

## **2006-526: STUDENT-GENERATED INTELLECTUAL PROPERTY: PRELIMINARY RESULTS FROM A RESEARCH INSTRUMENT USED TO CAPTURE STUDENT, FACULTY, AND INDUSTRY PARTNER PERSPECTIVES AND EXPECTATIONS**

### **Craig Silvernagel, University of North Dakota**

Craig Silvernagel is Entrepreneurship Director at the University of North Dakota (UND) College of Business and Public Administration. Craig came to UND from the University of Minnesota-Crookston (UMC), where he helped develop a new program emphasis in entrepreneurship while serving as a marketing faculty member. For the eight years prior to his time at UMC, Craig owned a full-service advertising agency he co-founded in 1994. The agency served several regional and national firms including Arctic Cat, Christian Brothers Hockey, and Simplot Soilbuilders. Craig sold the business in 2001. In addition to his own ventures, Craig grew up in a family business environment. For 20 years his parents owned "Duo Plastics Inc.," a custom plastic injection-molding manufacturer in Minneapolis, Minnesota, that currently employs more than 100 people. Craig is a native of Minneapolis and a UND graduate, receiving an MBA in 1995 and a BBA in Marketing in 1992.

### **Richard Schultz, University of North Dakota**

Dr. Richard R. Schultz is associate professor and interim chair of electrical engineering at the University of North Dakota in Grand Forks. He received the B.S.E.E. degree from UND in 1990, and the M.S.E.E. and Ph.D. degrees from the University of Notre Dame in 1992 and 1995, respectively. Dr. Schultz joined the UND faculty in 1995, and his teaching and research interests are in signal and image processing, embedded systems, technology entrepreneurship, and systems engineering.

# **Student-Generated Intellectual Property: Preliminary Results from a Research Instrument Used to Capture Student, Faculty, and Industry Partner Perspectives and Expectations**

## **Abstract**

An area of great interest within academia is the ownership of student-generated intellectual property (IP), particularly in an era when entrepreneurship and innovation are being stressed across academic disciplines. Students involved in engineering capstone design projects, business plan courses and competitions, and research activities have immense potential to conceive and prototype product, process, system, and service concepts within the university classroom and laboratory environment. Faculty members serving as mentors and liaisons to industry partners generally facilitate the innovation process in the context of their employment as university professionals. The research questions addressed in this project focus on who actually owns the intellectual property generated in the many possible partnership scenarios that arise among the students, faculty, and outside entities associated with a particular project, as well as whether students and faculty have a working understanding of IP ownership and what it really means to them. Through support by the North Dakota Small Business Development Center, a research instrument is currently under development to study the issue of student-generated intellectual property in more depth. The underlying assumptions used in the survey are that claims to IP ownership for a particular project are really based on the answers to three fundamental questions: (1) Who formulated the problem statement? (2) Who solved the problem? (3) How significant was the use of resources (e.g., human resources, financial resources, and facilities and/or equipment) by the people formulating and/or solving the problem? The primary purpose of this survey is to capture the attitudes of respondents on issues related to joint intellectual property ownership based on university student-generated intellectual property, with a secondary goal of capturing respondent expectations on issues related to joint intellectual property ownership among partnering institutions and people. The target audience includes university faculty, staff, and students; company owners, management, and employees; and federal, state, and local government employees. Preliminary results gathered from a small sample of students within University of North Dakota classrooms suggests that students today generally feel that they own their ideas, and they are not willing to share this ownership with their faculty mentors. Students feel that their tuition dollars are sufficient for providing institutional resources that can be used to refine their business concepts. However, if a project is financially supported by an industry partner or government agency and the students get paid for their work, then they do believe that a low level of ownership lies with the university, corporation, and/or government. In an era of software and digital music piracy that is completely accepted by modern university students, it is apparent that they believe either their ideas are open to all (i.e., open source movement), or that their ideas belong exclusively to them. Maybe we have moved from Generation X to Generation Y to “Generation iPod.”

## 1. Introduction

The authors are in the process of developing a survey to gain a better understanding of attitudes and expectations related to student-generated intellectual property and how to best manage the interaction of students, faculty, and private sector partners related to product, process, system, and service commercialization. While the concepts of ownership, recognition, and reward are central to any discussion on intellectual property, they do not tell the whole story. Dr. Steven Nichols, Associate Vice President for Research at The University of Texas at Austin, is a leader in the areas of intellectual property and conflict of interest/commitment as they relate to university research activities. According to Dr. Nichols, three fundamental questions must be answered to equitably determine ownership within a student/faculty mentor/private sector partnership:<sup>4</sup>

1. Who formulated the problem statement?
2. Who actually solved the problem?
3. Who provided the resources to accomplish the work?

