MGT 3744: Managing Product, Service and Technology Development

Professor: Stylianos (Stelios) Kavadias
Office: 4428 Technology & Management Suite
Email: stelios@gatech.edu
Phone: 404-894-4370
Office Hours: Email to set an appointment.

Course Description and Learning Objectives

Course participants will become familiar with the key stages of the product and service development process, such as concept generation, evaluation and selection, together with strategic decisions, like product portfolio selection and technology choice, and operational methods such as project planning, prototyping planning etc. The insights that the course offers constitute the basis for anyone who wishes to get involved with the development of new products, independently of her/his function within the organization. To achieve this, participants will work in cross-functional teams throughout the semester, and they have to achieve a *modus operandi* in order to attain the desired outcome. This "tacit" learning aspect offers valuable on-hand experience. Furthermore, the project offers the opportunity to apply some of the theoretical underpinnings of NPD in a project, finding out the limits of theory application in practice.

The development of new products and services (NPD/NSD) is without any doubt one of the key competitive enablers. Yet, it is still treated in many firms as a "black hole" into which management allocates significant resources (money and people), hoping to get enough useful outcomes that will sustain the company profitability/viability for the years "to come". Have you ever participated in any product development effort through a marketing, finance or sales role? Then you are likely to be familiar with that view. At the same time, in other organizations new product development is treated as a function that should be managed only by the technical experts, since "these are the ones who understand." Yet, often enough failure to develop successful product by these "experts" tends to be blamed on the customers that did not understand, or on the lack of adequate resources committed by senior management. Have you ever contributed to engineering development teams? Then, you have probably supported such perspectives.

MGT 3744 revisits those perspectives and questions their validity. I offer a systematic overview of the ***management challenges*** that arise during the product/service development process. The development process requires integration across the traditional management functions, an extremely hard capability to come about. The course introduces concepts, frameworks and tools that build the foundations for such an integrative capability: linking product/service development to strategy, and managing the development process for speed, efficiency, and market impact. Through a combination of company case studies, in-class simulation exercises and business press articles, I cover a wide range of topics.

The course is divided in two largely complementary components that run in parallel. On one side stand the theoretical perspectives and frameworks that inform successful practices about the management of the development process. A thorough understanding of the fundamental principle that governs the NPD process should emerge from this component: the notion that the NPD/NSD process entails "information processing and transformation." The development of a new product or service concerns mainly the transformation of an idea (that is information at a raw, primitive stage) into an actual product or service (that is finalized information that fulfills consumers' needs) through a number of intermediate stages (process steps). The second component is the application of theory in practice. Participants are expected to "develop" a new product. This second component aims to convey a basic principle that must not be overlooked in management: ***no theory stands as complex as practice***. Hence, it helps to recognize the intangible "bits and pieces" of NPD reality, e.g. team cooperation and management. For more details about the project see the relevant section.

Course Tentative Schedule

Session 1: (1/9) Introduction and Overview of the Course

Session 2: (1/11) The NPD Process: Past, Present, and Future Challenges
        In-class Exercise: the "NPD Challenge"
        Optional Reading: Iansiti, M., and Mac Cormack A. (1997) "Developing Products on
        Internet Time," Harvard Business Review, 75 (5), 108-117.

Session 3: (1/18) User Need Identification
        Case: SweetWater
        a) What are the most important user needs in the water purifier market?
        b) Interview one or two wilderness enthusiasts that you know.
        Optional Readings: (a) Griffin A., and Hauser J. R. 1993. "The Voice of the Customer",
        Marketing Science, 12 (1), pp. 1-27
        (b) Lynn G. S., J. G. Morone, and A. S. Paulson, "Marketing and Discontinuous
        Innovation: The Probe-and-Learn Process" California Management Review 38, Spring
        1996, 8-37

Session 4: (1/23) [**PRESENTATION 1**] Team mission statement

Session 5: (1/25) Product Specifications and the Innovator's Dilemma
        Case: Hewlett-Packard: The Flight for the Kittyhawk
        a) What do you think are the reasons that the Kittyhawk project failed?
        b) What do you think of the product concept the Kittyhawk team pursued?
        c) What is your view on the concept selection process?
        Optional Reading: Bower J. L. and Christensen C. M. "Disruptive Technologies: Catching
        the Wave," Harvard Business Review, Jan-Feb 1995.

Session 6: (1/30) Generating Concepts – the Brainstorming Exercise
        Design Problem will be defined in due time.

Session 7: (2/1) Brainstorming exercise debrief
        Teams will informally present their concepts and discussion will follow

Session 8: (2/6) Class Project Concepts revisited: individual team meetings

Session 9: (2/8) Developing a NPD strategy
        Case: Auto-diagnosis Inc. (A): Revolutionizing the auto repair process
        a)   What were some of the main challenges faced by the Auto-diagnosis team?
        b)   What are some of the root causes?
        c)   How should the leadership team of Auto-diagnosis craft their strategy?
        Optional Reading: Markides C., "A Dynamic View of Strategy" Sloan Management
        Review, 40 (3) 1999, 55-69.

