

# **TTMG 5001**

## **MANAGEMENT PRINCIPLES FOR ENGINEERS**

**Fall 2008**

**Department of Systems and Computer Engineering**  
**Carleton University**

Professor Weiss  
Architecture Annex (AA), Room No. 527  
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Wednesday, 6:05 p.m. to 8:55 p.m. EST

### **Instructor availability**

The instructor is available via e-mail any time. E-mail is the preferred mode of communication. To speak to him, please call 613 520 2600 x 1642 (Carleton office).

### **Calendar Description**

TTMG 5001 [0.5 credit] (formerly 96.501)

Management Principles for Engineers

Develops a common level of knowledge among students on topics in project management, leadership, industrial marketing, managerial economics, and organizational behaviour. These topics are relevant for engineers and computer scientists who manage the engineering processes that deliver innovative communications systems, products and services.

### **Course Objectives**

We learn about topics that are critical for technology-based companies that compete in the global market for communications products and services. These topics include:

- Product and service development
- Technical entrepreneurship and commercialization

The topics listed above cut across functional management areas and are examined from the perspective of the manager of the development project. These topics build on the literature in the fields of project management, industrial marketing, competitive strategy, organizational behavior, leadership and managerial economics.

This course introduces students to the literature in the field of engineering management.

### **Rationale**

The course is integrated around the work that development project and commercialization managers actually do, and the context within which they act. In organizing the course, we rejected the traditional organization around functional areas such as human resources, R&D, marketing, finance, etc. for two reasons. First, engineers and computer scientists who are responsible for engineering processes in the real world make management decisions that are integrative. Rarely can these decisions be broken down into well-defined and stable functions. Second, the delivery of a course partitioned by function frequently turns into a series of disjointed lectures with no evident interdependences.

From our research and consulting experience and the research of others we found that in successful technology-based companies the development project is the main mechanism for learning and profit generation and that the project manager is the one person that can make or break the project.

All master's students in the M.Eng. option in the Technology Innovation Management program are required to complete this course.

## **Benefits**

Students will benefit from:

- Acquiring a set of tools and concepts that can be applied to improve existing product development organizations or establish new ones
- Developing the skills required to make, assess and communicate recommendations in technical and early market environments where there is not an abundance of information
- Using lessons learned in other settings to solve product development and commercialization problems
- Learning how to prepare a Gate 0 project presentation and a literature review
- Knowing how to access the engineering management and commercialization literature
- Developing personal skills in making, assessing and communicating recommendations on how to improve development and commercialization organizations

## **Class Sessions**

Class sessions will be conducted as i. lecture and discussion sessions, and ii. student presentation sessions. Lecture and discussions sessions dominate the first part of the course while student presentation sessions dominate the second part of the course. Lectures in the project option will be delivered online. Please see the instructions on joining an online classroom at (except that our conference room is 85001):

<http://www.carleton.ca/tim/blindside.html>

Students are expected to have equipment that allows them to participate actively in online sessions. The system we use delivers audio over the phone, and slides and video of the presenter over the web. For audio delivery, a speakerphone or Bluetooth headset is highly recommended. If you use VOIP, invest in a good microphone. Students should also acquire a webcam (a basic model suffices), which allows them to share a video stream of themselves when giving presentations, or in virtual group discussions during their project work.

For the lecture and discussion sessions, there will be:

- Assigned readings
- A summary provided by the professor
- Changes to the professor's summary produced by the students
- Set of lessons learned produced by the students and professor

During the student group presentation sessions, groups will be asked to make short presentations on their assignments (max 10 minutes). Each group decides who presents what and the order. Before 5 p.m. the day prior to when presentations are due, each group will distribute to all members of the class the slides to be presented the next day. No exceptions. Presentations will be followed by clarification questions and discussions that involve the entire class. After all presentations are completed, lessons learned will be generated. The purpose of the lessons learned is to improve by a factor of 2X the content and style of the next presentations.

An excellent group presentation is max 10 minutes long, short, crisp and insightful.

Success as a manager depends on verbal communication skills. This course provides an opportunity for students to develop their ability to make, assess and communicate recommendations to their peers.

