

ENTREPRENEURIAL PRODUCT DESIGN AND MARKETING: A Student Design Competition Focusing on Market Feasibility

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Abstract

With a high percentage of products failing in the marketplace within a short period of time, it is essential that students learn to determine market feasibility and incorporate this research into their design process while developing new products. A junior/senior-level industrial design course is redesigned to include a strong emphasis on market research. Before a new concept is designed or prototyped, market demand is assessed to validate the need for the product and begin to define the overall design of its features and benefits. This real-world design approach will ultimately increase the potential success of the product in the marketplace before students proceed with their entrepreneurial ventures. Students pitch their innovative concepts in a final presentation competition to a large panel of judges made up of successful, high-profile community entrepreneurs, engineers, industrial designers, academicians, venture capitalists, and alumni to garner real-world feedback.

Introduction

Experiential learning in innovation and entrepreneurship has spread outside of business schools and moved into the fine arts, science, and engineering programs...Competitions are an excellent way to actively engage faculty and students in the learning process. As a whole, business plan competitions are geared toward teaching students how to think outside the classroom, fostering collaborations across disciplines and increasing access to businesses. Competitions provide an exciting platform for students to learn practical skills, such as how to craft a business plan, access venture funding, and pitch ideas. (US Department of Commerce 2013, 19-20).

Business plan competitions, entrepreneurship competitions, and feasibility competitions help universities stimulate entrepreneurial activity within the community and attract new entrepreneurial talent to the region (Huffman and Quigley 2002). Businesses and alumni are attracted to participating in the university culture by volunteering as judges, mentors, business coaches, sponsors, and advisors to the students in a collaborative effort to provide students valuable learning experiences that will help them succeed in the workplace (Bozward 2013). Interest in entrepreneurship at universities has seen a dramatic increase in the past thirty years. Entrepreneurship courses offered at college campuses have grown twentyfold since 1985, from 250 to 5,000 courses offered in 2015 (Morelix 2015). In 2009, the National Advisory Council on Innovation and Entrepreneurship was created as part of the implementation of the "America COMPETES Act," which was designed to promote and invest in innovation through research and development, and to improve the commercial competitiveness of the United States in a global marketplace. With innovation being a key driver of economic growth in the United States (US Department of Commerce 2013, 4), and industrial design being an important driver of innovation, this project has potential to have a great impact on students' future success as designers.



In professional practice, industrial designers and marketing professionals often work collaboratively during the product development process. During a typical industrial design student's education, however, exposure to the marketing discipline is limited. Industrial design students learn how to design a product, but they might lack understanding of why they are designing a product (Caston 2015). Since a majority of products fail within the first five years on the marketplace (Castellion and Markham 2013), it is especially important to integrate an emphasis on market research into the product design curriculum so students are equipped to design market-feasible products when they enter the workplace. A junior/senior-level industrial design studio course was recently redeveloped to include entrepreneurial product design elements and in-depth exposure to intensive market research through a comprehensive design project. Students conduct market research that includes:

- Consumer research (customer interviews and surveys)
- Trend analyses (cultural, socio-economic, technological, political, industry, etc.)
- Competitive product analyses
- SWOT analysis
- Survey of existing patents
- Defining distribution channels
- Ranking features and benefits
- Evaluating materials and manufacturing processes
- Determining costs of production

Students apply their market research to their individual entrepreneurial design projects by validating the market demand for their concept while engaging in the product design process. This project framework allows for market-driven design decisions to be incorporated into the design at each stage. At the completion of the project and as a competition, students pitch their

concepts, backed with convincing market research, to a panel of high-profile community leaders including entrepreneurs, engineers, industrial designers, academics, and venture capitalists. During this competition, the panel of experts judge the student concepts, determining whether or not they are succeeding in validating the need/demand for their product ideas as well as the feasibility of producing that product and selling it in the marketplace for a profit.

Background

This junior/senior-level project is titled "New Product Development Market Feasibility." It is an entrepreneurial product design project in which students choose one of their existing ideas from their "idea" notebook and iterate on the concept through informed market research. The notebook is a collection of ideas and sketches of new products and solutions to problems that each student is encouraged to record daily and contribute to throughout their college career and beyond.