As part of a larger study addressing these questions, the authors of this paper have started developing a research instrument to help learn more about what students believe they own in a variety of partnering relationships under different idea generation and resource utilization scenarios.

The research instrument development process began with an in-depth interview of Dr. Steven Nichols<sup>4</sup>. Using his background information and philosophies as guideposts, the authors began enumerating and organizing the many partnering relationship combinations that might be encountered in a university commercialization environment. The Nichols interview helped set the framework and focus for the survey, leading the authors to pursue respondent attitudes and beliefs about IP ownership as it relates to “who identified the problem, who solved the problem, and what resources were used.”

The data collection process is divided into several components, which began with a non-probability convenience sample. Students in two entrepreneurship courses and one engineering course took the survey to test-run the instrument. Some preliminary results emerged from this activity, but the main purpose was to gather feedback on content and survey flow. Several modifications will be made to the instrument as a result of this test-run, and a more extensive public institution pilot study will be conducted throughout the 11-campus North Dakota University System. Preliminary results and feedback from the pilot study will again be used to modify and improve the survey, as well as further clarify the research questions. Final steps will include administering the survey to a national audience by means of a probability sampling distribution technique, with reports on the results submitted for peer-reviewed publication.

The analysis of initial data gathered from non-probability, small-scale surveys of students enrolled in select university classes taught by the authors has resulted in three interesting – although not entirely unexpected – observations:

1. A majority of students believe they should own the work that they do, even if they did not define a particular problem statement but still used the resources of others to accomplish their tasks.
2. Students felt less ownership if they were paid to define or solve a problem, even though no level of salary was defined.
3. Students placed very little value on faculty input and refinement support in the context of concept development and venture initiation, believing that the faculty members were simply “doing their jobs” no matter what level of support or expertise was provided.

The intellectual property questions raised previously carry important implications for faculty, individual students and student teams, and universities at large. The authors believe that the crux of the issue does not simply lie in “who owns what,” but in how all the parties involved can agree on the fair disbursement and management of joint IP ownership. This leads to other interesting issues surrounding the role of a faculty member in student-initiated business development, particularly for the most promising service-oriented concepts that result from classroom and extracurricular projects.

This paper is organized as follows. Section 2 describes the content of the research instrument used in a pilot study in three undergraduate classes at the University of North Dakota during the 2005 fall semester. Tabulated results and observations/interpretations are presented in Section 3. Section 4 examines the possibility that service-oriented innovations generated by students at the university may have greater commercialization potential on a shorter timeline than patentable inventions. A summary is provided in Section 5, along with future plans for developing and administering this research instrument on a much larger scale.

## **2. Student-Generated Intellectual Property Research Instrument**

The research instrument was originally developed during the summer of 2005 and distributed to three classes taught by the authors at the University of North Dakota during the 2005 fall semester. Although the survey is not ready for broad distribution, the authors felt that it would be worthwhile to conduct a test-run to gather feedback from the students regarding content. Initially, the student-generated intellectual property research instrument was designed primarily to determine the attitudes and expectations of students, faculty, and industry partners regarding the joint ownership of patents and resultant royalty revenue streams. After continuing review and modification, the authors believe that this survey should also cover other potentially high-value intellectual property that may be created at the university, such as trademarks and branding materials. This will require substantial modifications to the existing survey.

The survey contains three sections: (1) demographics, (2) opinions on joint IP ownership scenarios, and (3) open-ended questions. The instrument begins with a preamble, explaining the purpose and goals of the survey, and it lists the target audience for distribution. The preamble is given in Table 1 as follows:

**Table 1.** Student-generated IP ownership research instrument preamble.

<p>Claims to Intellectual Property (IP) ownership are really based on three fundamental tenets:</p> <ol style="list-style-type: none"><li>1. Who formulated the problem statement (e.g., “We need to develop a more efficient fuel cell for zero-emission vehicles”)?</li><li>2. Who solved the problem (e.g., students and/or faculty who reduced the idea to practice in a university laboratory)?</li><li>3. Significant use of resources on the part of either the people formulating the problem or the people solving the problem (i.e., Human Resources, Facilities and/or Equipment, Financial Resources).</li></ol> <p>Primary Goal: To capture the philosophies of respondents on issues related to joint intellectual property ownership based on university student-generated intellectual property.</p> <p>Secondary Goal: To capture the philosophies of respondents on issues related to joint intellectual property ownership among partnering institutions and people.</p> <p>Audience (Institutions and Human Resources):</p> <ol style="list-style-type: none"><li>1. University (Faculty, Staff, and Students)</li><li>2. Companies (Owners, Management, and Employees)</li><li>3. Government (Federal, State, and Local Government Employees)</li></ol>
--

A description of the three sections is provided as follows.

