TIMG 5006
MANAGEMENT OF SOFTWARE ENGINEERING PROJECTS

Winter 2023
Institute of Technology Entrepreneurship and Commercialization, Carleton University

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Mon, 6-9pm
Nicol Building 4020

Updates to this outline will be made as necessary.

Version 3.1

Instructor availability
The instructor is available via Slack or e-mail any time. Office hours by appointment.

Calendar description
TIMG 5006 [0.5 credit] Management of Software Engineering Projects
Models for the development of software. Software project management tools. Quality control. Risk assessment and management. Examples are drawn from the development of new technology products.

Precludes additional credit for TTMG 5006 (no longer offered).
Prerequisites: TIMG 5001 or TTMG 5001, TIMG 5002 or TTMG 5002

Course objectives
This course examines topics relevant to the management of software engineering projects. Although the scope includes well-established traditional practices, we are particularly interested in emerging practices, on-going research, and exploring the controversies within the field (for example, no-projects, and working in remote teams). A specific focus on the course is on **continuous discovery and delivery approaches for digital products**.

Rationale
This course is designed to build capability and knowledge in the management of large, complex and changing software systems. Students will learn about different perspectives on managing software projects, gain familiarity with the practitioner and research literature, and become proficient with practical managerial skills which can add value in their companies.

Benefits
This course prepares students to undertake thesis research or applied projects in the design and development of software products, and the management of operations within software-intensive technology companies.

Class Sessions
This course will include interactive exercises that are best experienced **in person**. However, the course sessions will also be broadcast live and recorded on BigBlueButton. This is meant as an alternative mode for attending the class in case you are traveling, sick, or otherwise unable to come to class. However, some of the course experience may be difficult to replicate online. To join a broadcast, log into BigBlueButton on Brightspace. For the audio portion of the conference, you can also call into the conference server using the phone numbers provided on login.

Please see the tutorials on participating in an online classroom on https://bigbluebutton.org.

For the weekly sessions there will be assigned readings and tasks. Those should be completed before class.

During the student group presentation sessions, groups will be asked to make short presentations on their assignments (max. 10 minutes, except where explicitly stated otherwise; please practice so you stay on time). Each

group decides who presents what and in which order. Before **3 p.m.** on the day when presentations are due, each group will upload the slides to be presented. No exceptions.

The course material and recordings of the class sessions will be made available in Brightspace.

Student Evaluation
Course participants are required to complete two group assignments and two individual assignments. To determine the course grade, the following weights apply:

- Video and vignette on a digitalization case study (group) 15%
- Discovery and delivery (D&D) of a digital product (group) 40%
- Comments on one D&D assignment (individual) 15%
- Take-home exam 30%

Assignments submitted late and presentations not made will receive a grade of zero. The mark for the group assignment will be based on an assessment of the group assignment as well as an individual reflection. **In the individual reflection, students will be asked to summarize what they learned from the assignment and what they contributed to the team.** If the individual reflection demonstrates a poor understanding of the material or a low level of participation in the group, the instructor reserves the right to lower the individual's grade for the group assignment by up to a full letter grade. If it is particularly informed, thorough, or demonstrates an exceptionally high contribution to the team, the instructor will raise the individual's grade by up to a full letter grade. Final grade reports will follow Carleton University guidelines.

Assignment 1: Video and vignette on a digitalization case study (group)
Choose a case study from Fitzgerald et al. (2017). Only one group can work on the same case study.

Prepare a vignette of the case study using the template described in class, and record a 3 min video on it.

Format:

- Vignette of the case study (one page)
- A short video explaining your vignette (3 minutes or less)

Assignment 2: Discovery and delivery (D&D) of a digital product (group)
Design a smart, connected product by using the process outlined in the MappingTheIoT Toolkit by Vitali & Arquilla (2018), and document your progress using agile tools such as a Kanban board.

The design should proceed in stages:

1. Identify the initial idea and challenge
2. Conduct research on users and their pains/gains
3. Refine the initial idea
4. Complete a canvas for the product idea
5. Identify and test assumptions
6. Discover potential components and connectivity

The MappingTheIoT Toolkit provides forms and cards to support the discovery and delivery process. The toolkit can be obtained from this website: http://mappingtheiot.polimi.it/downloads.

Format:

- Interim versions of the report (stages 1-2 and stages 3-4)
- Interim version of the presentation slides
- Regular status updates via a Kanban board indicated by ⚐ in the schedule
- Final version of the presentation slides
- Retrospective of the assignment

Assignment 3: Comments on one one D&D assignment (individual)
Each student will review **one discovery and delivery assignment** from another group. Post **two rounds** of comments (version 1 and 2) for the **same** assignment. Add your comments as replies to the respective post in the discussion forum for the assignment.

