ENTR 458/658 Application Development for New Technology

Faculty: Robin A. Karol, Ph.D.
Email: rkarol@udel.edu
Office hours: by appointment only contact me 302-377-8615
TUES & THURS 12:30-1:45 PM
Location: OSM 120

Course Description

This course introduces students to key issues faced by companies and individuals attempting to bring science and technology inventions to market. The course presents best practices and general, analytic frameworks for developing commercially feasible applications of new technologies. Students work together in teams to complete proof of concept testing that typically involves primary and secondary market research and an assessment of technological feasibility, value, and use for specific applications. Students can take the project as far commercialization and launch.

Learning Objectives

By the end of the course, you will have some understanding of how to go from a new technology to a concept and a viable product. You will also have acquired valuable knowledge and skills applicable to starting a business, helping an established company to grow through the introduction of new products, and finding sustainable solutions to customer problems.

Specifically, you will:
(1) Develop skills to evaluate the feasibility of new technology and new ideas as they relate to customer problems
(2) Develop methods for testing new ideas for both technical feasibility and potential attractiveness to customers
(3) Learn tools and techniques to understand customer’s needs, and experiences and how to develop new customers and markets
(4) Use a business model canvas and lean startup methods to test the best concepts,
(5) Gain first-hand experience in identifying, testing, and validating assumptions as they pertain to operating a business based on the introduction of new technology
(6) Learn to use tools to understand creativity styles to help in team dynamics and communications.
(7) Understand how to identify potential customers and markets.

Readings

New Product Development for Dummies (Robin Karol & Beebe Nelson)
Lean Startup (Eric Ries),
Startup Owners’ Manual (Steve Blank)
Running Lean (Ash Maurya)
The PDMA tool book for New Product Development 1
Coursepack access by-- https://cb.hbsp.harvard.edu/cbmp/access/28019573
Additional reading identified as needed.

Deliverables

The course includes eight project deliverables:

(1) Problem Statement,
2) Concept Statement,
(3) Proof of Concept including a Technology Development Matrix
(4) New Product/Service/Offering Plan---Include Business Model Canvas, updated Tech Matrix, and Overview Chart and Voice of the Customer plan
(5) Launch Plan,
(6) Final Report including “
(7) Outline what you learned this semester”
(8) Review of what is needed to be part of a decision body
Additional assignments - not project related

- Review of Ramen Noodle Story
- Written plan for an idea session
- Review of Clorox story

*** class participation - includes presentations, comments on discussion boards and in class discussions

Problem Statement: You will collect all information needed to summarize the background information for the potential project. This will include technical information, market information, customers, business objectives, competition, manufacturing, and distribution. This information will be used to plan the idea session to create the product/offering concept. All or some of it will be presented in the idea session to inform and ground the participants. You must identify what problem is being solved.

Concept Statement: You will be required to take the technology presented and create a concept statement based on the selection of the “best” application. If the technology is not fully developed you will first create a technology development matrix (see chart attached to this document) to evaluate where the technology is in its development. From this you will create the concept statement. This concept statement must include all assumptions made in making the selection and a preliminary plan to test those assumptions. This concept statement also must identify the team needed to go to the next step and create the Concept Plan

Proof of Concept: Technology Development Matrix. Working in your team, you will be required to complete a Technology Development Matrix (written) for the concept that you will work to develop throughout the course. You will be expected to complete customer interviews, concept testing and plan and start the validation process.

You will need to address, in addition to all technical issues, business issues such as: (1) who your customers will be, (2) what the customers’ problem or point of pain is, (3) how your solution will solve the customers’ problem, including technical validation; (4) how/why your solution is superior to current solutions, (5) how you plan to make money (what is the revenue model), (6) why you (or your team) can be expected to deliver strong results, and (7) any evidence to validate or disprove the assumptions from the concept statement. The presentation should utilize a slide deck (PowerPoint, Keynote, or Prezi). Teams should also submit a 3-5 page written business concept statement. The written submission should include a completed business model
Create and present a High Level New Product Plan. Create and present an actual New Product Plan based on the concept plan. You may want to start with a business model canvas. Determine what is needed to make the New Product, such as: manufacturing, resources, technical expertise, materials, facilities, legal or regulatory clearances, etc. Example structure can be found at http://www.businessmodelgeneration.com/downloads/business_model_canvas_poster.pdf Include in this plan the team that is needed, the timing, validation and testing, and cash flow. Include information about where there will be input from customers or potential customers that may require rework of the plan. Also include marketing needs and the beginning of a launch plan.