### Section 1 – Demographics

This section provides questions on self-perception of knowledge on intellectual property issues, gender, ethnicity, what type of university the respondent attends (if a full-time student), and whether the respondent is a company owner or employee (if involved in a company full-time).

### Section 2 – Joint Intellectual Property (IP) Ownership

This is the most important section of the research instrument. A fairly thorough explanation is provided to the respondents to help ensure that they understand what information is being sought from the inquiry. The point of this section is to determine the respondents’ attitudes on joint IP ownership in a variety of partnership combinations. In the partnership scenarios shown in Table 2, it is assumed that the people on both sides of the scale contribute ideas, tools, financial and/or human resources to a specific project. Specifically, the respondents are told to assume that the party on the left-hand side initiated the idea for the project and formulated the problem statement (e.g., “We need to develop a more efficient fuel cell for zero-emission vehicles”), and they may or may not have provided tools, financial, and/or human resources to the party on the right-hand side. University students, university faculty, and company management are all considered idea sources for projects. The party on the right-hand side actually solved the problem (e.g., students and/or faculty who reduce the idea to practice in a university laboratory) and delivered that solution to the party on the left-hand side.

**Table 2.** Various partnership combinations on the joint IP ownership survey. The party on the left initiated the idea for a project and formulated the problem statement, and they may or may not have provided tools, financial, and/or human resources to the party on the right. The party on the right actually solved the problem and delivered that solution to the party on the left.

-3	-2	-1	0	+1	+2	+3
Univ. Students						Univ. Faculty
Univ. Faculty					Univ. Students in class project (not financially supported)	
Univ. Faculty					Univ. Students in class project (financially supported)	
Univ. Faculty				Univ. Students in extracurricular project (not financially supported)		
Univ. Faculty				Univ. Students in extracurricular project (financially supported)		
Univ. Faculty				Univ. Students as Research Assistants (not financially supported)		
Company Management					Private Consultants (financially supported by Company)	
Company Management					Company Employees (salaries paid by Company)	
Company Management					Univ. Faculty (financially supported by Company)	
Company Management					Univ. Faculty (not financially supported)	
Company Management					Students supervised by Univ. Faculty (financially supported by Company)	
Company Management					Univ. Students (not financially supported)	

The -3 to +3 scale listed in Table 2 was used by the respondents to indicate the appropriate distribution of IP ownership for each scenario, with the respondents circling one number that best represented their viewpoint on which partner has a greater claim to ownership. A value of 0 represents equal ownership between the two parties. A value of -3 designates that the party on the left-hand side (i.e., the idea generator and problem statement formulator) has exclusive ownership, while a value of +3 denotes that the party on the right-hand side (i.e., the problem solver) has exclusive ownership.

### Section 3 – Open-Ended Questions

While this section allows respondents to provide additional information, the main point of the current list of questions is to gather feedback and help refine the survey itself. The following questions will likely change as the survey is further developed and prepared for wide distribution:

1. What are your general thoughts on owning the ideas you create in class as a University Student?
2. Are there any other combinations of concept generation/problem solution scenarios that we missed?
3. Are there any other questions that we should have asked?

The next section describes how the survey was administered to University of North Dakota students in a convenience sample pilot study, with a presentation of the results. Observations and an interpretation of the preliminary results are provided as well.

### **3. Pilot Study Results and Interpretation**

The research instrument was distributed to three undergraduate classes at the University of North Dakota during the 2005 fall semester – one entrepreneurship course typically taken by sophomores, one entrepreneurship course typically taken by juniors, and one electrical engineering course taken exclusively by seniors. Survey results were tabulated, with percentages listed for the demographics, means calculated for the joint IP ownership scenarios, and all responses to the open-ended questions logged. The demographics of the classes offered the pilot study will be presented first, with their partnership perspectives and expectations to follow.

