

Supporting Sustainable Innovation with Information: A Case Study

Heather A. Howard
Purdue University
howar198@purdue.edu

David A. Zwicky
Purdue University
dzwicky@purdue.edu

Abstract

At Purdue University, librarians advise students participating in a soybean innovation competition. The project, sponsored by a qualified state board, focuses on developing new industrial products from soybeans to foster environmental stewardship and reduce reliance on petroleum. In order to progress through the competition, products must be shown to have environmental benefits, technical benefits, feasibility, and novelty. The early stages of the competition require students to investigate and report on the marketability and patentability of their inventions. In order to complete these reports, groups meet with a business librarian and a patent librarian. The business librarian consults with the students on how to conduct market research, and discusses concepts such as performing a market analysis and determining a target market for their products. The patent librarian consults with the students on intellectual property and the United States patent system, demonstrating basic patent searching methods and recommending patent searching tools appropriate to the students' level of expertise. In 2016, the librarians redesigned assessment rubrics for both the market analysis and patent search reports, in order to better align project outcomes with relevant learning objectives. Feedback from students and program coordinators was positive, showing clearer understanding of research reporting requirements. Anecdotally, the winning team met with both librarians multiple times through the course of competition, ensuring they understood both business and patent research methods. This form of interdisciplinary collaboration, while specific to this competition and this university, could be a model for other institutions to consider when working with sustainability-related innovation and agricultural commercialization programs.

Introduction

Since its inception in 1994, the annual Purdue University Student Soybean Innovation Competition has created a path for students to innovate and create new uses for soybeans. Soybeans are significantly better for the environment than the polycarbonates they often replace, offering a sustainable alternative for many products. The competition encourages environmental stewardship in industry through the identification, development, and commercialization of new soy-based products, designed to reduce our world's reliance on petroleum. The use of renewable resources is crucial for future economic growth, as petroleum resources are dwindling and consumers demand products that are environmentally friendly. This competition has been a cross-disciplinary and multi-departmental effort throughout the university to support the students' innovation. Agriculture information is used throughout the competition in a myriad of ways, including understanding the ways soybean components can be used, determining the market and impact on soy production, and in creating the product itself. Librarians are heavily involved in assisting the students in gathering and using this information, particularly in the first two areas mentioned.

Background

Invention and innovation competitions are widespread on college campuses, whether homegrown, such as Georgia Tech's InVenture Prize, University of Utah's Bench2Bedside Competition, or University of Nevada, Reno's Sontag Entrepreneurship Competition, or part of larger initiatives like University of Alaska Fairbanks' Arctic Innovation Competition or the national Collegiate Innovation Competition. The scope of these competitions vary, from business plan creation to product design to, in recent years, app design. Library support for these competitions is anecdotally common, but poorly documented.

Academic library support for entrepreneurship and innovation takes several forms. Librarians support entrepreneurship-focused curricula within engineering and business schools

(Kirkwood & Evans, 2012) and frequently have relationships with business incubators, centers for student entrepreneurship, etc. (Hoppenfeld & Malafi, 2015). Libraries are frequently also partners in community entrepreneurship programs, such as the Entrepreneurship Bootcamp for Veterans with Disabilities (Hoppenfeld et al., 2013), which currently has ten participating campuses across the United States. Libraries are also increasingly involved with makerspaces on campus, serving as a shared space welcoming to all disciplines (Barnett et al, 2015).

The Soybean Innovation Competition was founded in 1994 as a collaboration between Purdue University's College of Agriculture and the Indiana Soybean Alliance (ISA). The Soybean Alliance provided funding and received new ideas for soy-based products, generated by enthusiastic student inventors. Purdue students had the opportunity to experience the product development process firsthand. The first winner of the competition was a soy-based crayon product, which was licensed by Dixon Ticonderoga and is currently produced under their Prang brand ("Spreading their wings," 2002). The competition was briefly co-sponsored by the Indiana Corn Marketing Council (ICMC), with the idea that students could choose to invent new products using either corn or soy. That partnership was, however, short-lived.

In the last five years, more rigor has been brought to bear on the competition, with clear and well-defined phases of competition, the increased involvement of external experts from the Purdue Libraries and the Purdue Research Foundation, and the addition of a mid-project elimination round to weed out teams unlikely to complete their competition entries. This has also coincided with increased partnerships with other campus units, including the Libraries.

History of the Libraries' involvement

The Soybean Innovation Competition first came to the attention of the Libraries in 1994-95, after the first year of competition. The winning team had produced a soy-based crayon product, and one of the engineering librarians at the time, who also covered patents and trademarks, approached the program administrator about improving student outcomes through better patent searching. This collaboration continued over the next two decades, and grew to involve librarians from the Parrish Library of Management & Economics, who were able to work with students on the market research component of the competition.

Although Purdue Libraries has been involved since the mid-1990s, the past few years has seen an increase in the number of in-depth interactions with participants in the competition. The librarians previously involved in the competition found that the number of participant consultations was directly related to the emphasis the competition director put on the importance of meeting with the librarians. While this ebbed and flowed over the years, the current director, Michelle Creech, is diligent in highlighting the importance of research consultations with the student groups, so we have seen a dramatic increase in appointments.

