# TTMG 5001
# MANAGEMENT PRINCIPLES FOR ENGINEERS

**Winter 2012**
**Department of Systems and Computer Engineering, Carleton University**

**Time and place**
Tuesdays, 6 pm - 9 pm (EST)
4359 Mackenzie Building (ME4359) and online.

**Instructor**
Professor Steven Muegge
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1704 Dunton Tower (DT1704); 613-520-2600 x6804

**Office hours**
The instructor is available via e-mail any time. E-mail is the preferred mode of communication.
Instructor office hours (online or offline) are available by appointment.

**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 students 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 thesis 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 lecture and discussion sessions and 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.

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 real time in class

During the student group presentation sessions, groups will make short presentations on their assignments (maximum 10 minutes). Each group decides who presents what and the order. Before 5 pm 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 no more than 10 minutes long, and concise, 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.

Classes are delivered both in-class and online. To join online, go to the Technology Innovation Management conference server, type your name in the "Full Name" field, select room "TTMG 5001" with password "student", and click "Join". The TIM conference server is here:
http://present.carleton.ca/

For the audio portion of the online class, call 613-366-1985 (local) or 866-964-7085 (toll-free) from a telephone and enter conference room 85001 on the telephone keypad when prompted. Alternatively, you can click the headphones icon in the web conference for a VoIP connection through your computer (often lower audio quality); if you use a VoIP connection, it is essential that you wear a high-quality headset. Detailed instructions and video tutorials on joining and using the online classroom are available from the BigBlueButton website:
http://www.bigbluebutton.org/content/videos

For each weekly class session, there will be assigned readings and/or tasks. The course material and recordings of the class sessions will be made available on the Moodle learning content management system here:
http://cms.sce.carleton.ca.

You should visit Moodle frequently throughout the course. The instructor aims to make a version of the slides available before every class, however, they may be updated as a result of in-class discussion. Please check for updates after class. Contact the instructor, if you need a Moodle account.

**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 components 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 (maximum 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 session 2: Brown & Eisenhardt (1995), Krishnan & Ulrich (2001), and Shane & Ulrich (2004).

The list of better journals includes:

- High profile journals with a broad scope: *Management Science*, *Organization Science*, *Academy of Management Journal* (AMJ), *Academy of Management Review* (AMR), *Harvard Business Review* (HBR), *California Management Review* (CMR), *Administrative Science Quarterly* (ASQ), *Strategic Management Journal* (SMJ), and *MIT Sloan Management Review* (SMR).
- Specialized niche journals: *IEEE Transactions on Engineering Management*, *Research Policy*, *R&D Management*, and *Journal of Product Innovation Management*.

Millions of journal articles can be accessed online through the Carleton University Library Catalogue here: http://catalogue.library.carleton.ca

To access journal articles, you will need your Patron Barcode Number and your PIN. Your Patron Barcode Number is printed on your student card. Any alphabetical characters should be typed using upper-case, e.g., 0200003188X. Your library PIN is the first six digits of your Carleton Central PIN.

Each group will present version 1 of Assignment 1 (slides with TIM format) in session 8 on March 6, and present the final version of assignment 1 (slides with TIM format) in session 11 on March 27. Also in session 11 (March 27), each group will submit an Assignment 1 document (maximum 15 pages, double spaced, 1 inch margins on the sides, text in the body of the report is Times New Roman 12-point font). Use the Academy of Management (AoM) style for all citations and references. A style guide is provided below (pp. 314-316):

***Academy of Management Review***. 2007. Style guide for authors. 32(1): 313-316.
Available at http://www.aom.pace.edu/amr/AMRstyleguide.pdf

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

- Prepare a Gate 0 thesis proposal following the guidelines in "TTM Thesis Development"
- Present and defend the Gate 0 proposal

Information on TIM thesis development is available here:
http://www.carleton.ca/tim/sub/tim_thesis_development.pdf

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

A partial inventory of completed TIM theses is here: http://www.carleton.ca/tim/sub/theses.html

