MGT\ME 3744 Managing Product, Services and Technology Development (Elective)

Catalog Description: MGT\ME 3744 (3-0-3)
Prerequisites: None
Analysis of the managerial challenges of the product development process.

Textbook: None

Topics Covered:

- The Product Development Process
- User Need Identification
- Product Specifications and the Innovator's Dilemma [**CASE WRITE-UP 1**]
- [**PRESENTATION 1**] Team Mission Statement
- Generating Product Concepts
- Testing Product Concepts
- Design for Manufacturing
- Project Portfolio Selection and Resource Allocation in R&D
- R&D Portfolio Management [**CASE WRITE-UP 2**]
- Organizing Product Development Teams
- [**PRESENTATION 2**] Identifying the customer needs
- Project Management: Beyond CPM
- Project Management Under Risk
- Managing Highly Uncertain Projects
- [**PRESENTATION 3**] Concept Selection and Project Planning
- Concurrent Engineering
- Economics of Prototyping
- Virtual Prototyping [**CASE WRITE-UP 3**]
- Product Launching / Scalability
- Product Launching / Ramp up
- [**PRESENTATION 4**] Prototyping plan & 1st iteration results
- R&D Organization – Global R&D
- R&D Organization – Performance Measurement

Course Outcomes:

Outcome 1. To provide students with the ability to analyze and manage the new product development process.

Outcome 2. To enable students to market their product ideas both verbally and through project reports.

Outcome 3. To enhance a student's ability to work in inter-disciplinary teams to develop a new product or technology.

Contribution of course to meeting the requirements of Criterion 5.

MGT\ME 3xxx Managing Product, Services, and Technology Development												
	Mechanical Engineering Program Educational Outcomes											
Course Outcomes	a	b	c	d	e	f	g	h	i	j	k	l
Course Outcome 1	X	X		X	X			X	X	X	X	
Course Outcome 2							X					
Course Outcome 3				X			X	X				X

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Extended Syllabus

Course Description and Learning Objectives

Research and development (R&D) of new products and services has emerged as one of the key themes of competitiveness after the 1990s. And yet, it is still treated in many firms as a "black hole" into which management allocates lots of resources (money), hoping that enough useful things will come out to sustain the company for a few more years "on the run". Have you worked in marketing, finance or sales? Then you likely be familiar with that view.

This course offers a systematic overview of the ***management issues*** that arise during the process of new product development (NPD). The development process requires integration across the traditional management functions. The course introduces tools and concepts for both linking development to strategy, and for managing the development process for speed, efficiency, and market impact. Through a combination of cases and reading articles, the course covers a wide range of topics.

The course is divided in two large sections. The first one focuses on the theoretical perspectives and frameworks concerning the management of the development process. We follow the development process from the initial steps of identifying the customer needs and conceptualizing the product, to production ramp-up and product launch issues. Academics and practitioners have expanded the knowledge frontier significantly, and today we know more about NPD management. A thorough understanding of the fundamental principles that govern the NPD process should emerge from this first part. More specifically, the notion that the NPD process entails "information processing and transformation" must be realized. The development of a new product 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 (NPD process steps). Participants shall become familiar with the key stages, 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 constitutes the basis for anyone who wishes to get involved with the development of new products, independently of her/his function within the organization.

The second part is the application of the theory in practice. Students are expected to "develop" a new product in parallel to the course following the theoretical developments. The second part of the course aims to convey a basic principle that must not be overlooked in management: ***theory is always distant from practice***. Hence, it helps to recognize the intangible "bits and pieces" of reality in NPD, e.g. team cooperation and management. Students work in teams throughout the semester, and they have to achieve a *modus operandi* in order to attain the desired outcome. This "tacit" learning aspect offers important 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. For more details about the project see the relevant section in the end.