Comments will be evaluated on their value. Don't just say how much you liked a draft (low value), but provide concrete suggestions for improvement that your peers can incorporate into a better version of their assignment.

Take-home exam (individual)
The take-home exam will be posted on the day of the last class. The exam is due on **April 27, 2023**.

Group work and free loaders
Group work is an important component of this course. **Groups will be assigned by the instructor. Please complete a skills inventory that will help form balanced groups. Once teams have been formed, they will sign a team contract.** 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.

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.

Special Information for Pandemic Measures
It is important to remember that COVID is still present in Ottawa. The situation can change at any time and the risks of new variants and outbreaks are very real. There are a number of actions you can take to lower your risk and the risk you pose to those around you including being vaccinated, wearing a mask, staying home when you're sick, washing your hands and maintaining proper respiratory and cough etiquette.

Feeling sick? Remaining vigilant and not attending work or school when sick or with symptoms is critically important. If you feel ill or exhibit COVID-19 symptoms do not come to class or campus. If you feel ill or exhibit symptoms while on campus or in class, please leave campus immediately. In all situations, you must follow Carleton's symptom reporting protocols.

Masks: Carleton has paused the COVID-19 Mask Policy, but continues to strongly recommend masking when indoors, particularly if physical distancing cannot be maintained. It may become necessary to quickly reinstate the mask requirement if pandemic circumstances were to change.

Vaccines: Further, while proof of vaccination is no longer required as of May 1 to attend campus or in-person activity, it may become necessary for the University to bring back proof of vaccination requirements on short notice if the situation and public health advice changes. Students are strongly encouraged to get a full course of vaccination, including booster doses as soon as they are eligible, and submit their booster dose information in cuScreen as soon as possible. Please note that Carleton cannot guarantee that it will be able to offer virtual or hybrid learning options for those who are unable to attend the campus.

All members of the Carleton community are required to follow requirements and guidelines regarding health and safety which may change from time to time. For the most recent information about Carleton's COVID-19 response and health and safety requirements please see the University's COVID-19 website and review the Frequently Asked Questions (FAQs). Should you have additional questions after reviewing, please contact covidinfo@carleton.ca.

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 PMC, 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

Plagiarism
Plagiarism (copying and handing in for credit someone else's work) is a serious instructional offence that will not be tolerated. Please refer to the section on instructional offences in the Graduate Calendar for additional information. Plagiarism is against the TIM culture. A case of plagiarism will be referred to the Director of the TIM program 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
These are the rules of conduct for this course:

- Please notify the instructor via e-mail, if you will not attend a class.
- Sessions will include interactive exercises. These are better experienced **in person.**
- **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.
- We will use Moodle to share files and upload assignments unless noted otherwise.
- **You need to sign up for Slack.** Course announcements will made on Slack. Course discussions will take place on Slack. Don't send me an email if you have a question, but use Slack.
- Each presenter must make his/her slides available to all other students by **3pm** on the day of the class.

Better Journals
Journal of Project Management
IEEE Transactions on Engineering Management
IEEE Software
ACM Communications
ACM Transactions on Software Engineering and Methodology
Empirical Software Engineering
Management Science
Information Systems Research

Contribution to program learning goals

Learning goals	Not Covered	Introduced	Taught but Not Assessed	Taught and Assessed
TM1 Critical Thinking and Application of Knowledge Graduates will demonstrate a systematic understanding of knowledge, and a critical awareness of current problems and/or new insights.				✓
TM2 Research and Scholarship Graduates will demonstrate a conceptual understanding and methodological competence.				✓
TM3 Communication Capabilities Graduates will communicate ideas, issues, and conclusions clearly.				✓
TM4 Professional Capacity and Autonomy Graduates will demonstrate initiative and personal integrity when they interact with the TIM business ecosystem.		✓		

Management of Software Engineering Projects: Schedule

Date	Topic	Readings	Deliverables	Status
Jan 9	Session 1: Introduction	Course outline		
Jan 16	Session 2: Digitalization	Porter (2014) Fitzgerald et al. (2017, 16-45) Brennan et al. (2022, ch. 1)		
Jan 23	Session 3: Discovery: Research	Vitali & Arquilla (2018) Brennan et al. (2022, ch. 2) Weiss (2012)		
Jan 30	Session 4: Discovery: Design	Brennan et al. (2022, ch. 5) Münch et al. (2020)		⚐
Feb 6	Session 5: Discovery: Experimentation	Nguyen-Duc et al. (2017) Fagerholm et al. (2017) Brennan et al. (2022, ch. 6)		
Feb 13	Session 6: Delivery: Teams	Sutherland et al. (2014) Fitzgerald et al. (2017, 120-141) Fitzgerald et al. (2017, 100-119) Brennan et al. (2022, ch. 7)	Assignment 1 (video, vignette)	

