MGMT 579E – Sustainable New Product Design
Summer 2015

Instructor: Andrei G. Guschin, Ph.D.
Office: MKZ 261
(O): 206-616-1067   In urgent cases: (M): 206-234-6498   Email: aguschin@uw.edu
Office hours: Class days: 4:00-5:30 pm. Also by appointment (please email me with suggested meeting times).

Course Description
Today, to be competitive in the global economy, a company needs to master product design and development, and do it fast and at a reasonable cost, while satisfying ever-increasing demands of customers. A company also needs to pay attention to sustainability; this is a current market trend. After graduation, most Foster MBAs will be working at large product companies and this course will arm you with practical knowledge and will help to advance your career. You will learn modern tools and methods, including SolidWorks and 3D printing. Our focus is on integration of the marketing, design, industrial engineering, operations and manufacturing functions of the firm in creating new products. Topics include identifying customer needs, concept generation, industrial design and design for manufacturability and environment. Offered in cooperation with the MIT Sloan course Product Design and Development.

Course Objectives
Upon successful completion of this course you will:
1. Improve confidence in your abilities to create a new product
2. Build competence with a set of tools and methods for PDD
3. Build awareness of the role of multiple functions in creating a new product
4. Improve ability to coordinate multiple, interdisciplinary tasks in order to achieve a common objective

Types of Learning:
1. Project-based; Hands-on exercises; Case studies; Team presentations; Guest speakers; Company visits
2. We will collaborate with the UW ME SolidWorks Lab and 3D printing machine shop

Preparation for the First Class
1. Read the course syllabus
2. Review RedDot Product Design winners and think about your project ideas: http://red-dot.de/pd/online-exhibition/?lang=en&c=0&a=0&y=2012&i=0&oes=%20
3. Case: IDEO
4. Complete the Student Info Sheet (at the end of the syllabus) and submit it during class

Course Materials

Required
1. **Textbook: Ulrich and Eppinger, *Product Design and Development***, 5th, 4th or 3rd editions (there are almost the same). Based on a feedback from students who took this class last year, this book was extremely useful and you will not be able to add much value working on a team project without reading it. Also, during class lectures, I will assume that you have read the assigned chapters and will only cover the highlights from it. All chapters are from this book, available at UW Bookstore or amazon.com. Note: the most practical option would be to rent it, buy used or the 3rd edition (on amazon): http://www.amazon.com/s/ref=nb_sb_noss_1?url=search-alias%3Daps&field-keywords=ulrich+and+eppinger
2. Lueptow and Minbiole*, Graphics Concepts with SolidWorks* (Second Edition), available on amazon.com. It will help you to master SolidWorks quickly and we will use some exercises from this book. Note: the most practical option is to buy a used one (I got mine from Green_Earth_Books): http://www.amazon.com/gp/offer-listing/0131409158/ref=dp_olp_used?ie=UTF8&condition=used
3. Cases (you will need to buy them on the HBSP site): https://cb.hbsp.harvard.edu/cbmp/access/37691849
4. SolidWorks tutorials: http://www.solidworks.com/sw/resources/getting-started-with-solidworks.htm
5. SolidWorks Sustainable Design: http://www.solidworks.com/sustainability/index.htm

Optional:
- Donald Norman, *The Design of Everyday Things* (Doubleday, 1990). It discusses good and bad examples of product design and provides principles and guidelines for good design.
- Special report: Manufacturing, Innovation and 3D Printing, *The Economist* (April 2012): http://web.mit.edu/pie/news/Economist.pdf
- Design of Useful Things, *TED* talks: http://www.ted.com/playlists/80/design_of_useful_things
- Stanford Extreme Design MBAs: http://poetsandquants.com/2013/12/09/pbs-documentary-to-feature-stanfords-extreme-design-mbas/
- Stanford Design for Extreme Affordability course: http://extreme.stanford.edu/
- Gates Foundation target project areas (Global Development and Global Health): http://www.gatesfoundation.org/What-We-Do
- IDEO Social Innovation projects: http://ideo.org/projects
- "Objectified" documentary (2009): http://www.hustwit.com/category/objectified/

Class Policies

Class Attendance
Class attendance is critical to participation in the learning experience and is *required* aside from circumstances related to (1) illness or (2) a critical work event with your sponsoring employer that cannot be rescheduled. If you are not able to attend a particular class session, please email me in advance. Regardless of the rationale, please note that you are responsible for the learning

experience that takes place in your absence; please work within your MBA Team to address any material you may have missed. It will be your responsibility to find out from your classmates or myself what material was covered, what additional assignments were made, and to obtain any handouts you may have missed.