Suggested improvements on the Process Used. At the end of the course each team will create a lessons learned document that will be part of the documentation of your team project. This should reflect how you would improve what you did if you could start over. This is to be used as a learning tool to improve your skills both as an individual and a team.

Final: The final will be a written path forward to make this project a success. This should include a plan including timing, resources needed (including personnel), any manufacturing and distribution plans as well as launch and product management issues. Identify all areas of potential risk and how the uncertainty can be reduced. In addition you should comment on what could have been done at the beginning of the project to make it easier to move forward. If there is no actual data available make some educated assumptions in order to move forward with a scenario to create a successful product.

Class Participation. Application development is a collaborative and interactive process. Therefore, regular, active, and meaningful participation and engagement in course activities is required. On days where readings have been assigned, you are expected to come to class prepared for discussion. On days when guest speakers are present, you will be expected to listen respectfully and ask insightful questions.

The number of points that can be earned for each course requirement is listed in the table below (the final grade will be determined by the percentage of points earned of the total points available. This may be different than the total below because additional assignments may be given.) In addition extra points may be given for specific, outstanding, class participation.

- Problem Statement 10 points
- Concept Statement 25 points
- Proof of concept including technology matrix 30 points
- Product Plan 40 points
- Launch Plan 40 points
- Presentations 25 points
- Review of reading material each 25 points
- Review of decision body experience 25 points
- Class Participation 10 points
- Plan to move the new technology business to the next steps 30 points
- Summary of what you have learned this semester 25 points

Grading Guidelines

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<th>Cumulative percentage</th>
<th>Final Grade</th>
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<tr>
<td>93-100%</td>
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<td>90-92%</td>
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<td>87-89%</td>
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<td>83-86%</td>
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<td>80-82%</td>
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<table>
<thead>
<tr>
<th>Cumulative percentage</th>
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<td>77-79%</td>
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<td>73-76%</td>
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<td>70-72%</td>
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<td>60-69%</td>
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I reserve the right to award grades higher than those determined by this scale, but will not lower grades for any reason. Any “curving” of grades will occur only after the completion of all course requirements; grade adjustments for individual deliverables will NOT be made for any reason.

Advice for High Performance

*Arrive at class prepared to engage and explore.* Come to class with interesting points to share regarding readings and assignments. You may also use class time to ask for input on your projects. Approach every class like it is a business meeting with an agenda and action to follow.
Take risks in class discussions. Do not be afraid to respectfully disagree with your peers or with the instructor. Think through the logic behind your arguments and be prepared to share them.

Strive for clear, direct communication in your written and oral work. Clear communication reflects clear thinking. A concise well-written assignment and a clear presentation are correlated with higher quality work. Writing and presenting are essential in business; therefore writing and presenting are essential in this course.

Get out of your comfort zone. Push yourself to do things that don’t seem natural or easy. Growth comes from challenging yourself and being entrepreneurial in creating the life you desire.

Group Design Critique
It may be difficult to look at someone else’s design work and offer critical feedback. However, learning how to do so is a valuable skill that will assist in building your understanding and articulation of the design principles as well developing the disposition to question and push a design to a more finalized form.

Always work on offering respectful valuable critical feedback and graciously receiving constructive criticism. Defensiveness is not helpful in a creative environment.

Giving Advice and Opinions
Remember that you are stating an opinion about ‘the design’ and not about the person who created the design. Follow some of the guidelines listed below to make sure that your critique is well received:

- Start with a positive statement before launching into the negative
- Keep your critique short, don’t belabor your point
- Don’t be vague. Be as specific as possible so that the designer can relate to what you are saying.
- Listen to the designers reply and try to understand their work
- Don’t engage in a conflict with the designer. If someone does not receive criticism graciously while in a group setting, try to offer advice in private.

Plagiarism & Cheating.
I will pursue any and all violations of the University of Delaware's Code of Conduct, and request that they be punished to the fullest extent possible. So, please make sure that the work you hand in is your own, and that any “borrowed” material is properly cited.

Please familiarize yourself with UD policies regarding academic dishonesty (http://www.udel.edu/stuguide/14C15/code.html). To falsify the results of one's research, to steal the words or ideas of another, to cheat on an assignment, to re-submit the same assignment for different classes, or to allow or assist another to commit these acts corrupts the educational process. Students are expected to do their own work and neither give or receive unauthorized assistance.

