans of the colleges gave a charge to a small group of faculty from both units to develop a program that incorporated innovation, entrepreneurship, and global competition. Fortunately, faculty champions like Dr. Terry Boult brought the group together over the course of several meetings and was able to build an environment of trust. But not everyone embraced the innovation process concepts; for example, the mathematics department, which had been in the school of engineering for decades, decided this innovation initiative was reason enough to move their department from the College of Engineering and Applied Science to the College of Letter Arts and Science.

3.2 Challenge #2*: Convincing engineering faculty of the need for the program*. With over 23 national reports addressing innovation, engineering education reform, and global competition, the need for the Bachelor of Innovation program was compelling. Nonetheless, faculty had to be convinced this program was needed on a variety of fronts.

3.3 Challenge #3*: Convincing the engineering faculty that this is a good program for the field of engineering*. Engineering faculty want to be assured that the quality of a new program lives up to certain standards and that students will be well prepared for the engineering workforce. The technical core of the BI program was designed to be as close to the BS degrees in computer science or electrical engineering as possible; this addressed the quality concerns of the engineering faculty. To address the concerns of whether the students would be qualified, Dr. Boult conducted a thorough survey of local industries to see if the industry would accept the BI program and hire graduates. In building the program, we surveyed over 50 companies from across Colorado. It was a detailed survey with over 40 questions, many of which were the hard questions that people are often afraid to ask. The survey asked for input about the current UCCS students compared to those from other schools. The hypothesis about current students/major "*I would generally choose a UCCS BS/BA graduate over a BS/BA from other schools such as …*" was rejected at the 98.8% (p=0.0112) significance level. So at best our existing students are perceived as being equal to our competition and clearly, even in a geographically biased sample, **current UCCS do not have a significant market advantage over their peers**. This was not easy for our faculty to hear. However, when the same people were asked if they would agree with the statement "*I would generally choose a UCCS BI graduate over a BS/BA from other schools such as …"*, the hypothesis was accepted at the very significant 99.95% (p=0.0005) level. Double-checking, when asked to agree with the statement "*I would be unlikely to hire a UCCS BI student*" the hypothesis was rejected at the very significant 99.998% (p=0.00002) level. These, and other questions in the survey, strongly suggest that the new BI degree students will be more employable, and that the new degrees will be accepted by industry. And if there is a company that does not know what a BI is, it is still a formal "Bachelor" degree in either engineering or business, as we did not change the name of the major, just the name of the family.

3.4 Challenge #4*: Convincing faculty that the BI would not be a drain on resources*. This is a common concern among faculty; they are worried that resources will be diverted from the traditional programs to fund the new programs. To a certain extent, this is true since some faculty will now be teaching courses that support these programs. Our models, however, suggest the BI is critical to increasing enrollments, which will in turn increase resources. The budget that was included with the program proposal demonstrated the need for new faculty lines in year 2 and again in year 5 when the enrollments reached 60 full time equivalents. The faculty were adamant that new resources be 'guaranteed' by the campus administration but this was implicit when the campus leadership team approved the package.

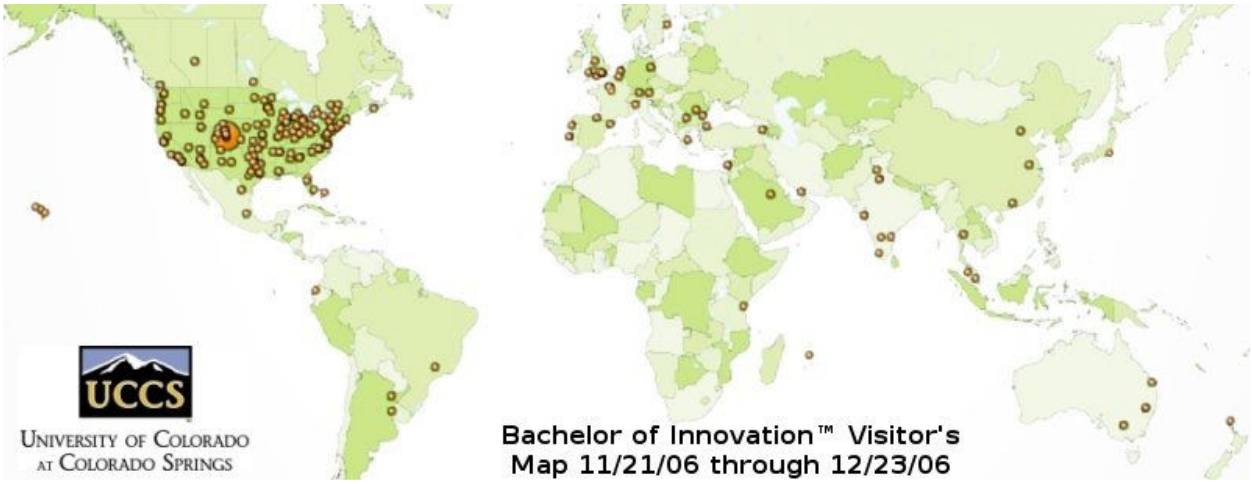
3.5 Challenge #5*: Getting campus administration to articulate a clear process for multi-disciplinary degree programs*. There were particular challenges in developing and seeking approval for a family of degrees that involves a number of disciplines in different colleges. The BI program primarily includes degrees from engineering and business but draws on courses offered by the college of letters, arts, and sciences. The campus did not have a clear policy and process for approving such a degree family. There had never been a proposal for a "family", only