Project Format

At the beginning of the semester, students choose twenty product concept sketches from their idea notebook that they originally recorded when they thought of a product to address an observed problem. These are concepts that students are particularly passionate about, believe could eventually be a marketable and successful product, and want to continue to develop. Each student presents their twenty concepts to their peers in the form of a class critique. The class then discusses each concept and, through vocal consensus, selects three concepts for the student to further ideate. The selection criteria includes concept uniqueness, market feasibility, and how knowledgeable and passionate the student is about the industry the concept falls under.

Students are then given two weeks to continue developing their three remaining concepts, research any new concepts they

might want to introduce, and conduct a primary feasibility analysis. This analysis includes developing an outline of the pros and cons of competitive and complementary products, identifying market segmentation, exploring existing patents, and producing more iterations of each concept. The iterations are explored through sketching. These sketches, along with the cursory market research, are presented during a second class critique. During this subsequent critique, students are encouraged to “sell” their ideas to their classmates in an attempt to sway their peers into selecting favorite concepts. The class then debates the merits of each of the three concepts. By show of hands, one concept is chosen for each student to focus on, conducting more in-depth research and prototyping moving forward.

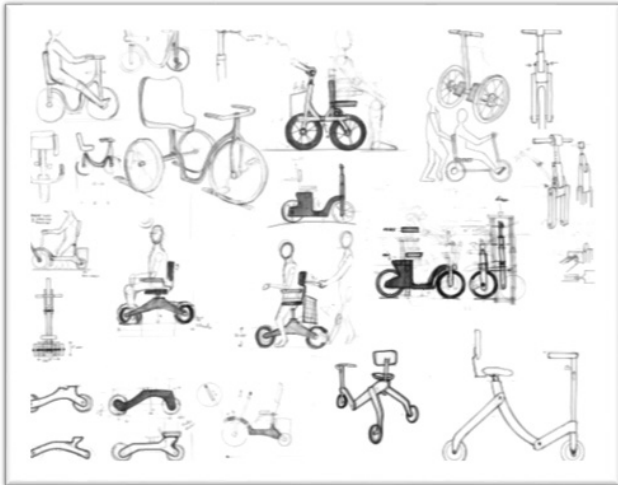


Figure 1. Sketches of Assistive Tricycle design by student Leah Rich.

While the students are preparing to conduct additional research and continue to develop their designs, guest lectures and in-class exercises help deepen their comprehension (Gleeson n.d.). Guest lecturers discuss topics related to patenting, defining a target market, marketing a product, design for production, sustainability, and the holistic product development process.

Students are also assigned readings from several books with topics related to market

research, marketing, entrepreneurship, observation, sustainability, and business plan writing. A sample of the readings include:

- Purple Cow: Transform Your Business by Being Remarkable (Godin 2009, 2nd ed.)
- Well-Designed: How to Use Empathy to Create Products People Love (Kolko 2014)
- Observational Research Handbook: Understanding How Consumers Live with your Product (Abrams 2000)
- Universal Methods of Design: 100 Ways to Research Complex Problems, Develop Innovative Ideas, and Design Effective Solutions (Martin and Hanington 2012).



Students begin their primary research by developing and distributing surveys to one or more targeted audiences. In trying to identify and focus in on their target market, students gain unique insights into which aspects of their design problem were most important to their intended users (Caston 2015). Students also spend time outside of the classroom in order to conduct one-on-one interviews, fly-on-the wall observations,

shadowing, design ethnography, simulation exercises, focus groups, and competitive testing (Martin and Hanington 2012). Since the design problem each student was working on is unique to them, they have the opportunity to choose from a large spectrum of primary design research methods in order to gather information and identify design opportunities.

Students conduct secondary research in addition to their primary research. Secondary research is accomplished by reviewing publications specific to their product area, as well as websites and databases containing statistics in their product's industry, environment, manufacturing methods, materials, competitor benchmarking, socioeconomic data, federal regulations, etc. Some of the online databases available to students include: ibisworld.com, statista.com, census.gov, fedstats.gov, sec.gov, hoovers.com, and cpsc.gov (Caston 2015). As students continue their market research, they begin to organize the data they are discovering in order to interpret it, and develop very specific insights about the market to guide their design process (Kolko 2014).