Course Session Topical outline

- Introduction and Overview of the Course
- The Product Development Process
  Case: Microsoft Office for Windows: The Next Suite
  a) What are the various troubles incurred in the office products?
  b) What differences do the processes for the different products exhibit?
  c) How critical do you think resource sharing is in office case?
  "The Battle Over a Radical New Plane", Business Week, November 25, 2002
  Optional Reading: Cooper R. G. "Third Generation New Product Processes", Journal of Product Innovation Management, 11, 1994, 3-14
- User Need Identification
  Case: SweetWater
  a) Which user needs are the most important ones 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
- Product Specifications and the Innovator's Dilemma [**CASE WRITE-UP 1**]
  Case: Hewlett-Packard: The Flight of 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: Christensen C. Ch. 9 Innovator's Dilemma, HBS Press 1997
- [**PRESENTATION 1**] Team Mission Statement
- Generating Product Concepts
  Case: Corporate New Ventures at Procter & Gamble
  a) How would you describe the choice process at P&G?
  b) Do you find this process appropriate for every type of industry?
  Von Hippel E. "Creating Breakthroughs at 3M", Harvard Business Review, September-October 1999.
  Optional Reading: U&E Ch. 6
- Testing Product Concepts
  Case: IDEO Product Development
  a) Identify the core characteristics of the concept development process in IDEO
  b) What, according to your view is the main strength of their process?
  U&E Ch. 8
- Design for Manufacturing
  Just bring an old VCR tape – it may not survive, so please be prepared!
- Project Portfolio Selection and Resource Allocation in R&D
  Case: American Switching Systems: Development Project Choice
  a) What do you think makes the process of project choice a difficult one? Is this the case in all industries that you are aware of?
  b) Identify what would be the portfolio choices in later stage developments of your team concepts. (this will be useful also for your team presentation)
  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
- R&D Portfolio Management [**CASE WRITE-UP 2**]
  Case: R&D Management at Universal Luxury Group (A) & (B)
  a) Does ULG have enough capacity to accept all projects proposed by the 3 brands? If not, which ones should be postponed?
  b) If they accepted all the projects what would be the utilization rate for the formulation labs?
  c) How are the formulation lbs organized? Would you propose an alternative organizational structure to improve their operational efficiency?
  Background: P. Adler et al. 1996 "Getting the most out of your Product Development Process", *Harvard Business Review*, March-April.
- Organizing Product Development Teams
  Ted Klastorin, *Project Management Tools and Trade-offs*, Ch. 3, J. Wiley & Sons
  Optional Reading: Wheelwright S. C. and Klark K. B., *Revolutionizing New Product Development*, Ch. 8, New York: Free Press.

- [**PRESENTATION 2**] Identifying the customer needs
- Project Management: Beyond CPM
  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?
  Optional Reading: U&E Ch. 14
- Project Management Under Risk
  Case: Crossair: The Introduction of the Differential Global Positioning System (DGPS)
  a) Identify the different contingencies that Crossair faces while undertaking the project
  b) Make a small revision from your MGT 6600 course of decision trees. It will be necessary in order to go through the case.
- Managing Highly Uncertain Projects
  Case: Cleveland Cliff Inc. and Lurgi Metallurgie GmbH: The Circored Project (A)
  a) Putting yourself in the position of the two boards of Cleveland Cliffs and Lurgi AG in the summer of 2000, would you invest the additional $45 million, or would you decide to write off the facility?
  b) What do you see as the key problems that caused the start of commercial production to be delayed to March 1, 2001?
  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
- [**PRESENTATION 3**] Concept Selection and Project Planning
- Concurrent Engineering
  Case: Jalopy Sports Car Development: Managing Concurrent Engineering Projects
  a) What are the fundamental conditions that caused the delay rework in die cutting?
  b) How applicable is the concurrent engineering methodology in the context of a radical new product (e.g. fuel cell automotive engine development)?
  Krishnan V., Eppinger S. D., and Whitney D. E. 1997. "A Model Based Framework to Overlap Product Development Activities", *Management Science*, 43 (4), pp. 427-438
- Economics of 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?
  U&E Ch. 12
- Virtual Prototyping [**CASE WRITE-UP 3**]
  Case: BMW AG: The Digital Auto Project
  a) What are the competitive challenges in the automotive industry in 1997 and beyond? How is BMW affected?
  b) How would you evaluate the evolution of product development at BMW? Why does BMW's senior management feel that there is an immediate need to slash development time by 50%?
  c) As Peter Ratz, what would you recommend to senior management? Should BMW's styling department go digital all the way? Be prepared to discuss your specific plans on BMW's styling process and the role of computer aided styling (CAS).
  "The Ultimate Creativity Machine: How BMW Turns Art into Profit" *Harvard Business Review*, Jan/Feb 2001
- 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?
- Product Launching / Ramp up
  Case: Project DreamCast: Serious Play at Sega
  a) What are the unique characteristics of the video game industry?
  b) Compare the Dreamcast development with the one of Saturn.
  c) What should Sega do in this difficult situation?
  Terwiesch, Christian, Roger E. Bohn, K. C. Chea, "An Exploratory Study of Product Transfer and Production Ramp-up in the Data Storage Industry", *R&D Management*
- [**PRESENTATION 4**] Prototyping plan & 1st iteration results
- R&D Organization – Global R&D
  Case: The Development of Nopane
  a) What are the strengths in the development process used?
  b) The price of a package is 80,- DM (compared to 20,- for a package of penicillin) with gross margins of 65,-. What is the discounted difference in gross margins of the GP market strategy compared to testing the product in hospitals (at 20% of the volume) for 3 years? Assume the GP strategy had resulted in sustained average monthly volumes of 150 000 units, as in February 1995, and assume a discount rate of 15% per year.