Session 10: (2/13) Project Selection and Resource Allocation in R&D
        Case: UB: New Product Genius or One-hit Wonder? [**TEAM WRITE-UP 1**]
        a)   PLEASE PREPARE THE QUESTIONS AT THE END OF THE CASE

Optional Reading: Loch C.H., Pich M. T., Terwiesch C., and Urbschat M. "Selecting R&D Projects at BMW: A Case Study of Adopting Mathematical Programming Models", IEEE Transactions on Engineering Management, 48 (1), pp.70-80

Session 11: (2/15) Organizing Product Development Teams – An in-class exercise

Session 12-13: (2/20, 2/22) [**PRESENTATION 2a, 2b**] Customer Need Identification.

Session 14: (2/27) Project Management: Beyond CPM [**TEAM WRITE-UP 2**]
Case: Dragonfly: Developing a Proposal for an Uninhabited Aerial Vehicle (UAV)
a) Do you think Dragonfly has any chance to make it on time? Would you invest your money in it?
b) What could be a derailing factor for timely completion of the project?

Session 15: (2/29) Guest Speaker Lecture
Daryl Dulaney, President and CEO, Siemens Industry Inc.
Presentation is part of the IMPACT Speaker Series, 4:30PM LeCraw Auditorium
[Be there early to secure seats! Participation is mandatory as it is for the regular sessions]

Session 16: (3/5) Panel Discussion: Open Challenges in NPD and Innovation
[More details will be provided as we approach on the date]

Session 17: (3/7) Prototyping
Case: Team New Zealand (A)
a) How would you evaluate Team New Zealand's use of simulation in the design process? What are its advantages and disadvantages?
b) What yacht construction strategy should Team New Zealand follow? Why?

Session 18-19: (3/12, 3/15) [**PRESENTATION 3a, 3b**] Concept generation, selection and prototype plan

Session 20: (3/26) Managing (Highly) Uncertain Projects
Optional Reading: DeMeyer A., C. H. Loch, and M. T. Pich "Managing Project Uncertainty: From Variation to Chaos", Sloan Management Review, 43 (2), Winter 2002, 60-67

Session 21: (3/28) Guest speaker lecture
TBD
[Keep in mind that the date is tentative; as it is often the case with senior executives, their schedules are somewhat volatile despite an upfront commitment; in that respect I do reserve the right to shift around some dates, and potentially deliverables if there is need. I will do so, though, with the objective of minimal disruption!]

Session 22: (4/2) Product Launching / Scalability
Case: PayMyBills.com
a) When should PayMyBills.com their new product?
b) What recommendations do you make concerning the outsourcing of the paper works? How do you evaluate the scalability (cost of handling a customer with more customers signing on) of the product?

Session 23: (4/4) Collaboration Challenges in NPD – an in-class exercise

Session 24- 25: (4/9, 4/12) [**PRESENTATION 4a, 4b**] 1st round of prototyping results - Progress

Session 26: (4/16) Panel Discussion: Open Challenges in NPD and Innovation
    [More details will be provided as we approach the date]

Session 27: (4/18) NPD Organization – Performance Measurement [**TEAM WRITE-UP 3**]
    Case: <u>Innovation at Cooper Lighting 2.0: Continuous Improvement of the Innovation Process?</u>
    a)   What organizational problems is Bart Ideker facing at CL?
    b)   How should the NPD functions be measured to ensure effectiveness?
    <u>Optional Reading</u>: Loch C. H., and U. A. S. Tapper "Implementing a Strategy-Driven Performance Measurement System for an Applied Research Group", Journal of Product Innovation Management, 19, pp. 422-436

Session 28: (4/23) New Product/Service/Technology Development Management: Overview and Wrap-up

Session 29: (4/25) Final Student Poster Session – Working Prototypes
    [**NOTE**: I AM PUTTING THE 25TH AS THE TENTATIVE DATE BUT YOU SHOULD NOTE THAT THERE MAY BE A SLIGHT CHANGE AS LINDA OLDHAM IS AIMING TO HOLD THE POSTER SESSION ON THE 27TH TOGETHER WITH THE T&M ADVISORY BOARD MEETING]

Course Grading Policy

Evaluations will be based upon the following components weighted as indicated:

1. Class Participation: 20%
2. Case Write-ups: 30%
3. Course Project: Intermediate reports (deliverables) and presentations: 20%
4. Course Project: Final report and presentation: 30%

Class Participation does not refer to regular class attendance; <u>it goes beyond simple student presence in class</u>. Students are expected to prepare the cases in advance, and <u>participate actively in the class discussion</u> enriching the views of their classmates as well as mine. Please, ensure that comments made do not insult in ANY way fellow classmates and/or the instructor. Although I will not take class attendance students should be aware that missing a session impacts the total grade through less participation. This will constitute the "individual performance" part of your grade. In the past students have complained *ex-post* because their grade was shaped by the participation component; be aware that I consider class participation a very important part of the grade as I have always done.