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

- Objective and deliverables (i.e., what you will accomplish; and a list of the concrete tangible outcomes that mark the end of your research)
- Value of the deliverables (i.e., who benefits and how from your deliverables; your contribution to the academic literature and to the solution of engineering management problems)
- Method (the actions you will take to produce your deliverables; e.g., if testing hypotheses, specify the sample, the population from which the sample will be drawn, and the statistical testing approaches to be used for each hypothesis; if using a grounded approach, specify the data analysis approach that will be used; if using a simulation approach, specify how your simulation will be built, tested and used to generate insight into the real situation simulated; if constructing a system, specify how your system will be calibrated, tested and used)
- Relevance (i.e., who cares about your research topic and why; use evidence from the literature to demonstrate that academics and managers care about your research)
- Literature review and lessons learned from the literature (i.e., demonstrate that the literature supports your contribution; identify the salient literature; organize the literature into streams; for each literature stream provide key findings and references; identify the salient lessons learned)
- Theoretical framework (e.g., if testing hypotheses, develop a diagram that presents and integrates your hypotheses; if using a grounded approach, specify the methodology sources that will guide your research; if using a simulation approach, specify the salient features of the simulation approach to be taken that make it suitable for your purposes; if constructing a system, specify the engineering theory that will be used)
- Research design, data acquisition, and data analysis (specify what data are needed, how you obtain these data, and will you do with the data; e.g., if you are testing theory, specify the data that you will use to operationalize your theoretical variables; if you are developing new theory, specify the data you will use to develop new theoretical categories and propositions; if you are simulating or constructing a system, specify the data you will use to develop, calibrate and test your simulation model or working system.)
- References (i.e., use Academy of Management style consistently and correctly; make each reference complete; limit your reference list to your critical sources)

Each group will present version 1 of Assignment 2 (slides with TIM format) in session 10 on March 20, and present the final version of Assignment 2 (slides with TIM format) in session 12 on April 3. Also in session 12 (April 3), each group will submit an Assignment 2 document (maximum 15 pages, double spaced, 1 inch margins on the sides, text in the body of the report is Times New Roman 12-point font). Use the Academy of Management (AoM) style for all citations and references in your presentations and documents.

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.

**Final examination**
The take home final exam is an individual effort. The examination questions will be distributed in session 12 on April 3 and your examination report with your answers is due one week later on April 10, no later than 6 pm. The exam report must be delivered online or as specified in class.

**Group work and free loaders**
Group work is an important component of this course. 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.

The instructor will deal with free loaders by first "encouraging" and then formally requesting them to leave the TIM program.

**Students with disabilities**:
Students with disabilities requiring academic accommodations in this course are encouraged to contact the Paul Menton Centre (PMC) for Students with Disabilities to complete the necessary letters of accommodation. After registering with PMC, make an appointment to meet and discuss your needs with the instructor at least two weeks prior to requiring accommodation for assignments presentations. This is necessary in order to ensure sufficient time to make the necessary arrangements.

**Plagiarism**:
Plagiarism, including 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 more details. Plagiarism is against the TIM culture. A case of plagiarism will be referred to the Chair of the Department and the Carleton University Ethics Committee. The instructor will not deal with the matter directly. The University has clear processes to deal with students who are suspected of plagiarism.

**Administrative Details**
- Please notify the instructor vie e-mail if you will not attend a class.
- 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 group must make his/her slides available to all other students by 5 pm the day before.