Competition Specifics

As currently constituted, the competition begins near the start of the academic year, and its first phase, recruiting students and forming teams, takes place in October. While the majority of the students come from Purdue's College of Agriculture, students from disciplines across the university participate. The competition's second phase covers the ideation process, in which students propose and test the commercial viability of their soy-based products. This is where the students do patent research, market research, and otherwise gather information about their idea, and it typically runs through the month of November. The third phase, determining technical feasibility of the product, runs through December and early January. The teams spend the bulk of this time in a lab, attempting to create workable prototypes. After this phase, there is a preliminary judging round, in which teams unlikely to finish the project are eliminated early.

Finally, the fourth phase, from late January to the end of February, sees the remaining teams complete their prototypes, work on packaging concepts, and develop their final reports and presentations.

In early March, the student teams present their completed projects to a panel of judges, assembled by the ISA. These judges vary from year-to-year, but are typically a mix of technical experts, farmers, and agribusiness executives. The teams are judged based on their reports, presentations, and prototypes, with the judges often focusing on the commercial viability of the product (i.e. how many soybeans will this sell). The winners are announced at a special awards ceremony organized by the ISA, coupled with an ersatz trade show in which all teams are able to pitch their products to various stakeholders. The winning team receives \$20,000 and support from the ISA for commercializing their product, the second-place team receives \$10,000, the third-place team receives \$5,000, and the remaining teams receive a variety of rewards and incentives for participating. It should be noted that teams placing outside of the top three still have the option of pursuing commercialization. In 2016, five teams, out of the sixteen that finished their projects, filed provisional patent applications for their inventions.

All students who complete the competition qualify to apply for the ASPIRE (Ag Soy Product Innovation Realization & Entrepreneurship) internship. This is a paid 11 week summer internship that allows students to continue working on their soy-based products while receiving entrepreneurial and commercialization support from the Purdue Foundry, part of the Burton D. Morgan Center for Entrepreneurship (ASPIRE, 2018). Additionally, students who complete the competition can apply for funding through the Purdue Ag-celerator specifically earmarked for products coming out of this competition. This product development internship has been so successful for the students in the soybean competition, it is now being replicated in Purdue's engineering departments.

In support of the competition, business librarian Heather Howard and patent librarian Dave Zwicky, the authors of this paper, attend the first large meeting where students learn more about the details of the project and the resources available. Each librarian speaks briefly and encourages the teams to make individual appointments to learn how to most effectively conduct market research and perform a basic patent search. This results in each librarian meeting with approximately 30 teams between the start of the competition in mid-October through the deadline for their initial research submission in December prior to winter break. Additionally, many teams make a second appointment in the spring semester as they are finalizing their projects.

Market Research

Market research support for the competition is provided by a business librarian who's liaison areas include Marketing and Agriculture Economics. The current business librarian working on the project, Heather Howard, joined Purdue in 2016. At that time, Howard evaluated the existing rubric used by the judges to evaluate the market analysis component of the project. The program director had provided feedback that the rubric had been vague, and a bit confusing to students, so a redesign was needed. Howard created a newly revised rubric with more specific descriptions of what constitutes satisfactory research in each of the areas and clarified expectations. The revised rubric can be seen in Appendix 1. Students are required to score at least 90% on their market analysis in order to move forward in the competition.

After the competition begins in October, student teams schedule consultations with the business librarian to begin their market research. The students are required to perform a market analysis that includes identifying existing products on the market, the advantages and limitations of the product, target market demographics, potential market size, product price for marketing and manufacturing, discusses the potential for commercialization by existing companies, and highlights the potential impact on soybean utilization. The students in the competition are

primarily from STEM backgrounds and majors, and have not done business research prior to the competition. The consultations include the basics of market sizing, market and industry research, company research, and frequently involve ideation. STEM students are often uncomfortable with the ambiguous nature of business research, and have to be assured that there is no direct formula to determine market size, but that they instead must do what is, effectively, educated guessing. Howard works with them to create a model for evidence-based decision-making within the scope of their project. Students must also learn that the specific business information they want is not always available. Market reports are not created primarily for academia, but rather for businesses that buy them individually. Though the library has access to a large number of these types of reports through academic database packages, we are not the primary market for these vendors, and they may not have created a report for the specific niche the students want. If unavailable, students are shown how to use reports on related or tangential markets and industries to extrapolate information useful to their own market analysis.

Patent Research

Patent research support for the competition is provided by the Libraries' representative to the United States Patent & Trademark Office's Patent & Trademark Resource Center (USPTO PTRC) program. The current librarian representing Purdue in the PTRC program, since 2014, is Dave Zwicky. He also supports Chemistry and related disciplines in Purdue's College of Engineering and College of Pharmacy. When beginning work with the Soybean Innovation Competition, Zwicky found that the existing rubric for evaluating patent searching focused on "proving" that an invention was patentable. This was deemed unrealistic given the scope of the competition and replaced with a rubric (see Appendix 2) that focused on effective patent search strategies and explaining the results of the search.