Panel Presentation

One of the required final deliverables for this project is a twelve-minute formal presentation in which students pitch their research and design work to a panel of guest judges through a format similar to the television show "Shark Tank" (Griffith 2015). Students' presentations are scored on several factors, which include how well they conduct their research, the quality of the product design, how well they demonstrate the market feasibility of their concepts, and how well they tell the story (Figure 2). The panel of judges also has five minutes in order to ask questions and provide verbal feedback.

I. CONTENT

1. Problem Statement - How well did the student explain the problem? Did they convince you that it is a worthwhile problem to tackle?

2. Primary Research - How well did the student go out into the field and actually talk to potential customers and industry experts to gain feedback and direction? Was this well-documented?

3. Target Market - Was the target market accurately defined or was it too broad? Did the student focus in on the correct market?

II. THE NUMBERS

4. Industry Analysis - How well did the student perform the industry analysis? Did they discuss the industry size, number of competitors, trending upwards or downwards, etc.? Did the student communicate the data graphically?

5. Costs and Price Point - Did the student obtain quotes and/or provide estimates for manufacturing their product? Did they discuss the retail price? How did they arrive at this number? Were their numbers justified with research?

III. CONCLUSION

6. Feasibility - Is this concept feasible? Is it a good idea? Did the student discuss future considerations and next steps for further research and refinement?

7. Presentation - Rate the overall presentation. How well did the student present the content? Was the format appropriate? Did the visuals/graphics make sense? Was there too much text on the slides? Did the verbal component flow well? Did the student make eye contact with the audience? Was the presentation engaging? Was the student upbeat and positive?

Figure 2. Rubric for "Shark Tank" Judges (scored on a scale of 1-10 with space for comments).



The Panel of Judges

The formation of judging panel begins with a survey of the industry professionals within the surrounding community. Candidates are high-profile leaders with a variety of backgrounds, including industrial design, engineering, manufacturing, business, marketing, entrepreneurship, academia, and venture capital, as well as program alumni. Each panel member that is invited to participate is carefully selected based on their unique professional profile (specific expertise in their fields) as well as their dedication to helping educate future designers. Several of the panel members have an existing relationship with the industrial design department. The total number of judges for the panel is twelve. The competition is held over two days.

Students are given names and biographies of each of the judges several weeks prior to the competition. Students are encouraged to research the background of each of the judges to find out as much as they could about who they will be addressing. This is important for two reasons. First, students can relate the product concept that they are proposing to other activities and interests that the judges have, which could enhance

the value of the concept in the judges' minds. Second, students can find some type of personal connection with one or more of the judges, such as a similar affiliation or hobby. Finding common ground with the judges and working that connection into the presentation can help build a rapport with the panel and break the ice (Barringer 2015). Some students will contact a few judges with similar interests to their own and meet with them prior to the competition in order to get their feedback/advice regarding the development of their concept, which usually helps them score higher during the competition.

Learning Outcomes

This past semester, upon completion of the project, students were asked to reflect on their learning experiences by responding to six questions. Figure 3 is a summary of the students' most common responses to the questions (multiple responses eliminated).

Discussion

Overall, the project "New Product Development and Market Feasibility" has been successful in providing a profound and exciting learning opportunity by the students. Students appreciated the heightened sense of importance that their projects took on



1. DISCUSS THREE KEY LEARNINGS / DISCOVERIES YOU HAD DURING THIS PROJECT.

- I was so nervous. But the feedback from professionals was great. I never get feedback from multiple professionals, normally two or three max.
- Understanding the market and consumer as well as costs and how it will be manufactured helps the design process.
- When pitching a product to professionals with a marketing and business perspective, a clear prototype is extremely helpful.
- The importance of covering all the bases and practicing the presentation. The importance of HOW you present your story while keeping it simple enough so everyone can follow.
- It takes a lot of time on the front end to properly research all the aspects of a product.
- Research should drive the different aspects of the product. Every design direction must be justified so it isn't subjective.
- Talking to industry people is valuable to help pick a direction. Experts in the industry/sales associates are aware of gaps in the market and can help you focus on a target group early on.