The first course, entitled Entr 200 Concept Generation & Technology Entrepreneurship, is a one-credit introductory entrepreneurship class co-taught by the authors every fall and spring semester. The academic catalog description for this course is given as follows:<sup>1</sup>

Entr 200. Concept Generation and Technology Entrepreneurship. 1-3 credits, non-repeatable. Technical Entrepreneurship is an introductory course for non-business majors to explore important foundational concepts of entrepreneurship, including technical feasibility, marketability, intellectual property (IP) protection, technology transfer, and venture initiation. This course is team-taught by one business school faculty member and one faculty member from a technology-oriented discipline.

This introduction to entrepreneurship has no prerequisites, so it is available to students from a variety of disciplines (e.g., atmospheric sciences, business, engineering, graphic design, nutrition and dietetics, etc.). The course targets sophomores, although a number of juniors, seniors, and even graduate students enroll in this class to learn more about entrepreneurship and the invention process<sup>3</sup>. The survey was handed out the very first day of class in August 2005, before the students were exposed to any concepts of entrepreneurship or intellectual property. The demographics of the course are provided in Table 3.

Note that the students were asked to rank their knowledge of legal issues related to intellectual property ownership<sup>2</sup>. Even without any training (as assumed by the instructors), many students felt that they had at least some knowledge of intellectual property issues.

**Table 3.** Entr 200 Concept Generation & Technology Entrepreneurship (Fall 2005) student demographics (N=26, mainly sophomores).

How do you rank your knowledge of legal issues related to intellectual property ownership?	
<u>0%</u>	Expert
<u>7%</u>	Very Knowledgeable
<u>63%</u>	Somewhat Knowledgeable
<u>30%</u>	Not At All Knowledgeable
What category best describes you?	
<u>96%</u>	University Undergraduate Student
<u>4%</u>	University Graduate Student
Gender:	
<u>67%</u>	Male
<u>33%</u>	Female
<u>0%</u>	Do not wish to respond
Ethnicity:	
<u>100%</u>	White/Caucasian

The second course, entitled Entr 302 Marketing and Management Concepts for Entrepreneurs, is a three-credit introductory class taught by Prof. Craig Silvernagel every fall semester. The academic catalog description for this course is given as follows:<sup>1</sup>

Entr 302. Marketing and Management Concepts for Entrepreneurs. 3 credits.  
Prerequisite: Entr 201 The Entrepreneur & the Economy or permission. This course is an introduction to the nature, significance and role of marketing and management in today's society. The main objective is to explore business functions from both management and marketing perspectives. By combining the two disciplines, this course provides the prerequisite understanding needed by non-business undergraduate students pursuing further education in business. It will point out the skills that managers must apply to meet crucial goals. Course will not count towards graduation if taken by a College of Business and Public Administration student.

This course is typically taken by non-business majors who wish to receive a certificate in entrepreneurship to complement their major disciplines of study. Junior-level students are the target audience; however, seniors and graduate students also enroll in this course. In this case, the survey was handed out at the end of the semester, after the students had already been introduced to general intellectual property issues through a lecture/discussion format. Table 4 shows the demographics of this class, which had a relatively small enrollment in the fall of 2005.



**Table 4.** Entr 302 Marketing & Management Concepts for Entrepreneurs (Fall 2005) student demographics (N=9, mainly juniors).

How do you rank your knowledge of legal issues related to intellectual property ownership?	
<u>0%</u>	Expert
<u>11%</u>	Very Knowledgeable
<u>89%</u>	Somewhat Knowledgeable
<u>0%</u>	Not At All Knowledgeable
What category best describes you?	
<u>67%</u>	University Undergraduate Student
<u>33%</u>	University Graduate Student
Gender:	
<u>67%</u>	Male
<u>33%</u>	Female
<u>0%</u>	Do not wish to respond
Ethnicity:	
<u>100%</u>	White/Caucasian

Note that the students in this class felt even more knowledgeable regarding IP issues than the students enrolled in Entr 200, even though they received only a single lecture on the topic.

The third course, which includes combined sections of EE 480/481 Senior Design I & II, is the capstone design experience for electrical engineering facilitated by Dr. Richard R. Schultz. The academic catalog description for this two-semester course sequence is given as follows:<sup>1</sup>

EE 480. Senior Design I. 3 credits. Prerequisite: Consent of instructor. First course in the two course capstone design experience for the electrical engineering undergraduate degree, emphasizing design methodologies, systems engineering, teamwork, and oral/written/interpersonal communications. Emphasis is placed on oral presentation and written report generation with critique.