Feb 20	Winter break			
Feb 27	Session 7: Draft presentations		Assignment 2 (draft 1, slides) Assignment 2 (draft 1, report)	⚑
Mar 6	Session 8: Delivery: Remote teams	Weiss (2022) Nguyen-Duc et al. (2022) Lous et al. (2018) Fitzgerald et al. (2017, 182-211)	Assignment 3 (comments, draft 1)	
Mar 13	Session 9: Delivery: Community	Agerfalk et al. (2015, ch. 2) Agerfalk et al. (2015, ch. 3) Fitzgerald et al. (2017, 60-70) Fitzgerald et al. (2017, 86-99)		
Mar 20	Session 10: Capabilities: Organization	Wolf (2020) Vaidhyanathan et al. (2022) Hvatum (2020)	Assignment 2 (draft 2, report)	⚑
Mar 27	Session 11: Capabilities: Large teams	Paasivaara et al. (2018) Fitzgerald et al. (2017, 142-159) Smite et al. (2019)	Assignment 3 (comments, draft 2)	
Apr 3	Session 12: Capabilities: Governance	Stettina & Hörtz (2015) Fitzgerald et al. (2017, 212-233) Brennan et al. (2022, ch. 4)		
Apr 10	Session 13: Final presentations		Assignment 2 (slides) Assignment 2 (report) Exam will be posted	⚑

Readings

The readings refer to the following books (available online through the library):

Fitzgerald, B., Stol, K., Minör, S., & Cosmo, H. (2017), *Scaling a Software Business*, Springer.

Brennan, K., Goodwin, S., & Hendrickx, F. (2022), *Digital Product Management*, BCS.

Agerfalk, P., Fitzgerald, B., & Stol, K. (2015), *Software Sourcing in the Age of Open: Leveraging the Unknown Workforce*, Springer Briefs in Computer Science, Springer.

The readings for each session are:

Readings for Session 2

Porter, M. E., & Heppelmann, J. E. (2014). How smart, connected products are transforming competition. *Harvard Business Review*, 92(11), 64-88.

Fitzgerald, B., et al. (2017), Common challenges with software, 16-21.

Fitzgerald, B., et al. (2017), The map: The scaling management framework, 23-45.

Brennan et al. (2022). What is digital product management?, chapter 1.

Readings for Session 3

Vitali, I., & Arquilla, V. (2018), Developing a design toolkit for the Internet of Things. Design Research Society 2018, 90:16, https://dl.designresearchsociety.org/drs-conference-papers/drs2018/researchpapers/90.

Brennan et al. (2022). Product vision: Enabling customer value, chapter 2.

Weiss (2012), User frustrations as opportunities, *TIM Review*, April, http://timreview.ca/article/546.

Readings for Session 4

Brennan et al. (2022). Discovering and designing a valuable customer experience, chapter 5.

Münch, J., Trieflinger, S., & Heisler, B. (2020). Product discovery–building the right things: Insights from a grey literature review. *International Conference on Engineering, Technology and Innovation,* 1-8. IEEE.

Readings for Session 5

Nguyen-Duc, A., Wang, X., & Abrahamsson, P. (2017). What influences the speed of prototyping? An empirical investigation of twenty software startups. *International Conference on Agile Software Development*, 20-36. Springer

Fagerholm, F., Guinea, A. S., Mäenpää, H., & Münch, J. (2017). The RIGHT model for continuous experimentation. *Journal of Systems and Software*, 123, 292-305.

Brennan et al. (2022). Data-driven decisions, chapter 6.

[Additional] Nguyen-Duc, A., Kemell, K. K., & Abrahamsson, P. (2021). The entrepreneurial logic of startup software development: A study of 40 software startups. *Empirical Software Engineering*, 26(5), 1-55.

Readings for Session 6

Sutherland, J., Har1rison, N., & Riddle, J. (2014). Teams that finish early accelerate faster: a pattern language for high performing scrum teams. *Hawaii International Conference on System Sciences*, 4722-4728. IEEE.

Some patterns from: Sutherland et al. (2019). A Scrum Book: The Spirit of the Game. The Pragmatic Bookshelf. [Available through the O'Reilly database in the library]

Fitzgerald, B., et al. (2017), Deliver 24/7, 120-141.

Fitzgerald et al. (2017), Add supplementary services, 100-119.

Brennan et al. (2022). Development, chapter 7.

Readings for Session 8

Zaripour, B., & Weiss, M. (2022). Patterns for remote agile teams. *The Latin American Conference on Pattern Languages of Programs* (*SugarLoaf PLoP),* to be published.