Each student team is asked to meet with the patent librarian, in order to give them a basic understanding of the patent searching process. Students, whether technically adept or not, often have trouble understanding patent searching. Patents, due to their extreme use of jargon and legal language, are difficult to search using basic keyword searching methods. As such, students must learn to search using a hybrid system of keyword searching and classification searching, making use of the USPTO's classification system. However, there are differences between what students are expected to determine for this competition and a formal patentability search. A true patentability search, using USPTO methods and resources, can take weeks, and actually parsing patent claims would require a higher level of technical and legal sophistication than one can reasonably expect from undergraduates. Instead, students are taught to search using a variety of tools (subscription database Derwent Innovation Index, free international database Espacenet, free and independent database Lens, and the inescapable Google Patents), mixing and matching search methods to triangulate on relevant classes and then using those classes to find potentially relevant patents. Students often find it helpful to think of this as an iterative process, using keywords to find classes, using classes to find patents, using patents to find better keywords, and so on.

Discussion & Conclusion

Through our experience of being embedded in the competition, we have been able to work with hundreds of students at various points in their academic careers. Often, students will compete in multiple years, giving us the opportunity to build information literacy skills over time. The combination of agriculture and business information is particularly effective in helping to create innovative and sustainable products with soy.

The work librarians have done with this competition is only a small piece of the larger entrepreneurial landscape across campus, wherein librarians offer support in a multitude of ways. For example, the ASPIRE internship available to the students who complete the soybean is run through the Foundry, part of the Burton D. Morgan Center for Entrepreneurship. Librarians already work with the Center and Foundry in a train-the-trainer capacity, as well as meeting with individual and groups of entrepreneurs. The Center also offers a certificate in entrepreneurship, which includes courses in which a librarian is significantly embedded. These programs, and others, create an information ecosystem wherein libraries and librarians play a central role. No matter the path an entrepreneur takes at Purdue, they are almost certain to learn about the valuable resources we can provide.

This competition offers a rich opportunity to assess the impact of library intervention on the information use and decision-making practices of the student participants. We have just completed two mini focus groups designed to inform a larger assessment project they hope to implement in the 2018-2019 competition. With this information, we will be able to better understand how students are gathering and using information in the context of the competition. It is our hope to further refine the ways in which we work with students to have the highest possible impact. We would like to encourage other librarians to look for similar innovation competitions on their own campuses in which they could become involved. Working with these student groups offers a rich opportunity to teach information literacy in a context where the value is immediately visible, not only to the students, but also to the competition staff, judges, and the community.

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Appendix 1
Market Analysis Rubric

Categories	17	14	10	0
Industry Analysis	Indirect competitors identified. Outlook for industry and opportunities and threats provided	Similar products available. Competitive advantages listed and explained, outlook for industry and opportunities and threats provided	Similar products available. Competitive advantages listed, but not explained	No industry analysis provided and/or identical product already on market
Product Analysis	Advantages and limitations of product are clearly defined and well-reasoned	Advantages and limitations of product are given, but somewhat unclear or incomplete	Advantages and limitations of product are unclear, hard to understand, and very little detail is provided	Advantages and limitations of product are not identified
Market demographic and volume	Reasonable estimates of market potential and demand are provided and clearly stated. Target market is identified, explained, and reasonable	Estimates of market potential and demand do not show an adequate market for product. Target market is provided, but not explained or reasonable	Estimates of market potential and demand are missing or clearly miscalculated. Target market is missing, or if identified, not appropriate	No market identified
Price	Objectives of pricing management are clearly stated and appropriate. Tactics for managing price are clearly identified and reasoned	Objectives of pricing management are given, but somewhat unclear. Some detail on tactics is missing	Objectives for pricing management are missing. Tactics are unclear, hard to understand, and very little detail is provided	Price prohibitive to manufacture or no price information provided

Summary	Summary is clear, concise, and effective. Provides a thorough overview of the information, and fully outlines and describes main points	Summary provides a satisfactory overview. Summary is missing a few minor points, but meets expectations	Summary does not present a clear overview. Main points are not outlined or cannot be understood	No summary written
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Appendix 2
Patent Searching Rubric

Categories	20	16	12	0
List of sources used	Multiple sources used, combining government, free third-party, and proprietary tools	Multiple sources used, combining government and free third-party tools	Multiple sources used	Only one source used
Keywords & classifications searched	Extensive keywords and classifications searched	Multiple keywords searched, with synonyms; multiple classifications searched	Basic keywords searched; one classification searched	Only one keyword and/or one classification searched
Items found that are the same as or similar to your product	No exact matches found, your product idea's differences with existing prior art are explained thoroughly	Close matches found, your product idea's differences with existing prior art are highlighted	Very close matches found, your product idea's differences with existing prior art are mentioned	Exact matches found, your product idea's differences with existing prior art are not discussed
Summary	Excellent, well thought out summary	Good summary including relevant information	Summary is not well organized or thought out	No summary