EE 481. Senior Design II. 3 credits. Prerequisite: EE 480. Second course in the two-course capstone design experience for the electrical engineering undergraduate degree, emphasizing design methodologies, systems engineering, teamwork, and communications. Emphasis is placed on oral presentation and written report generation with critique. EE 481 satisfies three credits of the GER Communication requirement.

During the 2005 fall semester, the majority of the students were enrolled in EE 480 Senior Design I, with only three students finishing up the second semester of their capstone design experience. The survey was distributed to the students before they were provided with lectures and a discussion on intellectual property issues, with demographics shown in Table 5.

**Table 5.** EE 480/481 Senior Design I & II (Fall 2005) student demographics (N=20, exclusively seniors).

How do you rank your knowledge of legal issues related to intellectual property ownership?	
<u>0%</u>	Expert
<u>0%</u>	Very Knowledgeable
<u>89%</u>	Somewhat Knowledgeable
<u>11%</u>	Not At All Knowledgeable
What category best describes you?	
<u>100%</u>	University Undergraduate Student
Gender:	
<u>78%</u>	Male
<u>17%</u>	Female
<u>5%</u>	Do not wish to respond
Ethnicity:	
<u>5%</u>	Indian
<u>95%</u>	White/Caucasian

These students were seniors in electrical engineering, but they felt rather unknowledgeable about intellectual property topics that will affect them throughout their careers. The survey was not handed out a second time after the IP lectures were complete.

Table 6 tabulates the responses to the various partnership scenario questions. Several observations and interpretations are provided as follows:

- Mean values are relatively consistent from class to class, with the exception of the University Students as Research Assistants (not financially supported) scenario.
- In all cases, the mean was bounded to a fairly narrow range of [-1.3, 2.0], with an apparent skew towards the problem solvers rather than the idea generators/problem statement formulators. This can be interpreted as students not believing that IP is owned exclusively by either the problem statement formulators or the problem solvers, even when people are paid as company employees.
- The students seem to believe that university faculty do not bring significant ideas, expertise, or experience to the table. Frankly, this is quite disconcerting, but not terribly surprising. The preliminary results seem to indicate that students feel their tuition dollars are sufficient for providing institutional resources that can be used to refine their ideas.
- Financial support for students does make a difference, although much less than expected. In a scenario where university faculty formulate a problem that is solved by students, financial support reduces the level of student IP ownership indicated, but for the most part, the students still believe that they are the majority owners.
- When a company is involved in idea generation and problem formulation, the students seem to have the opinion that the financial support does provide company ownership, but certainly not to the degree expected by a company. The students are probably not aware that when they sign IP transfer, confidentiality, and noncompete clauses as company employees, they essentially give up all ownership of their ideas to the company.
- One critically important missing scenario is between University Faculty as idea

generators/problem statement formulators and University Students as Research Assistants (financially supported). This was an oversight by the research instrument authors, and it will be rectified in future distributions of the survey.

**Table 6.** Student survey joint IP ownership perspectives and expectations for various partnership combinations on the joint IP ownership survey (mean values shown in shaded cells). The party on the left initiated the idea for a project and formulated the problem statement, and they may or may not have provided tools, financial, and/or human resources to the party on the right. The party on the right actually solved the problem and delivered that solution to the party on the left.

-3	-2	-1	<b>Entr 200 N=26</b>	<b>Entr 302 N=9</b>	<b>EE 480/481 N=20</b>	+1	+2	+3
Univ. Students			<b>0.0</b>	<b>0.2</b>	<b>0.7</b>			Univ. Faculty
Univ. Faculty			<b>1.0</b>	<b>1.4</b>	<b>0.9</b>			Univ. Students in class project (not financially supported)
Univ. Faculty			<b>0.5</b>	<b>0.7</b>	<b>0.2</b>			Univ. Students in class project (financially supported)
Univ. Faculty			<b>1.4</b>	<b>2.0</b>	<b>1.2</b>			Univ. Students in extracurricular project (not financially supported)
Univ. Faculty			<b>1.0</b>	<b>0.8</b>	<b>0.5</b>			Univ. Students in extracurricular project (financially supported)
Univ. Faculty			<b>0.3</b>	<b>-0.6</b>	<b>0.7</b>			Univ. Students as Research Assistants (not financially supported)
Company Management			<b>-0.9</b>	<b>-0.8</b>	<b>-0.7</b>			Private Consultants (financially supported by Company)
Company Management			<b>-0.7</b>	<b>-1.3</b>	<b>-1.3</b>			Company Employees (salaries paid by Company)
Company Management			<b>-0.2</b>	<b>-1.1</b>	<b>-0.6</b>			Univ. Faculty (financially supported by Company)
Company Management			<b>1.0</b>	<b>0.7</b>	<b>0.8</b>			Univ. Faculty (not financially supported)
Company Management			<b>-0.5</b>	<b>-0.3</b>	<b>-0.7</b>			Students supervised by Univ. Faculty (financially supported by Company)
Company Management			<b>1.1</b>	<b>0.3</b>	<b>0.6</b>			Univ. Students (not financially supported)