## **Brand**

The brand of the program is a valuable asset. All students are expected to work hard to protect and enhance the value of the TIM brand. All presentations are made using TIM templates and students must use Carleton email accounts.

The instructor will provide TIM templates.

## **Student Evaluation**

Students are required to work in groups to complete two assignments, work individually to write a final examination, and make presentations during class sessions (presentations are also group efforts: every group member has to present). To determine the course grade, these will be weighted as follows:

- Assignment 1 (group) 30%
- Assignment 2 (group) 30%
- Final Examination (individual) 30%
- Presentations (group) 10%

Assignments submitted late and presentations not made will receive a grade of zero. All students in a group receive the same grade. Final grade reports will follow Carleton University guidelines.

### **Assignment 1: Literature review**

Each student is required to work in a group (max of 3 students) to:

- Identify a topic or research question
- Review the academic and professional literature relevant to the topic or research question
- Identify at least three groups (e.g., entrepreneurs, top management teams of communication suppliers, government policy makers) who will be interested in reading your literature review and explain why
- Identify at least five insights you gained from producing the literature review

To understand what a good literature review looks like, please read the three articles assigned for next week: Brown & Eisenhardt (1995), Krishnan & Ulrich (2001), and Shane & Ulrich (2004).

The list of better journals includes:

- High profile journals: Management Science, Organization Science, Academy of Management Journal, Academy of Management Review, Harvard Business Review, California Management Review, Administrative Science Quarterly, Strategic Management Journal, and Sloan Management Review.
- Niche journals: Journal of Product Innovation Management, IEEE Transactions on Engineering Management, Research Policy, and R&D Management

Millions of journal articles can be accessed online at: [catalogue.library.carleton.ca](http://catalogue.library.carleton.ca). To access the journal articles, you will need your Patron Barcode Number and your PIN. Your Patron Barcode Number is in your student card. Any alphabetical characters should be in upper-case, e.g., 0200003188X. The first six digits of your Carleton Central PIN is your PIN.

Each group will present version 1 of Assignment 1 on Oct 29 (slides with TIM format). A document that includes the final version of Assignment 1 is due Nov 19 (max 15 pages, Arial size 10, 1 inch margins on the sides, double spaced). On Nov 19, each student will also present the final version of Assignment 1 (slides with TIM format).

In your document, use the reference style set by the Academy of Management Review.

Slide decks to be presented must be distributed to all members of the class before 5 p.m. the day before the presentation is due.

### **Assignment 2: Gate 0 project proposal**

Each student is required to work in a group (max of 3 students) to:

- Prepare a Gate 0 project proposal following the guidelines in “TIM Project Development”
- Present and defend the Gate 0 proposal

Information on TIM project development is at:

[http://www.carleton.ca/tim/sub/tim\\_project\\_development.pdf](http://www.carleton.ca/tim/sub/tim_project_development.pdf)

The gate process is summarized at: <http://www.carleton.ca/tim/sub/research.html>

A Gate 0 project proposal is comprised of the following sections:

- Research objective (i.e., a clear statement of the technology management problem to be addressed)
- Relevance (i.e., provide evidence that there are managerial/entrepreneurial clients interested in and supportive of the project)
- Literature review (e.g., for each literature stream provide key findings and references)
- Contribution (i.e., explain your contribution to the academic literature and to the solution of engineering management problems)
- Project plan (i.e., specify tasks, responsibilities and schedule that will be followed)
- Data to be used and how data will be analyzed (i.e., specify what type of data will be collected, from where and how, and explain how the data will be analyzed to produce the project deliverables)
- Stopping rule (i.e., what exactly will signal that the project is completed)
- Stretching aspects for each of the team members (i.e., state what you intend to learn and how does it fit to your personal career development needs and plans)
- References (i.e., use Academy of Management style; make each reference complete; limit your reference list to your critical sources)

Each group will present version 1 of Assignment 2 on Nov 12 (slides with TIM format). Final version of Assignment 2 is due Nov 26 (max 15 pages, Arial size 10, 1 inch margins on the sides, double spaced). On Nov 26, each student will also present the final version of Assignment 2 (slides with TIM format).

In your document, use the reference style set by the Academy of Management Review.