Team write-ups should address the questions that accompany the case assignment or the questions handed out at the time of in-class exercises. In preparing your write up, you should be aware of two major points: (a) be concise and well structured; it is rather hard to "guess" what is implied by the write up if the message is not clear; note also that lengthy write ups DO NOT necessarily get better grades, (b) be punctual; late submissions will be penalized by 20% less on grading. The case write-ups will have to be done ONE by each team, and together with the course project they will determine the "team performance" part of your grade!

Course Project; see Special section. **Remarks:** I will ask the group members to evaluate each other's participation in the project, and in case of serious indications of non-cooperation, I retain the right to penalize the responsible member. Remember: ONLY in cases of serious deviations!

Honor Code
The GeorgiaTech Honor Code applies. Students are responsible for the information contained in the Academic Honesty policies found at http://www.honor.gatech.edu/.

Course Project

The course project is the most important part of your grade! It is supposed to exhibit that throughout the class you acquired the knowledge and hopefully the ability to successfully bring a new product from conceptual thought to a successfully working prototype. It will be conducted in teams of 4-5 students. Although you will not be required to actually materialize the final product, and launch it, you will be asked to bring it to the stage of a cheap working prototype or a proof-of-concept. This last point brings us to the challenge of the idea choice. The project idea should be aligned with the following generic guideline:

> ***Low Budget, High Performance Innovation for the underprivileged****. Your team has to introduce a "product/service" that will offer to the less privileged segments of the global markets access to higher performance solutions for every day problems. The task is less complex than it sounds for two reasons: (i) once someone looks carefully into third world countries or even in the backyard of our big cities here in the US, they can see that many standard processes or products are totally absent; therefore going from nothing to something requires simple creative solutions and not complex high capital investment solutions; (ii) as one can read in recent press coverage, such cheap innovation is becoming the target for many large corporations and entrepreneurial efforts; the reason is that access to cheap experimentation has become easier (look for example at rent-a-coder.com or innocentive.com as markets for cheap innovation). You should put your imagination to action as to what are the dimensions of improvement and how some "proof of concept" could become more effectively demonstrated. The good news is that you are at a very good position regarding market knowledge! You ARE GT students so you have access to new technologies, an international environment and you can leverage your experiences. The challenge is to translate great ideas into a profitable idea.*

Therefore, you will have to be careful about choosing an idea. Here are some additional thoughts to ponder:
   (a) Be careful about the capital intensity of your project! Examples: semiconductor = bad; too expensive, unless the project is sponsored by a company; internet based auction for xyz good = better; despite the mere reality that you would need venture capital support >$1m to get an actual company going, one could easily get to the stage of a working prototype even at their laptop!
   (b) The "imitation fear" effect: If you think you have a great idea that runs the risk to be copied if you bring it to discussion in the course, then you have two choices: either DO NOT use it for the class, or, try to develop a simpler and vaguer version of it, thus exploit the class to get something going and to realize some feedback. Whatever the case, keep in mind that very often people have had the illusion that they had a fantastic idea that later on turned out to be already done by somebody else. Hence, be alert but do not overdo it!
   (c) Exploit the GaTech environment, and the Atlanta area! You are lucky to be in a school that is known for its technological advance, and for the big number of inventions that take place on its campus. Take advantage of that! Talk with people from engineering if you have "techie"

questions. Find out where the technology front lies. Try to engage personal contacts and identify problems and potential projects.

The following deliverables are expected with respect to the course project; intermediate deliverables do not require a formal report document; a copy of the powerpoint presentation with notes is sufficient. However, a formal paper is required for the final deliverable; there will be no final presentation but instead we will hold a "poster session" where the teams will showcase their project prototypes.

Deliverable 1

What is the core function of your product/service to be?

Why do you think it will be useful?

Hint: This is the presentation where you can be slightly generic. You will have one more opportunity to alter your idea before the second deliverable. Therefore use your fellow classmates as "sounding boards" for good feedback! I will also oblige everybody to sign a non-disclosure agreement (NDA) in this first deliverable.

Deliverable 2

What consumers are you mainly targeting?

What data supports your market segment choice? (Apart from questionnaires or focus groups you are advised to use further media tools like videos or photos providing evidence on why you think the customer needs ought to be addressed and/or why competitors fail to accomplish the required needs).