RESOURCES
❖ Center for Counseling and Student Development(CCSD): http://www.udel.edu/counseling/
At times, personal problems, stress, or life circumstances can interfere with your academic functioning. UD's Center for Counseling and Student Development provides a variety of services to support you in your academic work and be successful. The Center works with you on a confidential and individual basis; in addition, you may utilize assessment and counseling services, and referral to additional resources off campus. CCSD is funded by the student health fee and does not charge for services. For more information, visit [http://www.udel.edu/counseling](http://www.udel.edu/counseling), or call the office at 831-2141.

**Harassment**

It is unacceptable and a violation of university policy to harass, discriminate against or abuse any person because of a person's race, color, national origin, gender, sexual orientation, disability, religion, age or any other characteristic protected by applicable law. Such behavior or threats to destroy the environment of tolerance and mutual respect that must prevail for this university to fulfill its educational mission. Contact the Office of Equity and Inclusion([http://www.udel.edu/oei/](http://www.udel.edu/oei/)) if you believe a violation has occurred.

**Inclusion of Diverse Learning Needs:** [http://www.udel.edu/DSS/](http://www.udel.edu/DSS/)

This course is open to all students who meet the academic requirements for participation. Any student who has documented a need for accommodation based on the impact of a disability should contact the instructor privately to discuss the specific situation as soon as possible. Disability Support Services in Alison Hall 130 and will coordinate reasonable accommodations for students with documented disabilities.

Please note: The University of Delaware is committed to diversity and welcomes students with disabilities. If you have a documented disability related need for a modification or reasonable accommodation in this course, please contact the Office of Disability Support Services located at 325 Academy St, Suite 161, Perkins Student Center, email: dssoffice@udel.edu or call 302-831-4643.

**Plagiarism & Cheating.** I will pursue any and all violations of the University of Delaware's Code of Conduct, and request that they be punished to the fullest extent possible. So, please make sure that the work you hand in is your own, and that any "borrowed" material is properly cited.

**Concerns about idea sharing & disclosures.** If you feel your idea may become real, you should discuss intellectual property rights and ownership with your team from the beginning. This is an open class. Currently there are no non-disclosures among students and faculty. Please keep in mind that ideas are best viewed as liabilities, rather than assets, because there are significant costs associated with pursuing them (in terms of time & money). Also initial ideas seldom prove successful; most companies succeed because
the process of learning, discovery, and execution shapes an initial idea that is mostly wrong into something that people actually want to use. This process requires willingness to share your ideas openly with peers and others. However, if you and your team feel that it is essential to get an NDA we will look into it. There is no problem with doing it. We just do not want to do this for the entire class for each idea.

ADA ACCESSIBILITY STATEMENT
Any student who thinks he/she may need an accommodation based on a disability should contact the Disability Support Service (DSS) office as soon as possible. The DSS office is located at 130 Alison Hall, 240 Academy Street, Phone: 302-831-4643, fax: 302-831-3261, website: www.udel.edu/DSS

Class Roadmap

The course will approximately follow the schedule below, with changes for weather, as well as other circumstances to be considered. Assigned readings should be completed prior to the pertinent class session. Additional reading or reference may be given during class. This schedule can be changed because of the needs of class members projects.

Week 1: Course Introduction

Syllabus Review, and Introductions

Initial project discussions

- Lecture/Discussion Topics
  - What is application development/new product development?

- Discussion about project selection and team formation
  - Teams must be 2-4 people.
  - There can be team members that are not in the class
  - Team members can come from other disciplines; engineering, physical therapy, other business classes, etc.

Sumi N. Cate, R&D Group Manager, The Clorox Company (Sumi.Cate@clorox.com);
David Pilosof, R&D Director, The Clorox Company (david.pilosof@clorox.com);
Richard Tait, Principal, Product Development Consulting, Inc. (rtait@pdcinc.com);
and Robin Karol, Executive Director, PDMA (rkarol@pdma.org), The story of Clorox Green Works™—in designing a winning green product experience Clorox cracks the code, PDMA Visions Magazine, March 2009

**Week 2—Define Innovation/Invention**

Come prepared to discuss reading assignment.