Professionalism
- Arriving late and leaving early is not polite to your classmates and to your instructor.
- Please bring and display your nametag at each session to enable me to grade your class participation correctly.
- Use of electronic devices other than for engaging in the activities associated with the class (e.g., a notebook computer for note taking) is distracting for you, your fellow students, and your instructor.

Please note that participation grades are based on quality of participation in class; high quality participation requires all of your attention and focus during class time. Each student is expected to be fully engaged in class content and respectful of fellow students' and your instructor's attempts to do the same. During class discussions you should be willing to support your point of view and—at the same time—be willing to listen hard to what others have to say, even when their view differs from yours. You are encouraged to consider the impact of comments that may be distracting from the class such that each comment you offer potentially adds value to the overall dialogue in each class and over the entire quarter.

Academic Integrity
I employ the principles and procedures espoused by the University of Washington Student Conduct Code to maintain academic integrity in the course. The Code establishes the expectation that students will practice high standards of professional honesty and integrity. In particular, implementation of the Code at the Foster School of Business prohibits cheating, attempted cheating, and plagiarism—including improper citations of source material—as it pertains to academic work. If you are unclear about how the Code applies to assignments for this course, for example, what kind of assistance is permissible for homework, whether you may study with classmates for an exam, how to cite source material gather from the internet, etc., please ask for clarification. Suspected violations will be handled in compliance with the University of Washington Student Conduct Code (http://www.washington.edu/students/handbook/conduct.html) as outlined in Washington Administrative Code 478-120.

Course Assignments and Grading

Grading
- Meaningful Class Participation (30%)
- Individual Project Proposal (10%)
- Team Project (60%)

Grade Scale

% Grade	Course Grade
95-100	4.0
92-94	3.9

91	3.8
90	3.7
89	3.6
88	3.5
87	3.4
86	3.3
85	3.2
84	3.1
83	3.0
82	2.9
81	2.8
80	2.7
Below 80	☹

Class Participation

The grading of classroom participation is difficult because of an element of subjectivity. Nevertheless, it is a vital part of the course. Most students feel comfortable in speaking up with thoughtful comments and questions, but some do not, and I wish to be fair to everyone. I will not be grading on "air time", but rather on the quality of the question or comment and will evaluate:

1. Frequency of your class contributions
2. Quality of your contributions (ability to draw on course materials and your own experience productively; ability to advance or sharpen our discussions; willingness to take risky or unpopular points of view; use of logic, precision, and evidence in making arguments)
3. Professionalism of your conduct (see **Professionalism** above)

Case Discussions

Cases are used to learn how to analyze information and make decisions as a manager. You should assume the role of the decision maker in the case, analyze the information that you feel is relevant, make a decision, and explain why your decision is the best course of action in light of the risks and benefits of the alternatives you considered. Treat our class sessions as management meetings where you discuss your decisions and the reasoning/analysis behind them.

Team Project

Team projects would be selected from your Individual Project Proposals (see below). You will work in small teams and your challenge is to design and produce a 3D-printed prototype of a physical product that can be easily manufactured. For this project, you are encouraged to propose product ideas focusing on sustainable design, addressing green living, global health and global development. Teams are strongly encouraged to choose a project satisfying the following constraints:

- There should be a demonstrable market for the product
- The product should be simple and have a high likelihood of containing fewer than 10 parts so you can design and prototype it in 10 weeks
- The product should require no technological breakthroughs
- You should validate your product with more than five potential users (more than 20 would be better).

Project Hints:
- Save any highly proprietary ideas for another context.
- Most successful projects tend to have at least one team member with strong personal interest in the target market.
- It is great to have a connection to a commercial venture that may be interested in the product.
- Just because you have used a lousy product doesn't mean that a better one doesn't exist. Do some thorough research to identify competitive products and solutions.

Team Project Grading

Team assignments will be graded on the appropriateness and execution of the techniques employed, the team's understanding of relevant concepts, the depths of analysis, product validation with potential users, the quality of presentations and product design, and product market potential.

Peer Evaluation

The peer evaluation form (posted on Canvas) will be used to assess the contribution of each team project member. I will take the average score for each student (100 is max) and multiply it by the team's project grade. For example, if a team receives a grade of 90% and a member of the team receives average peer evaluation of 70, that person's team project grade will be 63%. This peer evaluation will be applied when there is a consensus among of all team members and being downgraded by a single team member will be disregarded.

Please set expectations for team roles and deliverables early on, and communicate it clearly to all team members. Please let me know of any problems well before end of the course.

Individual Project Proposal (due 11:59 pm on Thursday, June 25)

This is the only individual assignment for this class. Exercises 2 and 3 in Ch. *Identifying Customer Needs* can serve as a starting point for project proposals. I will post your proposals on Canvas so everyone can read them during the weekend and be ready to vote in class 2 to select top projects.