Hint: From now on your project is fixed for the rest of the course! We will sign an agreement on the exact deliverables you expect to have by the rest of the deadlines.

Deliverable 3

What product concepts can fulfill the needs described? (It should not necessarily be only one concept – I would expect you to come up with at least 10 concepts fulfilling the needs that you identified). You need to decompose the needs into rough product features, in order to convince the audience that those are the product characteristics that do address successfully the relevant need. Create a Concept Selection Matrix, indicating which concept sounds the best and why? What will be the resources needed for the development of the product? Discuss possible contingencies. Do have a plan of your prototyping tests, for the various prototypes you may proceed experimenting with. Analyze the fidelity (e.g. how reliable is the result of your test as an indicator for product functionality) of your experiments, but also the alternative experiments that could be feasible, as well as their costs. Do also have a necessary chart (either a Gantt one OR a decision tree depending on the uncertainty of your project) that will show contingency planning.

Hint: Remember that a working prototype is a relative term! Hence, in the case you are analyzing a service that concerns a bank environment, YOU DO NOT have to engage a whole bank branch for it! You can instead get some idea about the service data (e.g. arrivals of customers, number of clerks, customer perception of the service etc.), and then use computer simulations as the prototypes. Similarly, you can use a graphical interface and ask consumers about their perception! DO NOT HESITATE TO STAY IN TOUCH FOR ME ABOUT THIS PART!

Deliverable 4

Prototyping results act as (i) a way to convince the audience about the quality of your product, and (ii) a feedback mechanism for improving the finalized "prototype." Think carefully how you will present them, and how you will achieve your target: sell your product as a working prototype.

Final deliverable

Present the "final" working prototype (so that the class is convinced that it works). Put together the relevant information for your product. That implies including a summary of all previous steps. Then offer estimates for production/service launch, how much time would it take to get to full capacity (as a proxy from the defections you observed during prototyping), what capacities you are planning to achieve.

Course Materials

There is no required textbook for this class. However, the textbook *Product Design and Development*, by Karl T. Ulrich, and Steven D. Eppinger Irwin / Mc-Graw Hill, 4th edition 2005 covers several of the topics discussed and constitutes an excellent background reading. I would suggest that if not in person, at least in teams you should try to get access to a copy of the book (i.e. photocopy parts from the library copies; the library copies ARE NOT reserved!). Most cases of the course outline are included in the package – to be distributed through Study.Net. The bolded cases below will be distributed electronically from me through emails or the T-square website. The optional readings are all available to all GT students via the library databases and e-journals (http://www.library.gatech.edu/). They will not be distributed by me in an effort to retain the price of the course packet low and at the same time to move to a more sustainable ("green") packet.

Course Cases
1. SweetWater (HBS 9-695-026)
2. Hewlett-Packard: The flight of the Kittyhawk (HBS 9-697-060)
3. **Auto-diagnosis Inc. (A): Revolutionizing the auto repair process (COM Case Study – distributed in class)**
4. United Beverages: New Product Genius or One-Hit Wonder? (UVA – OM 1335)
5. Dragonfly: Developing a proposal for uninhabited aerial vehicles (INSEAD 600-003-1)
6. Crossair: The Introduction of the differential global positioning system (DGPS) (INSEAD 698-030-1)
7. Team New Zealand (A) (HBS 9-697-083)
8. **PayMyBills.com (Wharton – distributed in class)**
9. **Innovation at Cooper Lighting 2.0: Continuous Improvement of the Innovation Process?**

Course Articles
1. Iansiti, M., and Mac Cormack A. (1997) " Developing Products on Internet Time," Harvard Business Review, 75 (5), 108-117.
2. Griffin A., and Hauser J. R. 1993. "The Voice of the Customer", *Marketing Science*, 12 (1), pp. 1-27
3. Lynn G. S., J. G. Morone, and A. S. Paulson, "Marketing and Discontinuous Innovation: The Probe-and-Learn Process" California Management Review 38, Spring 1996, 8-37
4. Bower J. L. and Christensen C. M "Disruptive Technologies: Catching the Wave," Harvard Business Review, Jan-Feb 1995
5. Markides C., "A Dynamic View of Strategy" Sloan Management Review, 40 (3) 1999, 55-69.
6. Loch C.H., Pich M. T., Terwiesch C., and Urbschat M. "Selecting R&D Projects at BMW: A Case Study of Adopting Mathematical Programming Models", IEEE Transactions on Engineering Management, 48 (1), pp.70-80
7. DeMeyer A., C. H. Loch, and M. T. Pich "Managing Project Uncertainty: From Variation to Chaos", Sloan Management Review, 43 (2), Winter 2002, 60-67
8. Loch C. H., and U. A. S. Tapper "Implementing a Strategy-Driven Performance Measurement System for an Applied Research Group", Journal of Product Innovation Management, 19, pp. 422-436