Slide decks to be presented must be distributed to all members of the class before 5 p.m. the day before the presentation is due.

### **Exam**

The take home exam is an individual effort. The exam will be distributed on Nov 26, and is due on Dec 3, at 6 p.m. The exam must be delivered online or as specified in class.

### **Group work and free loaders**

Group work is an important component of this course. Because of the virtual nature of the M.Eng. program, it would be common for project team members to communicate and to coordinate their work using the Internet – in much the same way that the M.Eng. courses are delivered. You may elect to work in the same group to prepare both assignments or work in two different groups. Group conflicts are to be dealt with by the group in a way that is fair, fast and without personal attacks. The instructor does not settle group disputes.

The instructor will dissolve a group that is late submitting an assignment. A group of three is expected to deliver better work than a group of two.

Free loaders are not welcome anywhere. This course is no exception. The best way to deal with free loaders is to not include their names in the first page of the group assignments. If a student's name does not appear in an assignment submitted by his or her group, the student must submit his or her own assignment. Failure to do so, the student will receive zero for the assignment. There is zero tolerance for free loaders.

I deal with free loaders by first “encouraging” and then formally requesting them to leave the TIM program.

### **Students with Disabilities**

Students with disabilities who require academic accommodations in this course are encouraged to contact the Paul Menton Centre (PMC) for Students with Disabilities to complete the necessary forms. After registering with the Centre, make an appointment with me in order to discuss your needs at least *two weeks before the first assignment is due*. This will allow for sufficient time to process your request. Please note the following

deadlines for submitting completed forms to the PMC for formally scheduled exam accommodations: *November 7, 2008* for fall and fall/winter term courses.

**Plagiarism**

Plagiarism (copying and handing in for credit someone else's work) is a serious instructional offense that will not be tolerated. Please refer to the section on instructional offenses in the Graduate Calendar for additional information.

**Administrative Details**

- Please notify the instructor via e-mail if you will not attend a class.
- Classes will be recorded. You can access the recording any time.
- You must be prepared for each class. You do so by reading the material assigned and being prepared to discuss in class how what was read can be applied in product development organizations.
- Each student must make his/her slides available to all other students by 5 p.m. the day before.

**TTMG 5001 Class by Class Schedule Fall 2008**

<b>Date</b>	<b>Topic</b>	<b>Article</b>
Sep 10	Introduction and administrative matters	<ul style="list-style-type: none"> <li>• Course outline</li> <li>• TIM program</li> <li>• TTMG 5001 and TIM program</li> <li>• Project development guidelines</li> <li>• TIM project and thesis inventory</li> </ul>
Sep 17	Session 2: Product development, literature review	<ul style="list-style-type: none"> <li>• Brown &amp; Eisenhardt (1995)</li> <li>• Krishnan &amp; Ulrich (2001)</li> <li>• Shane &amp; Ulrich (2004)</li> </ul>
Sep 24	Session 3: Product and service development, theory and models as practical aids I  Identify topics for Assignments 1 and 2	<ul style="list-style-type: none"> <li>• MacCormack et al. (2001)</li> <li>• Eisenhardt &amp; Tabrizi (1995)</li> <li>• Goldenberg et al. (2001)</li> <li>• Haefliger et al. (2008)</li> </ul>
Oct 1	Session 4: Product and service development, theory and models as practical aids II	<ul style="list-style-type: none"> <li>• Prügl and Schreier (2006)</li> <li>• Bhuiyan et al. (2004)</li> <li>• Ethiraj &amp; Levinthal (2004)</li> <li>• MacCormack et al. (2006)</li> </ul>
Oct 8	Session 5: Product and service development, theory and models as practical aids III	<ul style="list-style-type: none"> <li>• Gerwin (2004)</li> <li>• Tatikonda &amp; Montoya-Weiss (2001)</li> <li>• Van de Ven (1986)</li> </ul>
Oct 15	Session 6: Technical entrepreneurship and commercialization I	<ul style="list-style-type: none"> <li>• Ferrier (2001)</li> <li>• Gans, Hsu &amp; Stern (2002)</li> <li>• Gans &amp; Stern (2003)</li> <li>• Miller &amp; Olleros (2007)</li> </ul>
Oct 22	Session 7: Technical entrepreneurship and commercialization II	<ul style="list-style-type: none"> <li>• Teece (1988)</li> <li>• Teece et al. (1997)</li> <li>• Pisano &amp; Teece (2007)</li> <li>• West (2007)</li> </ul>
Oct 29	Session 8: Presentation of version 1 of Assignment 1  Lessons learned from making presentations	
Nov 5	Session 9: Technical entrepreneurship and commercialization III	<ul style="list-style-type: none"> <li>• Iyer et al. (2006)</li> <li>• Anderson et al. (2006)</li> <li>• Moore (2004)</li> <li>• Chakravorti (2004)</li> <li>• Watson et al. (2005)</li> </ul>
Nov 12	Session 10: Presentation of version 1 of Assignment 2	
Nov 19	Session 11: Presentation of final version of Assignment 1 and Assignment 1 document are due	
Nov 26	Session 12: Presentation of final version of Assignment 2 and Assignment 2 are due  Exam is provided to students	
Dec 3	Exam is due before 6 p.m. EST. Submit exam online.	No class