individual degrees. Clearly the proposal had to be approved by the two primary colleges but it was not clear if the letters, arts, and science college had to fully approve the degree since they would be affected with more students in the general education courses. In the end, we agreed that the dean of letters, arts and science had to approve but a full college vote was not necessary. After the colleges approved the degree, the proposal went before the campus-wide academic planning committee. We learned that the University Budget Advisory Committee (UBAC) required additional information above and beyond the campus standard form for new degree proposals. After UBAC, the proposal was vetted initially with the Colorado Commission for Higher Education to make sure the program was aligned with the mission of the university. The Vice Chancellor led the effort to get the Colorado Board of Regents to approve the program based on the submitted proposal. This required a month long process over two Regent's meetings. When the program was approved by the regents, we thought the approval process complete. But soon thereafter new UBAC meetings were called and new issues arose. While the program is now approved, implementing the program still requires considerable effort from both the College of Engineering and the College of Business, as we struggle to get the campus information systems, applications, recruiting, advising and marketing, to address a number of cross college programs at a scale heretofore unprecedented on our campus. Program approval was not the end — it was just the beginning.

3.6 Challenge #6*: Marketing and market education.* The BI program, because it is non-traditional, required considerable marketing, both in getting it passed through campus, getting community/industry support and finally to our customers, the students. If we were a top-10 school, the marketing process would be easy. But for a smaller school, the smallest campus in a multi-campus system, developing the marketing strategy and credibility to do something as bold as the BI has to start long before program approval. We knew there would be many critics along the way and that it would be important to measure the market, describe how the results will be validated, and then how the market will be penetrated. We found we needed multiple marketing plans: internal, administration, industry, and then finally for prospective students. For the first three, we worked our planning team and laid the groundwork even before we got into the curriculum. Since our plan had student teams working with companies, as in the core of our BI program, we validated that we could do the type of work we planned, at least on a small scale, before we proposed it in a program. We gained significant credibility because we could point to Dr. Boult's extensive ongoing Small Business Innovation Research partnerships where undergraduates, sophomores through seniors in particular, were delivering on real projects for real companies. We planned for and developed a few key relationships that were critical to demonstrating the viability of the idea, well before the idea was formally presented. We were deliberate when we beta-tested in stealth mode so that we could point to real data in the marketing phase, both internally and externally.

The next phase of marketing, after program approval, was marketing to prospective students and the external world. When proposing the program, we had to fight to get even a small marketing budget. No previous program had requested, let alone been granted, funding for marketing. But as a new "product" we argued the BI needed it and that it would more than pay for itself. We were successful in large part because we raised external funds to cover most of the first year's marketing budget. Our marketing plan was based on the web, including Google AdWords, followed by an email marketing campaign. The website went operational the day after the

program was approved. Using matched criterion we obtained email lists from ACT, and emails started going out Thanksgiving week. There was also a bit of "guerilla PR", wherein we contacted active "innovation" related blogs and sites to get them interested, knowing that if they were, someone would post a short blog entry about us. We tracked the majority of our marketing progress using Google™ Analytics. Within weeks we were seeing not only increased regional traffic, but also an unprecedented level of national and global traffic visiting the innovation.uccs.edu website. We provided our own mirror of the application download and tracked visits down to that level of application interest. Google™ AdWords has been much less effective than direct email. The map below shows the location visitors from 11/22/06 through 12/23/06, with the size of the dot-representing fraction of visitors. By March 1 we had seen over 1700 visitors from 58 countries and 49 states.



4.0 What's in a name?

We review reasons why this program is called the Bachelor of Innovation™.

When introducing a new degree we must also consider what will happen when graduates of that program approach employers who are not yet familiar with the program. If the degrees were named by modifying the name of the major, rather than the family, e.g. like a BS in Innovative Electronics, the employers, and especially the human resource departments, might have a harder time understanding what these students do. Human resource offices in companies that advertise for students with, say, a Bachelor in Electrical Engineering, might dismiss them as unqualified without looking deeper. The BI designation allows the students, when they apply, to honestly say they have a "Bachelor in Electrical Engineering". Since the degrees are in general quite comparable to the BS degrees in their related areas, this naming allows companies to see it for what it is, a variation on the underlying background but still retaining the core of the major which is generally the first consideration when hiring.