Prepare a project proposal in any format that fits on one 8.5x11 page (one side only). Proposals will be graded primarily on the strength of your product opportunity. Proposals should include:
1. A brief, descriptive project title (2-4 words).
2. Your name and email.
3. A description of the product opportunity you have identified, including:
   o Market need
   o Shortcomings of existing competitive products
   o Definition of the target market and its size.
4. The 3 nearest competitors (existing solutions) and price.
5. Any special skills or assets you have (marketing expertise, access to a shop, materials, electronics wizardry, etc.)

Please do not present any of your own product ideas or solutions at this point; our strict focus in this phase of the course is on the market opportunity and not on solution concepts.

Team Project Assignments

The assignments are intended to pace the development process for your product. The assignments must be completed on the scheduled due date in order to maintain the project schedule. Please adhere to the following guidelines:

- Assignments are to be submitted on canvas by **midnight the day before** the session that we will be discussing it in**.** I will accept assignments up until class time with some penalty.
- Team assignments are to be developed by a team!
- Be concise. Most assignments can be completed in a few pages. One exception to this guideline is concept sketches, which should be formatted with one concept per page.
- Combine all your work in one PowerPoint® file (ppt or pptx).
- Teams will present their work in class (limit: 5 min) to exhibit best practices and pitfalls.
- Sample team assignments are available on Canvas

Assignment 1: Assess the Product Opportunity Potential (due class 3)
Prepare three slides (follow the Real-Win-Worth-it framework):
1. Market need - is it real?
2. Existing competitive products – can you win?
3. Market potential – is it worth it?

Assignment 2: Mission Statement and Customer Needs List (due class 4)
- Write a mission statement for your project team as described in Ch. *Product Planning*.
- Based on customer interviews and/or surveys, develop an organized list of customer needs for your product as described in Ch. *Identifying Customer Needs*.
- Identify competitive products and list strengths and weaknesses of each.

Assignment 3: Concepts, Target Specs and Patent Review (due class 5)
- Prepare several sketches and bullet-point descriptions of alternative concepts for your product. For each sketch, note which of the important customer needs it addresses and which it does not.
- Choose three critical customer needs from your list and prepare a list of the target specifications as defined in Ch. *Product Specifications*. Provide justification to support these targets.
- Perform a preliminary patent searching to identify patents most closely related to your product idea. Briefly describe the 3 closest matches. Explain what you have learned from the search and how this might affect your approach to further development. You may research patent information at www.uspto.gov or www.google.com/patents.

Assignment 4: Final Concept Selection and Models (due class 6)
- Use and show a concept selection matrix (screening or scoring) to select at most three concepts for further consideration.
- Show some physical models for these top product concepts.
- Decide on a single concept and be prepared to explain your choice.

- Prepare a list of the key uncertainties or questions you still need to address to determine the viability of your product. For each one, specify an associated plan of action (such as analysis, mock ups, interviews, experiments, etc.).

Assignment 5: Final Specs, 3D CAD Model and Production Plans (due class 7)
- Create an updated one-page description and sketch of your product concept.
- Prepare a 3D CAD assembly drawing of the alpha prototype you intend to build. An assembly drawing shows all the parts in their assembled positions.
- Identify the critical-to-function (CTF) specs and include documentation showing how you arrived at these CTFs.
- Include a bill of materials indicating whether the prototype parts will be purchased or fabricated and a description of the assembly process. Indicate the material and fabrication process you have selected for each prototype part.
- Make a drawing or sketch of the production version of the product.
- Describe the differences between the prototype you will build and the production product.
- Briefly explain how the production product would be manufactured.
- List the web resources and vendors you have found to be helpful.

Assignment 6: Life Cycle Assessment (due class 8)
- Assess the environmental impact of your product and compare to competing products.
- Identify the sources of the greatest impacts and ways to potentially reduce them.

Assignment 7: Final Presentation to Judges at the Foster Second Evening MBA Product Design Competition (due class 9)
Prepare a 15-minute presentation describing and demonstrating your product. Your presentation should mainly concentrate on the product itself, although you may wish to emphasize any particularly impressive portions of your development process. Also include:
- Market need, competitive products and market potential
- Life Cycle Assessment
- How will you produce it?
An effective presentation includes color photographs or video presentation along with a live display of the hardware. This presentation should be of the quality you would make to convince a top management group to purchase the rights to your product or to fund its final development and launch. Be prepared to answer questions about all aspects of your project.

[Optional] Course Feedback (due class 9)
In order to help me to continue improve this course I would much appreciate if teams create three simple slides:
1. What you liked
2. What you didn't like and suggestions how to improve
3. Case ranking (scale 1-5, 5 is high)

Case Preparation Questions

IDEO Product Development
1. How would you characterize IDEO's process? Its organization and management?
2. Should IDEO accept the Visor project? Should you try to negotiate a longer lead time?