2. WHAT SUCCESSES DID YOU HAVE DURING THIS PROJECT?

- Finding a real problem and solving it.
- Success I found was this problem I was trying to solve is a bigger issue than I thought.

- I think prototyping was key to understanding users' needs.
- Got more and more invested in my idea! Not common for me.
- I learned a lot about researching and how to apply that research to a product design.

3. WHAT CHALLENGES DID YOU FACE DURING THIS PROJECT?

- I struggled in narrowing down my target market and conveying important data to my audience.
- Finding cost on components.
- Finding potential users to talk to.
- Organization is sooo hard with such a multi-faceted project.
- Time management and multitasking.

4. HOW DO YOU FEEL THIS PROJECT HAS BROADENED YOUR UNDERSTANDING OF THE "BIG PICTURE" OF PRODUCT DEVELOPMENT?

- When designing things, big or small, designers have to spend a lot of time focusing on the design, but not only drawing and building. Designers have to understand the problem, market, and users, and think about many factors in their solution. After almost finishing this major, now I just know about it!!
- It opened my eyes to what research needed to be done to achieve a starting point!
- It was interesting to see what market researchers go through, to create a design brief for designers.



- It definitely helped me understand the big picture by looking at users more, gathering data, looking in detail at markets and industries, and analyzing competitors.
- This project definitely emphasized the importance of research. I learned how much research is needed to just scratch the surface of an idea.

5. WHAT DO YOU WISH YOU KNEW AT THE BEGINNING OF THE PROJECT NOW THAT THE PROJECT IS OVER?

- I wish I would have known that a prototype would help the presentation. I was unaware of the incredible amount of information needed to have a valid argument.
- Research is very, very deep and the deeper you go, the more you will learn and will have a better idea of what needs to be done.
- I wish I was more aware of how long people take to respond to my inquiries! So many questions are still unanswered!
- I wish I knew what to prioritize. I could spend days researching government regulations and I could write a 10 page paper on just that!

6. IN THINKING ABOUT THE PROJECT, WHAT ADDITIONAL TOPICS DO YOU WISH WERE COVERED DURING CLASS TIME?

- I feel knowing a bit more about the manufacturing process would have helped me understand my retail prices and costs of materials.
- I feel like there should be a class dedicated to "how to research." I feel that I lack in that department.
- More how to find/determine what is good/bad research.
- As this was my first Research-based project in school thus far, which is strange, I would have liked to have deliverables required that would help guide my research.

Figure 3. Student Reflections on the "New Product Development and Feasibility" Project

when they presented in front of a panel of high-profile judges. Students commented that they spent a great deal more time on this project than on projects in other courses. They became invested in their projects and worked harder to prepare for the presentation competition. Students mentioned that they were very nervous presenting to a panel of successful local professionals in a competitive atmosphere. Though the stakes were not very high (there was no prize money involved, only extra credit for winners), students took the competition component of the project very seriously. To add to the gravity of the presentations, the local news and the university newspaper sent out reporters and photographers to cover the event. The location chosen for the event was a multi-million dollar, state-of-the-art presentation hall commonly used by the President of the university for press conferences. This ambiance helped to motivate the students to do their best.

Regarding the presentation, students commented that they received honest and direct feedback from the panel of judges. The judges offered perspectives and asked questions that often neither the students nor their professor had previously taken into account, provoking the students to defend their design decisions on the spot and think more critically of their research moving forward. Feedback from judges

encouraged the students to be even more innovative and take more calculated risks. This lesson is better to learn while in school than later on when the stakes might be higher (Butterman 2013). Being creative and innovative, and taking calculated risks, are essential skills for the students to arm themselves with as they graduate and enter an increasingly competitive global economy (Gleeson n.d.). Many students also learned the power of storytelling through their presentations. Since the presentation was limited to twelve minutes, students had to be selective in what they presented both visually and verbally. Their stories had to make sense to a wide variety of people and also had to be honest and compelling.