As a marketing consideration, this is a name we believe we can literally own, via trademark. Moreover, protecting an innovation through intellectual property protection, like trademarks, is part of the innovation process; it is only natural that we protect it, and use it as an example in our

program. This speaks to both the uniqueness, and the need to understand intellectual property, which is part of the formal BI curriculum. Thus, as we begin advertising/marketing, the uniqueness of the name will initially have students, parents and companies asking what it is all about, and once they know, it will not be confused with programs from competitors. We can develop brand recognition for this (and eventually for our planned Masters of Innovation™ program) so that if a person/company has looked at a BI in Computer Science, when they see a BI in Electrical Engineering they will have a good idea exactly what that means. Within a short time, because we will have the exclusive rights to the name, when someone talks of the Bachelor of Innovation, people will know exactly what they are talking about. The program is designed to appeal to people that want to be part of a team and yet stand out from the crowd just a bit. The branding and uniqueness will appeal to such students, and donors, as they tell their friends they are going to be part of the only (hence the best) Bachelor of Innovation program in the country!

Some might question why, if we are trying to transform education in a larger way and addressing a national need, we would want to trademark the name and restrict its use. We were asked this many times along the way. The trademark does not mean no one else can use it. It means we will get to decide who can and cannot use it. Initially the name will allow us to build our market for the BI program. But as it is established and ready to grow, the trademark status will allow us to choose the organizations that can use it and which cannot. We can strategically choose partners, and can ensure the name is used consistently and is only associated with programs of quality. We will not have to worry about aggressive for profit groups deciding to jump on the "innovation bandwagon", defining a weak program and then advertising/hyping it to the point of diluting the perceived quality of our program.

5.0 Conclusions and lessons learned

The Bachelor of Innovation™ family of degrees represents a new direction for engineering and business education. Getting such a novel program through departments, campus and eventually state approval is a non-trivial exercise. Along the way we faced and overcame multiple challenges. The lessons learned can be summarized as follows:

1) Do the research and ask the hard questions; the answers help quell the skeptics.
2) Tough times with even tougher times forecast can be strong motivators for change.
3) Don't just ask for what you need; expect to have to compromise. Plan to negotiate, and negotiate time to plan – it took us years to do this.
4) Building a multi-disciplinary community of support takes time. When you think you finally have it, you probably only have the extroverts. Getting the introverts on board, who don't speak out, takes even longer but is equally important.
5) If you cannot manage the complexity of a major change, you are not ready for an innovation curriculum. Innovation is all about change.
6) Don't expect to ever get everyone on board. Letting some people go can help move ahead faster. (We will eventually have BI in other fields, but the discussions and approvals would have delayed us at least another year, if not more.)

Our recruiting efforts started when the program was approved and we have had significant interest from around the world. It is still too early to know the financial impact this will have,

which was part of the motivation. But the intellectual and motivational impact is already being felt on campus. As we quoted above, "True innovation is not just about changing a product, a service or even a marketplace; it's also about recognizing and relishing the need to change yourself."

Bibliography

---

[1] Educating the Engineer of 2020: Adapting Engineering Education to the New Century (2005), the National Academy Press. Available online at at http://orsted.nap.edu/openbook/0309096499/html

[2] http://www.businessroundtable.org/pdf/20060112Two-pager.pdf. Business Roundtable is an association of chief executive officers of leading corporations with a combined workforce of more than 10 million employees in the United States and $4 trillion in revenues. The chief executives are committed to advocating public policies that foster vigorous economic growth and a dynamic global economy. The survey sampled 250 government, business and non-profit opinion leaders and 1800 voters.

[3] From http://www.ge.com/stories/en/20052.html?category=Innovation Last accessed 1/15/2007

[4] Confederation of British Industry, *CBI's 1999 Innovation Trends Survey*. Last access 1/15/2007 from http://www.cbi.org.uk/ndbs/positiondoc.nsf/81e68789766d775d8025672a005601aa/F95F45715B4410D18025680E002BAA6D/$file/its1999.pdf

[5] Oral presentation at the London Innovation Conference, 2003. Slides were online for a while, but no longer available. See also Jim Brown, "Lifting The Barriers To Innovation, A Practical View From The Trenches", Int. Federation of Information Processing , IT Innovation Conference 2004., last accessed 1/15/07 from http://computing.unn.ac.uk/staff/isps1/webpages/test/Barriers%20and%20Enablers%20to%20Innovation%20Formated1.doc