Nguyen-Duc, A., Khanna, D., et al. (2022). Work-from-home and its implication for project management, resilience and innovation – a global survey on software companies. arXiv:2202.04950v1

Lous, P., Tell, P., Michelsen, C. B., Dittrich, Y., Kuhrmann, M., & Ebdrup, A. (2018). Virtual by design: How a work environment can support agile distributed software development. *International Conference on Global Software Engineering (ICGSE)*, 97-106, IEEE.

Fitzgerald et al. (2017), Outside the box, 182-211.

Readings for Session 9

Agerfalk et al. (2015), Opensourcing, chapter 2.

Agerfalk et al. (2015), Innersourcing, chapter 3.

Fitzgerald et al. (2017), Co-create in a community, 60-70.

Fitzgerald et al. (2017), Building ecosystems, 86-99.

Readings for Session 10

Wolf, C. T. (2020). AI models and their worlds: Investigating data-driven, AI/ML ecosystems through a work practices lens. *International Conference on Information*, 651-664. Springer.

Vaidhyanathan, K., Chandran, A., Muccini, H., & Roy, R. (2022). Agile4MLS – Leveraging agile practices for developing machine learning-enabled systems: An industrial experience. *IEEE Software*, 39(6), 43-50.

Hvatum, L. (2020). Patterns for Distributed Teams: Revisited. *Conference on Pattern Languages of Programs*

(*PLoP),* to be published.

Readings for Session 11

Paasivaara, M., Behm, B., Lassenius, C., & Hallikainen, M. (2018). Large-scale agile transformation at Ericsson: a case study. *Empirical Software Engineering*, 23(5), 2550-2596.

Fitzgerald, B., et al. (2017), Pump up the volume, 142-159.

Smite, D., Moe, N. B., Levinta, G., & Floryan, M. (2019). Spotify guilds: how to succeed with knowledge sharing in large-scale agile organizations. *IEEE Software*, 36(2), 51-57.

[Additional] Sievi-Korte, O., Richardson, I., & Beecham, S. (2019). Software architecture design in global software development: An empirical study. *Journal of Systems and Software*, 158, 110400.

[Additional] Leite, L., Pinto, G., Kon, F., & Meirelles, P. (2021). The organization of software teams in the quest for continuous delivery: A grounded theory approach. *Information and Software Technology*, 139, 106672.

Readings for Session 12

Stettina, C. J., & Hörz, J. (2015). Agile portfolio management: An empirical perspective on the practice in use. *International Journal of Project Management*, 33(1), 140-152.

Brennan et al. (2022). Product roadmaps, chapter 4.

Fitzgerald et al. (2017), First things first, 212-233.

Suggested Books

Many of these are available online (on Safari via the Carleton library, or on the Web).

Bergin, J. (2012), *Agile Software: Patterns of Practice*, Joe Bergin Software Tools.

Berkun, S. (2013), *The Year Without Pants: WordPress.com and the Future of Work*, Jossey-Bass.

Borek, A., & Prill, N. (2022), *Driving Digital Transformation through Data and AI*, KoganPage.

Burkus, D. (2020). *Leading from Anywhere: The Essential Guide to Managing Remote Teams*. Houghton Mifflin Harcourt.

Coplien, J. & Bjørnvig, G. (2010), *Lean Architecture for Agile Software Development*, Wiley.

Harrison, N., & Coplien, J. (2006), *Organizational Patterns of Agile Software Development*, Addison Wesley.

Highsmith, J. (2004), *Agile Project Management*, Addison Wesley.

Hohmann, L. (2003), *Beyond Software Architecture: Creating and Sustaining Winning Solutions*, Addison Wesley.

Kelly, A. (2021), *Continuous Digital: An Agile Alternative to Projects for Digital Business*, Leanpub.

Lopp, M. (2007), *Managing Humans*, Apress/Springer.

Nguyen-Duc, A., Münch, J., Prikladnicki, R., Wang, X., and Abrahamsson, P. *Fundamentals of Software Startups*. Springer, 2020.

Poppendieck, M., & Poppendieck, T., *Implementing Lean Software Development*, Addison Wesley.

Richardson, J., & Gwaltney, W. (2007), *Ship It!*, The Pragmatic Bookshelf.

Rasmusson, J. (2020), *Competing with Unicorns*, The Pragmatic Bookshelf.

Rosenberg, S. (2007), *Dreaming in CODE*, Crown.

Royce, W., Bittner, K., & Perrow, M. (2006), *The Economics of Iterative Software Development*, Addison-Wesley.

Torres, T. (2021), *Continuous Discovery Habits*, Product Talk LLC.

Ullman, E. (2012), *The Bug: A Novel*, Picador. [originally published in 1984]