Student responses are listed for the following open-ended question: “What are your general thoughts on owning the ideas you create in class as a University Student?” In particular, the most insightful, opinionated, or thought-provoking comments are shown in bold.

Responses from students enrolled in Entr 200 Concept Generation & Technology Entrepreneurship (N=26, mainly sophomores):

- **If I had the idea prior to joining the class, it’s all mine. Otherwise, I’m not sure.**
- Should belong in some part to me.
- If it’s that good, get it copyrighted, or if even better, trademark it.
- **The ideas I create belong to me, and no one else.**
- Depending on how much effort students put into the class/project, the student would get the IP.
- **I think that if you do the work, then you should get the credit.**
- **Two fold, without the university professors the thought may not have sparked, then again it may have. Students should have the rights to ideas created in class, we should be treated as equals.**
- Ideas are the students’ unless permission to use them is granted from the student.
- If I think of a better mouse trap or a longer lasting light bulb or something I’m taking it to the bank and naming it after me. If I think that mentioning my idea in class will have me seeing it in a WalMart aisle in a month without me getting any credit, I’ll just be nice and quiet about it.
- I feel if I put all the work and energy into my original idea than it is solely mine. If I was helped financially, I can see part of the outcome the university’s ownership.
- I believe that if an idea that was created and/or presented in class was completed by a student solely then it should be their right to have control over the idea, and what is contributed to the success of the idea.
- I think it depends on the situation, who helped create the idea, and where the influences came from.
- I think that if you’re the one who managed to solve a problem, you should get the majority of the credit. Also, some should go to those who provided you with the resources/facilities.
- I believe if you worked hard on those ideas and they were not the university’s ideas, then the student should have full rights to them.
- I think they should be mine unless otherwise noted. It would be pretty shady if another student or professor took my idea away from me and ran with it.
- **Ideas of individuals or groups are the personal property of the group or individual. However if they are working on a task force for someone else, and being compensated, then they are partially the compensator’s property.**
- **I think that if I have an idea and pursue that idea, I should get all the credit; financially and otherwise.**
- **I feel that ownership very much belongs to the person who comes up with the solution, with credit also going to the others involved, but to a lesser extent.**
- They should be the property of the creator.
- **I think that the ideas created by one person should be their own unless paid to create these ideas by someone else...or have agreed to their use out of class.**

- If I have the ideas and nobody else developed them, I would want to own them completely.
- **I feel we have ownership of the work that we do in class.**
- **This depends on the level of support by the university, by financial or faculty help.**
- You don't really own your ideas.
- **What is the process for owning your idea, cost, paperwork? How do you sell your ideas? It is important to show students the value of their ideas.**
- I believe that if a student has an idea in class that others are capable of acting upon them...the ownership should be equal. I do believe, however, that the acting party should ask or at least let the student with the idea know of their plans and perhaps offer to include the person with the idea in the product.

Responses from students enrolled in Entr 302 Marketing & Management for Entrepreneurship (N=9, mainly juniors):

- Whoever solved the problem should own the idea. Part ownership should go toward the university.
- **If you are challenged by a professor with a potential problem, and if you solve the problem, the student cannot take full credit for the sole development of the solution.**
- I think in any situation students should be able to share in some part of the ownership, especially if they were supported financially in some way.
- **All my ideas should belong to me. If financially supported, the level falls.**
- Depends on who generated the problem and where and how the solution was attained.
- **If you have ideas you feel are revolutionary and valuable, it is your responsibility to shelter those ideas from other sources who you feel might harvest your ideas. This is a trick to do in a university setting, where your ideas are constantly flowing to other sources.**
- As a student, I feel that students' ideas should be their own if they did it on their own and not as a part of school. But I know that anything developed in school they can have no matter if they are helped or not.
- **We own them. Our teachers have not funded our ideas in any way, we are paying to be taught by them.**
- Keep them to yourself and document every possible thought until you graduate.