This project's multidisciplinary structure gave the students the opportunity to learn about the broader picture of product development, considering the end user and pricing to determine what the market could bear. Students were tasked with conducting more in-depth research than they had ever been asked to complete before. They got out of the classroom and entered the field, where they observed and interviewed potential customers and industry experts. They set up surveys and conducted focus groups, testing prototypes against competitive products. Students focused on market feasibility as much as the design of their concept. This level of focus on research was new to the students. While most students commented that it was invaluable to experience how the fields of marketing and industrial design are so interconnected, some felt there was almost too much new material to learn and master in one semester. They wished they had been taught some of these lessons earlier in their industrial design education. Many students commented that they felt they were only "scratching the surface" of the research into the design and market feasibility of their concept, helping them realize that product development can be a lengthy multidisciplinary process requiring

the "team" effort of marketing, engineering, industrial design, sales, customer service, quality assurance, shipping, and so on.

Some of the struggles that students encountered were in defining their target market. When first conducting research, a market can appear very large until students start to define the various segments within the market. Soon, students realize that one product may not serve the entire market. Design decisions may have to be made in order to properly serve the most promising market or the market segment with the largest demand. Students are forced to consider costs of manufacturing and materials very carefully, especially if they choose to design a "family" of products and/or accessories to serve a larger target market. By identifying and then ranking the benefits that correlate with the products' features, students can design iterations that have various trade-offs between them, some more valuable or costly than others. Then they can carefully weigh them against profits and feasibility in the marketplace.

Conclusion

Not all students are destined to be entrepreneurs, but the entrepreneurial mindset that this project promotes will serve all students well. Thinking like an entrepreneur builds confidence and a willingness to adapt and grow. Students develop a feeling of control that can be applied to future design projects no matter how complex or multifaceted, because they have additional tools for thinking creatively and outside of the box. Whether the student will eventually work for themselves or for someone else, they will have the confidence to develop a new idea—bringing it closer to fruition—or improve upon an existing idea. This confidence is born out of the students' experience in conducting sound research, developing a plan, and then taking calculated risks (Hinds 2015).

While this project has a demonstrated ability to broaden design students' understanding of the product development process and enrich their entrepreneurial mindset, there is room for improvement in the project structure and deepening of the student learning objectives. Based on student responses to the reflection questions after the project completion, several areas have been identified as opportunities for further enhancement. The first, which also governs the others, is the length of time students have to complete the project. The project timeline is currently one semester and it is not the only project the students are working on in the course, which includes two equally weighted projects. This does not provide enough time to adequately accomplish the entire scope of the project's requirements. Because of the time limitations, students are stressed to produce a functional prototype, let alone a series of prototypes that would be useful in testing with consumers, gaining feedback, and producing more refined iterations. It would be ideal if this project could span an entire year.

Some students have commented on the difficulty of locating a target market and determining the cost to mass-produce their concepts. It can be challenging for an



instructor to provide concise and in-depth education on these two topics because of the divergent nature of this project; each student has a unique concept that they are pursuing. For instance, there are several websites that

can provide instant quotes for manufacturing, but the number of manufacturing processes offered are limited. Injection molding, CNC machining, and additive manufacturing are often the only options. There are also several comprehensive resources related to locating a target market, interviewing customers, and etiquette for implementing surveys and focus group studies. Despite the availability of this information and the topical in-class instruction, students are sometimes left questioning how to apply this information to their specific design problem and the industry that surrounds it. What has proven to be helpful in catering to students' individual research needs are both critiques/discussions with the participation of the entire class and one-on-one meetings with the course instructor. These are opportunities for the students to individually share their successes and failures in finding the information that they are seeking and is an opportunity for the student to gain collective feedback from their peers, as well as learning from their instructor's professional and academic experience. Students' ease with these elusive market research topics could be increased by the integration of more of these "feedback-focused" meetings.

The sense of competition provided through this project helps heighten students' commitment to the success of the project. While the selected winners of this competition only gain extra credit points to bolster their grade, many entrepreneurial competitions at other universities offer cash prizes or business services. It is hoped that the next iteration of this project will involve sponsorship from local businesses and organizations that can provide venture capital and business services to the most promising student designs, allowing those students to continue to pursue their concepts. Prize money could be used for focus group studies, prototyping, patenting, marketing, or even launching a business. Business services could include coaching/mentoring, creation

of a website, a product video, assistance with crowdfunding, etc. Several community organizations committed to supporting student innovation and entrepreneurship have already offered positive feedback.

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