**TTMG 5001 Class Schedule (tentative)**

| Date | Session # | Topic | Assigned reading |
|---|---|---|---|
| Jan. 10 | Session 1 | Introduction and administrative matters (TTMG 5001 course outline; the TIM program; the role of TTMG 5001 in the TIM program). | TTMG 5001 course outline.<br>*TIM Thesis Development* guidelines.<br>TIM project/thesis inventory. |
| Jan. 17 | Session 2 | Product development, literature reviews | Brown & Eisenhardt (1995)<br>Krishnan & Ulrich (2001)<br>Shane & Ulrich (2004) |
| Jan. 24 | Session 3 | Product and service development, theory and models as practical aids I.<br><br>Identify topics for Assignments 1 and 2. | MacCormack et al. (2001)<br>Eisenhardt & Tabrizi (1995)<br>Goldenberg et al. (2001)<br>Haefliger et al. (2008) |
| Jan. 31 | Session 4 | Product and service development, theory and models as practical aids II. | Prügl and Schreier (2006)<br>Bhuiyan et al. (2004)<br>Ethiraj & Levinthal (2004)<br>MacCormack et al. (2006) |
| Feb. 07 | Session 5 | Product and service development, theory and models as practical aids III. | Gerwin (2004)<br>Tatikonda & Montoya-Weiss (2001)<br>Van de Ven (1986) |
| Feb. 14 | Session 6 | Technical entrepreneurship and commercialization I. | Ferrier (2001)<br>Gans, Hsu & Stern (2002)<br>Gans & Stern (2003)<br>Miller & Olleros (2007) |
| Feb. 21 | | Winter break: no classes at Carleton this week. | |
| Feb. 28 | Session 7 | Technical entrepreneurship and commercialization II. | Teece (1988)<br>Teece et al. (1997)<br>Pisano & Teece (2007)<br>West (2007) |
| Mar. 6 | Session 8 | Presentation of version 1 of Assignment 1.<br><br>Lessons learned from making presentations. | |
| Mar. 13 | Session 9 | Technical entrepreneurship and commercialization III. | Anderson et al. (2006)<br>Johnson et al. (2008)<br>Yoffie & Kwak (2005)<br>Chakravorti (2004)<br>Sargut & McGrath (2011) |
| Mar. 20 | Session 10 | Presentation of version 1 of Assignment 2. | |
| Mar. 27 | Session 11 | Presentation of final version of Assignment 1 and Assignment 1 document due. | |
| Apr. 03 | Session 12 | Presentation of final version of Assignment 2 and Assignment 2 document due.<br><br>Exam is handed out to students. | |
| Apr. 10 | No class. | Exam is due before 6 pm EST. Submit online. | |

To access the required journal articles in electronic form, go to the Carleton University Library Catalogue (http://catalogue.library.carleton.ca), enter the name of the journal (not the article) in the "Title" field, select "E-Journals" from the pull-down menu, and click "Search". When the catalogue entry for the journal is displayed, click the link below "Connect to Web Resource", and then enter your barcode number and PIN when prompted.

**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**

Anderson, J. C., Narus, J. A. & van Rossum, W. 2006. Customer value propositions in business markets. ***Harvard Business Review***, 84(3): 90-99.

Johnson, M. W., Christensen, C. M., & Kagermann, H. 2008. Reinventing your business model. ***Harvard Business Review***, 86(12): 51-59.

Yoffie, D., & Kwak, M. 2006. With friends like these: The art of managing complementors. ***Harvard Business Review***, 84(9): 89-98.

Chakravorti, B. 2004. The new rules for bringing innovations to market. ***Harvard Business Review***, 82(3): 58-67.

Sargut, G., & McGrath, R. 2011. Learning to live with complexity. ***Harvard Business Review***, 89(9/10): 69-76.

**Reference Texts**

The following books and articles contain further information about product and service development and technical entrepreneurship and commercialization. They are not assigned reading for this course.

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. M., & Raynor, M. E. 2003. ***The innovator's solution: Creating and sustaining successful growth***. 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***. 3rd edition. Perseus Publishing.

Cusumano, M. 2010. ***Staying power: Six enduring principles for managing strategy & innovation in an uncertain world***. Oxford.

Downes, L., & 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.

Johnson, M. W. 2010. ***Seizing the white space: Business model innovation for growth and renewal***. Harvard Business Press.

Jolly, V. K. 1997. ***Commercializing new technologies***. Harvard Business School Press.

McGrath, R., & MacMillan, I. 2009. ***Discovery-driven growth***. Harvard Business Press.

Moore, G. A. 2002. ***Living on the fault line, revised edition: Managing for shareholder value in any economy***. 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.*** 2nd edition. John Wiley & Sons.