Responses from students enrolled in EE 480/481 Senior Design I & II (N=20, mainly seniors)

- **The idea of owning an idea is really pretty sketchy. Just because you think of something, doesn't mean you have the means or know how to profit from the idea.**
- I realized that I did not own a lot of ideas that I have come up with.
- I think ideas can be categorized as ideas which will benefit humanity or ideas which will be lucrative to a specific party. The former should always be knowledgeable in the domain. The latter may be used to generate money.
- As a student I believe that we should have a majority of ownership of our ideas, but a portion of ownership should be given to the university.
- I own most of my ideas. If the university is funding my project, it is probably a split. If it is my own money and idea, I have to claim it, unless I patent it.
- If a student comes up with a creation as a part of class, they should be entitled to it.

- **The student should have the right to IP he/she creates. This, however, could be an issue because most likely the student used university equipment.**
- I should have a larger percentage of ownership. If the idea is funded by the school, than the school should have more ownership.
- If documented, most IP ownership credit given where credit is due.
- **As a student, I haven't signed anything so as long as nobody else is shelling out the cash it's mine.**
- As a student, I think most, but not all, ideas would likely be the ownership of the department or faculty. Credit should be given to students involved.
- **If a basic idea is given to the student, who then designs and creates the project from nothing to a finished product, then the students deserve a lot of the credit.**
- We should retain all rights and ideas generated by us.
- If my advisor wants to own the ideas, that's fine, as long as my name is attached with the ideas.
- **The solution to the problems we solve are usually directed by a faculty member and without guidance the student may be totally in the dark. If this is the case, than I believe the faculty has just as much right to the solution.**

From these comments, there is no doubt that, in general, students believe they own their ideas. This is not necessarily bad, as long as they understand and appreciate the importance of partnerships and joint IP ownership. As university faculty, however, it would probably make us feel better about our contributions to their education if they gave us more credit and really did consider us experts in our disciplines. In an era of software and digital music piracy that is completely accepted by modern university students, it is apparent that students believe either their ideas are open to all (i.e., open source movement), or that their ideas belong exclusively to them. Maybe we have moved from Generation X to Generation Y to "Generation iPod."

#### 4. Service-Oriented Innovations

Most university technology transfer and commercialization offices help faculty patent their innovations and either start companies to manufacture the invention or license the technology to established businesses in appropriate market channels with the resources available for further development<sup>3</sup>. All innovations that emanate from a university environment do not necessarily have the potential to be protected through patents, however. In fact, the authors conjecture that service-oriented innovations resulting in new retail establishments or business processes actually have a greater potential to generate positive cash flow in the timeframe of an undergraduate or graduate education. The upside might not be as high, but the cost, risk, and barriers to entry are often lower. These types of service innovations require the development of branding materials (e.g., logos, taglines, etc.) that may or may not have the ability to be protected through trademarks, but which help create unique selling positions for the business concepts. The following narrative is an interesting investigation of the boundary between a conscientious faculty member mentoring a student in the classroom and that same faculty member serving as a nonpaid consultant when the student needs marketing assistance in order to take a service-oriented innovation to the marketplace outside the university. The anonymous case study presented here is an actual experience stemming from a venture initiation class, and it has been

taught in several courses to help students understand the roles of all partners affiliated with a particular project.

Most entrepreneurship programs include a venture initiation/business planning course where students are challenged to conceive and develop a novel business concept for potential execution. As part of the teaching process, most faculty members help students first refine and improve their business concepts, and then properly prepare and present these concepts as business plans. Through experience with the venture initiation classroom environment, several important issues regarding the dividing line between professor/mentor and paid consultant have arisen as faculty work to help students commercialize their ideas.