**Innovation Process**
**Lecture/Discussion Topics**

- Defining terms: invention, innovation, entrepreneurship, new products, & startup
- Overview of the innovation/new product development process

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- Applicability of the process to: Startups, Intrapreneurship, & Social entrepreneurship
- Types of new products

Reference: New Product Development for Dummies

Reading for next week—Ramen Noodle information

Deliverable: Project Concept (first)

**Week 3 Solving the Right Problem**

Customer—How to get customer input

**Lecture/Discussion Topics**

- What is the problem that needs to be solved?

- Who is the customer?

- What do they think they want?

- How to gather information?

KAI will be distributed.
**Week 4—Idea Generation and Creativity**

KAI feedback and lecture on Creativity

Idea Generation and Creativity

Discussion Topics
- Sources of ideas – points of pain, problems, environmental changes
- Creativity/brainstorming
- Idea evaluation – initial screening criteria
- Determine who should attend the session
- Creativity style—each student to take KAI
- Creation of focus question for idea session
- How are decisions made

Assignment
Review the background information needed for the session.
Refine focus question

**Week 5: Idea Generation Session**

Idea-- Generation Session

- Introduction to the project
- Background information presented
- Generate Ideas

- Elevator pitches 101 – storytelling & selling
- What problem are you solving
  - Review Ideas from Session
- Review excel spreadsheet of ideas
- Review or create concept statements
- Review preliminary assumptions
- Determine status of technology
- Review the need for a technology Development Matrix
Week 6: Problem, Solutions and Customers—Concept Statement

Week 6: Concept Statement
● Review the technology matrix Create a concept statement or two statements based on the result of the idea session. Create the plan to create and test assumptions on this concept.
● Identify what must be tested and when

● Market Segmentation Evaluation

Week 7: Unique Value Proposition & Competitive Advantage

Lecture/Discussion Topics
Identify and assess the Competition
Unique value proposition
Competitive advantage
Source of advantage---Intellectual property
Prioritize goals
Customer's perception of value

Deliverable: Updated concept statement

Week 8: Do You Need A Team

Lecture/Discussion Topics
What kind of Team do you need?
● Create the Product Development plan starting with the canvas created
● Review KAI information
● What/who is needed
What kind of Leadership

**Deliverable**  A plan for the team composition.

**Week 9: From Concept to Product**

- Processes and Plans
  - Sources of funding
  - Overview of funds needed
  - Overview of all resources needed
  - Create the next step plan
  - Start to create a business model or product canvas

**Readings**

**Lecture/Discussion Topics**
- Create overall plan
- Set preliminary goals and understand assumptions
- Reaching your customers – involve customers in overall development
- Create plan for testing assumptions and decreasing uncertainty
- Determine key metrics
- Document preliminary timing and decision points
- Form team

**Deliverable**
Product Development Plan/ Business Model Canvas/ Overview chart

**Week 10-Customer Development**

**Lecture/Discussion Topics**
- Customer interviews
- Solution features vs. benefits
- Customer needs identifies
- Customer experience/ persona
- Market segmentation
- Market size – total vs. addressable
- Importance of problem definition

**Readings**
Deliverable
- What did you learn from customers—Development plan and repo

**Week 11—Regulatory, Legal, IP issues**

Regulatory Issues and Intellectual Property
Lecture/Discussion Topics
- Legal requirements & pitfalls
- What is needed to file for FDA approval

**Week 12: Go to Market Strategy & Operational Planning—**

Testing Assumptions, Revenue Models and Costs
- What is a revenue model
- Pricing
- Fixed vs. variable costs
- Breakeven analysis
- Channels of distribution
- Communication channels
- Marketing
- Key metrics
- Build out the plan including testing
- Understand your Revenue Model
  - Pricing
  - Fixed and Variable Costs
  - Breakeven analysis
  - Channels of distribution
  - Key Metrics

**Week 13—Launch Plan**

Lecture/Discussion Topics
- What is the communication plan with new customers
- When, where, and how will this be launched
- Will social media be used? Other communications media
- Other

**Deliverable**
- Final pitch (team) and
- Course review written overall plan

**Weeks 14-15—Final Presentations & Course Review**

**Deliverable**
- Final presentation (team) and proposal for how this will go forward
- Course review
- Written overall plan

**Suggested Readings**


- Course pack from Harvard Business Review
  [https://cb.hbsp.harvard.edu/cbmp/access/28019573](https://cb.hbsp.harvard.edu/cbmp/access/28019573)