c) What would you answer to John Hammer's suspicion that there may be a management failure at Alpex?

Lemonick M. D."Redux – The New Miracle Drug?", *Time*, September 23, 1996, 60-67

- R&D Organization – Performance Measurement

  Case: Gemstone Inc.: Measuring Research Performance

  a) What organizational problems is Magnus Norborg facing at Gemstone?
  b) Do you feel that R&D can be measured in conventional ways (e.g. financial measures)?

  Optional Reading: 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

- Final Student Presentations – Working Prototypes

Course Grading Policy

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

1. Class Participation: 25%
2. Case Write-ups: 15%
3. Course Project: Intermediate reports (deliverables) and presentations: 35%
4. Course Project: Final report and presentation: 25%

Class Participation refers to regular class attendance, but it goes beyond simple student presence in class. It has as prerequisites, of course, courteous and professional comportment in class. Students are expected to prepare the cases in advance, and participate actively in the class discussion 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 plan on measuring class participation as I have always done.

Case write-ups should address the questions that accompany the case assignment. 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.

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 the grade! It is supposed to exhibit that throughout the class students acquired the knowledge and hopefully the ability to successfully bring a new product from the conceptual thought to the successfully working prototype. It will be conducted in teams of 5-6 students. Although students are not required to actually materialize the final product, and launch it, they are asked to bring it to the stage of a cheap working prototype. This last point relates strongly to the idea chosen. There will be three main sources of ideas for this course:

(i) The Georgia Tech richness of new technologies,
(ii) a real project that a member of the team has worked on in the past during their career,
(iii) an idea that will emerge from your group brainstorming[1].

All these imply that students must be careful about the product idea. Here are some important issues to keep in mind:

(a) Choose carefully the development capital intensity of your product! Examples: semiconductor = bad; too expensive, unless the project is sponsored by a company; internet based auction for xyz good = better; although you would need to have a venture capitalist supplying you with >$1m to get the company going, you could easily get to the stage of a working prototype even at your computers!

(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: first, DO NOT use it for the class, or, second, try to develop a simpler and vaguer version of it, and exploit the class to get 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 really careful when thinking about 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.

(d) When defining the team, you have to abide to a diversity constraint with respect to the members' backgrounds! Each team should involve both technical competence and managerial capabilities hence **each team is required to have AT LEAST 2 management students (if not I will redistribute people!) and AT LEAST 2 engineering students**.

[1] The latter maybe requiring further discussion internally in the team in order to converge to something tangible enough and doable enough within the semester length. This is similar to the past single option in this course of "students finding their own idea," with a small tweak: try to talk to companies you know of, in search for this idea.