To access the required journal articles in electronic form, go to:

<http://catalogue.library.carleton.ca/> enter the name of the journal, select Web resource and click “Search”. Click on link, and then enter your barcode number and PIN.

### **Required Readings for Session 2: Product development, literature reviews**

- Brown, S. L., & Eisenhardt, K. M. 1995. Product development: Past research, present findings and future directions, *Academy of Management Review*, 20(2): 343-378.
- Krishnan, V., & Ulrich, K. T. 2001. Product development decisions: A review of the literature. *Management Science*, 47(1): 1-21.
- Shane, S., & Ulrich, K. T. 2004. Technological innovation, product development and entrepreneurship in Management Science, *Management Science*, 50(2): 133-144.

### **Required readings for Session 3: Product and service development, theory and models as practical aids I**

- MacCormack, A., Verganti, R., & Iansiti, M. 2001. Developing products on “Internet time”: The anatomy of a flexible development process. *Management Science*, 47(1): 133-150.
- Eisenhardt, K. M., & Tabrizi, B.N. 1995. Accelerating adaptive processes: Product innovation in the global computer industry. *Administrative Science Quarterly*, 40(1): 84-110.
- Goldenberg, J., Lehmann, D. R., & Mazursky, D. 2001. The idea itself and the circumstances of its emergence as predictors of new product success. *Management Science*, 47(1): 69-85.
- Haefliger, S., von Krogh, G., & Spaeth, S. 2008. Code reuse in open source software. *Management Science*, 54(1): 180-193.

### **Required readings for Session 4: Product and service development, theory and models as practical aids II**

- Prügl, R., & Schreier, M. 2006. Learning from leading-edge customers at The Sims: Opening up the innovation process using toolkits. *R&D Management*, 36(3): 237-250.
- Bhuiyan, N., Gerwin, D., & Thomson, V. 2004. Simulation of the new product development process for performance improvement. *Management Science*, 50(12): 1690-1703.
- Ethiraj, S.K., & Levinthal, D. 2004. Modularity and innovation in complex systems. *Management Science*, 50(2): 159-173.
- MacCormack, A., Rusnak, J., & Baldwin, C. 2006. Exploring the structure of complex software designs: An empirical study of open source and proprietary code. *Management Science*, 52(7): 1015–1030.

### **Required readings for Session 5: Product and service development, theory and models as practical aids III**

- Gerwin, D. 2004. Coordinating new product development in strategic alliances. *Academy of Management Review*, 29(2): 241-257.
- Tatikonda, M. V., & Montoya-Weiss, M. M. 2001. Integrating operations and marketing perspectives of product innovation: The influence of organizational process factors and capabilities on development performance. *Management Science*, 47(1): 151-172.
- Van de Ven, A. H. 1986. Central problems in the management of innovation. *Management Science*, 32(5): 590-607.