Sweetwater
1. What do you consider to be the most important needs associated with water purification devices such as the Sweetwater Guardian? Get information from wilderness enthusiasts.
2. How do competitors' products meet those needs?
3. How Sweetwater's product should address those needs?

Honda Today
1. How would you characterize Honda's approach to PD?
2. What should Kamimura do to increase engine volume?
3. What do you think Honda's competitors will do?

Team New Zealand (A)
1. How would you evaluate Team NZ's use of simulation in the design process? How did their approach differ from other syndicates?
2. What would you advise them to do (two similar boats now; two different boats now; one boat now, one boat later)?

Kindle Fire
1. How would you describe Amazon's approach to PD?
2. What is Kindle Fire and who should Amazon target with it?

Braun: The Syncro Shaver (A)
1. How would you describe Braun's approach to PD?
2. Should the 6017 and the cleaning center become a single system and why?

Boeing 767: From Concept to Production (A)
1. How would you describe Boeing's approach to PD? What are its basic elements? Strengths and weaknesses?
2. How does Boeing manage risks? Consider all four risks.
3. Which method should Boeing use to convert the first 30 Boeing 767s from 3-person to 2-person cockpits? Why?

Class Schedule

Date	Topic	Required Readings and Class Preparation
1. June 22	Introduction	1. Read the course syllabus 2. Review RedDot Product Design winners 3. **Prepare Case: *IDEO*** *** Complete the Student Info Sheet and submit it during class**
2.June 29	Tour of UW ME SW Lab and Rapid Prototyping Shop. SolidWorks Exercise. <u>Room: MEB 232</u> Selecting Top Projects	*** Due on Thursday, June 26: Individual Project Proposal** 1. Read Ch: *Prototyping* 2. Review SolidWorks tutorials online 3. Skim trough Pizza Cutter exercise from *Graphics Concepts with SolidWorks*
3. July 6	Customer Needs	*** Due: Assignment 1: Product Opportunity Potential** 1. Read Ch: *Identifying Customer Needs* 2. **Prepare Case: *Sweetwater***
4. July 13	Product Specifications Concept Generation	*** Due: Assignment 2: Mission Statement and Customer Needs** 1. Read Ch: *Product Specs* (prepare Ex. 1 + Qs) 2. Read Ch: *Concept Generation* (prepare Qs) 3. **Prepare Case: *Honda Today***
5.July 20	Concept Selection and Testing	*** Due: Assignment 3: Concepts, Target Specs and Patents** 1. Read Ch: *Concept Selection* (prepare Ex. 1-2 + Qs) 2. Read Ch: *Concept Testing* (prepare Qs 1-2) 3. **Prepare Case: *Team New Zealand (A)***
6.July 27	Intellectual Property Designing Smartphones and Tablets	*** Due: Assignment 4: Final Concept Selection and Models** 1. Read Ch: *Patents and IP* (prepare Ex. 2 & 4 + Qs) 2. *Look up a patent number on a product you like. Be prepared to explain to the class what the novel, useful and non-obvious invention is and how the claims describe it.* 3. **Prepare Case: *Kindle Fire***
7.Aug 3	Design for Environment Design for Manufacturing	*** Due: Assignment 5: Final Specs, 3D CAD Model and Production Plans** 1. Read Ch 12 (5th Ed): *Design for Environment* (prepare Ex. 1-3 + Qs 1-3 & 6). The chapter is also posted on Canvas. 2. *Think about the products you use, identify one that has reduced environmental impact and describe it in class.* 3. Review SolidWorks Sustainable Design online 4. Skim: *Analyzing the Environmental Impacts of Simple Shoes*: http://www.bren.ucsb.edu/research/documents/SimpleShoesFinalReport.pdf 5. Read Ch: *Design for Manufacturing* (prepare Ex. 1-2 + Q2) 6. **Prepare Case: *Boeing 767: From Concept to Production (A)***

8.Aug 10	Industrial Design	*** Due: Assignment 6: Life Cycle Assessment** 1. Read Ch: *Industrial Design* (prepare Qs) 2. *Think about the products you use and identify one that exhibits good ID. Bring it to class and demonstrate what you like about the design.* **3. Prepare Case: *Braun: The Syncro Shaver (A)***
9.Aug 17	Foster Second EMBA Product Design Competition Course Feedback	*** Due: Assignment 7: Final Presentation** *** Due: Team Course Feedback** *** Due: Peer Evaluations**

MGMT 579E Student Info Sheet

(Please submit on the first day of class)

Name	E-mail

Previous Degree(s): _____

_____

Career Goals: _____

_____

Why this course? What do you most want to learn? _____

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Summarize your work experience: _____

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Tell me something interesting about you (interests, hobbies, achievements): _____

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