As part of a venture initiation class, a student created a concept for the delivery of a niche/specialty service to an open market space. While the service itself was not novel, the student and faculty member both believed its market placement and growth strategy were novel and contained significant harvest potential. In this case, the faculty member teaching the venture initiation class happens to have significant private sector business experience in helping startup businesses develop branding materials (i.e., company name, logo, creative platform, marketing plans with media buying schedules, etc.). The student, knowing the background of the faculty member, asked for support in developing critical branding materials for the classroom-generated concept. The regional fair market value of the brand development services ranges from \$5,000 to \$10,000. Wanting to help the student find success and having knowledge of the student's limited financial resources, the faculty member agreed to help refine the business name and "brand," effectively developing the logo, public signage, and tagline/positioning statement. These items constitute the bulk of a branding package and are critically important for this niche business, since the service itself is not novel. In this particular case, the company's value is almost entirely dependent on the marketing of the brand and its trademark protection. The faculty-developed branding package was implemented and opened to strong reviews as the venture began. While many factors will ultimately play a role in the future success of this venture, the branding materials created by the faculty member in this case will definitely play a significant role in the harvest value of the business.

This case study raises several important questions regarding the faculty/student advising relationship. Where is the dividing line between professor/mentor and consultant? If faculty support moves outside the scope of teaching/mentoring, how should it be administered (e.g., as a consulting fee in the short-term or as equity over the long-term)? What responsibility does the faculty member and/or university have in providing support to the students, and how can they be effectively managed and applied in widely varying circumstances? Although there are no unique answers to these questions, the authors believe a reasonable solution lies in the fundamental framework questions concerning who identified the problem or opportunity, who solved the problem or figured out how to exploit the opportunity, and what resources were utilized. One key aspect of managing university and student-driven IP effectively and fairly involves an open discussion about potential conflicts of interest and commitment that also come into play in these types of situations. The authors also believe that the faculty member and the university should share in the profits and harvest of a successful student-initiated venture when it was created with university resources, which include a substantial portion of the faculty member's time, expertise, and professional network.

## 5. Summary and Future Directions

Significant further development will take place on the research instrument, as student-generated intellectual property is a fruitful area for discovery. First and foremost, some of the student responses about what could be improved will be used to refine the survey:

- Please be more clear on what constitutes owning an idea.
- The survey could be a bit easier to understand and interpret.
- Perhaps example scenarios would help us understand the survey better.
- Government versus non-government funded projects could be included.
- Include questions in the beginning about what best describes the person taking the survey (field of study, type of work, etc.).
- Maybe include a question on what type of field we are going into.
- Include more information on company employees in the survey.

Certainly, we need to include the level of education as a demographic question, as well as the year in school for university students. We also must make sure that people list themselves as (mainly) full-time university students, full-time university faculty, or full-time company employees. This was a point of confusion for the student respondents. Additionally, better statistics must be compiled for the survey results, and this must be taken into consideration as the research instrument is modified.

Another important consideration is taking into account the amount of resources that have been contributed to the problem solvers by the idea generators/problem statement formulators. This factor must somehow be incorporated into the research instrument. Some questions related to the level of financial support from the sponsor would certainly be useful, because this could affect the level of IP ownership by both partners.

Most significantly, we would like to expand the survey to explicitly include other forms of intellectual property besides patents. In particular, branding materials for service-oriented businesses should be included as a viable option, since these types of business plans can actually be executed rather quickly after the students have completed their venture initiation or capstone design course.

Finally, the modified student-generated IP survey will be pilot tested on a larger scale, using students and faculty within the 11-campus North Dakota University System. Based on the feedback from this much more extensive test-run, the survey will be administered on a national scale using a probability-based sampling technique. Targeted areas of the country will include Silicon Valley in Northern California, Route 128 in Boston, Research Triangle Park in North Carolina, and the Red River Valley Research Corridor in North Dakota, South Dakota, and Minnesota.



## Acknowledgments

The initiation of the student-generated intellectual property research project was made possible with financial support from the North Dakota Small Business Development Center (SBDC) and the UND College of Business & Public Administration.

## Bibliography

1. Academic Catalog 2005-2007, University of North Dakota, Grand Forks, North Dakota. University Office of the Registrar and the UND Graduate School, vol. 97, issue 3, July 2005.
2. M. Thomas Arnold, George Vozikis, and Claire Cornell, "The Legal Bridge between Business and Engineering." In *Proceedings of the National Collegiate Inventors & Innovators Alliance 9<sup>th</sup> Annual Meeting*, pp. 249-261, San Diego, CA, March 17-19, 2005.
3. Maurice Kanbar, *Secrets from an Inventor's Notebook*. Penguin Group, Inc., 2001.
4. Dr. Steven P. Nichols, Associate Vice President for Research, Clint W. Murchison Chair of Free Enterprise, and Professor of Mechanical Engineering, The University of Texas at Austin. Telephone conversation, July 27, 2005.