### **Required readings for Session 6: Technical Entrepreneurship and Commercialization I**

- Ferrier, W. J. 2001. Navigating the competitive landscape: the drivers and consequences of competitive aggressiveness. *Academy of Management Journal*, 44(4): 858-877.
- Gans, J. S., Hsu, D. H. & Stern, S. 2002. When does start-up innovation spur the gale of creative destruction? *RAND Journal of Economics*, 33(4): 571-586.
- Gans, J. S., & Stern, S. 2003. The product market and the market for “ideas”: commercialization strategies for technology entrepreneurs. *Research Policy*, 32: 333-350.
- Miller, R., & Olleros, X. 2007. The dynamics of games of innovation. *International Journal of Innovation Management*, 11(1): 37-64.

### **Required readings for Session 7: Technical Entrepreneurship and Commercialization II**

- Teece, D. J. 1988. Capturing value from technological innovation: integration, strategic partnering, and licensing decisions. *Interfaces*, 18(3): 46-61.
- Teece, D. J., Pisano, G. & Shuen, A. 1997. Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7): 509-533.
- Pisano, G., & Teece, D. J. 2007. How to capture value from innovation: shaping intellectual property and industry architecture. *California Management Review*, 50(1): 278-296.
- West, J. 2007. Value Capture and Value Networks in Open Source Vendor Strategies. *Hawaii International Conference on System Sciences*: 176-185.

### **Required readings for Session 9: Technical Entrepreneurship and Commercialization III**

- Iyer, B., Lee, C. H., & Venkatraman, N. 2006. Managing in a “small world ecosystem”: Lessons from the software sector. *California Management Review*, 48(3): 28-47.
- Anderson, J. C., Narus, J. A., & van Rossum, W. 2006. Customer value propositions in business markets. *Harvard Business Review*, 84(3): 90-99.
- Moore, G. 2004. Darwin and the demon: Innovating within established businesses. *Harvard Business Review*, 82(7/8): 86-92.
- Chakravorti, B. 2004. The new rules for bringing innovations to market. *Harvard Business Review*, 82(3): 58-67.
- Watson, R. T., Wynn, D., & Boudreau, M. C. 2005. JBOSS: The evolution of professional open source software. *MIS Quarterly Executive*, 4(3): 329-341.

### **Reference Texts**

- Baghai, M., Coley, S., & White, D. 2000. *The Alchemy of growth*. Perseus Publishing.
- Betz, F. 2003. *Managing technological innovation*. John Wiley.
- Burgelman, R. A., Maidique, M. A., & Wheelwright, S. C. 2001. *Strategic management of technology and innovation*. McGraw Hill-Irwin.
- Christensen, C., & Raynor, M. E. 2003. *The innovators solution*. Harvard Business School Press.

- Clark, K. B., & Wheelwright, S. C. 1992. *Managing new product and process development: Text and cases*. Free Press.
- Collins, J. 2001. *Good to great: Why some companies make the leap ... and others don't*. Harper Business.
- Cooper, R. G. 2001. *Winning at new products: Accelerating the process from idea to launch*. 3<sup>rd</sup> edition. Perseus Publishing.
- Downes, L. and Mui, C. 1998. *Unleashing the killer app*. Harvard Business School Press.
- Fine, C. 1998. *Clock speed: Winning industry control in the age of temporary advantage*. Perseus Books.
- Fleisher, C., & Bensoussan, B. E. 2002. *Strategic and competitive analysis: Methods and techniques for analyzing business competition*. Prentice Hall.
- Foster, R., & Kaplan, S. 2001. *Creative destruction*. Doubleday.
- Harris, J. 2002. *Blindsided: How to spot the next breakthrough that will change your business forever*. Capstone.
- Jolly, V. K. 1997. *Commercializing new technologies*. Harvard Business School Press.
- Moore, G. A. 2000. *Living on the fault line*. Harper Business.
- Patterson, M. L., & Lightman, S. 1997. *Accelerating innovation: Improving the process of product development*. John Wiley & Sons.
- Schein, E. H. 1999. *Corporate culture: The survival guide*. Jossey Bass.
- Shane, S. 2005. *Finding fertile ground*. Wharton School Publishing.
- Smith, P. G., & Reinertsen, D. 1998. *Developing products in half the time, new rules new tools*. 2<sup>nd</sup> edition. John Wiley & Sons.