

INNOVATION MANAGEMENT

Course code	GRAI022
Course title	Technology and Innovation Management
Type of course	Compulsory
Stage of study	Graduate
ECTS	6 ECTS; 32 hours of class work, 128 hours of self-study, 2 hours of consultations (distant or direct form)
Coordinating lecturers	Prof. Dr. Jason Li-Ying, yinli@dtu.dk
Studies form	Full-time
Prerequisites	Undergraduate diploma
Language of instruction	English

Course description

This course approaches the management of technological innovation from a resource/knowledge-based view, which sees technological innovations as a driving force of competitive advantage of organizations through a combination of internal resources and external linkages. Students are introduced to the theories, models, tools and practical cases from industries by understanding what technological innovations are, why they are important, and what are needed to enable and manage technological innovations within and outside of the boundary of organizations. Although most attention will be paid to innovations made by industrial firms, relevant issues of innovations at levels of individual, team, network of organizations, and industry will be addressed as well. The weekly readings consist of a mixture of book chapters, journal articles, and cases.

Course aim

The primary goal of the course is to expose students to a variety of perspectives on technological innovation, building on an active learning process and preparing for work experiences in the future.

Course learning outcomes (CLO)	Study methods	Assessment methods
CLO 1: Understanding the phenomena of innovation. Define what innovation is, what different types of innovations are, and explain why innovation is important.	Online lectures, self-study, online group work, case studies.	Active participation in online discussion, small assignments, case analyses assessment, and group project.
CLO 2: Pinpoint the role of technology in innovation both in theory and in practice.	Online lectures, self-study, online group work, case studies.	Active participation in online discussion, small assignments, case analyses assessment, and group project.
CLO 3 To explain the key concepts of Schumpeterian theory and technology in relation to technological innovation.	Online lectures, self-study, online group work, case studies.	Active participation in discussion, case analyses assessment, and group project.
CLO 4 To be able to describe what are the key concepts of resource-based view and its relevance to innovation strategy	Online lectures, self-study, online group work, case studies.	Active participation in online discussion, small assignments, case analyses assessment, and group project.
CLO 5 To be able to explain the key concepts of knowledge and learning and its relevance to innovation and the innovation process within an organization.	Online lectures, self-study, online group work, case studies.	Active participation in online discussion, small assignments, case analyses assessment, and group project.
CLO 6 To be able to explain the organizational implications, including decision making under uncertainty with regard to innovation and the open	Online lectures, self-study, online group work, case studies.	Active participation in online discussion, small assignments, case analyses assessment, and group

innovation perspective and how external resources are possibly expanded into a larger scope thanks to an open approach of innovation.		project.
CLO 7 To discuss the strengths and weaknesses of the theoretical perspectives from the course curriculum.	Online lectures, self-study, online group work, case studies.	Active participation in online discussion, small assignments, case analyses assessment, and group project.

Quality assurance issues

The lecturer will apply multiple teaching methods to keep the students engaged in the topic (case studies). Continuous student feedback will be encouraged and accommodated to continuously improve class experience.

Course content

Date	Topic	Contact hours		Readings
		Theory	Practice	
April 2	<p>Session 1: Introduction: What is innovation and why is it important?</p> <p>Workshop: Mini case on class: The Driverless Revolution case (Fortune 2012)</p> <p>Time reserved for group discussion regarding the case company search.</p> <p>Learning objectives: (1) Define what innovation is and what different types of innovations are; (2) Explain why innovation is important.</p> <p>Session 2: Technology, innovations, and an overview of technological innovation process</p> <p>Workshop: group presentation on COVID 19 innovation cases</p> <p>Learning objectives: (1) Pinpoint the role of technology in innovation both in theory and in practice; (2) Identify relevant issues about innovation when exposed to a real-life situation.</p>	4	4	<p>Session 1 Coursebook: Chapter 1, pp.1-24. Article 1</p> <p>Session 2 Coursebook: Chapter 3, pp.54-92. Articles 2 & 3</p>
April 3	<p>Session 3: Make innovation happen: Products and Service Innovation</p> <p>Group exercise on class: On campus service innovation presentation</p> <p>Learning objectives: (1) distinguish product and service innovations; (2) understanding the relationship between product and service innovations; (3) recognize that innovation is not only a process and but also the success of innovations rely on what the offerings are; (4) understanding products and service innovation needs to create value.</p> <p>Session 4: Make innovation happen: Resource-based view and innovation strategy.</p> <p>Group exercise on class: The RBV assignment based on a case video of Theranos (a short report to be submitted later).</p>	4	4	<p>Session 3 Course-book Chapter 7, pp.197-234. Articles 4 & 5</p> <p>Session 4 Course-book Chapter 4, pp.94-132. Article 6</p>
April 9	<p>Session 5: The external side: Open innovation and Networks for innovation - a RBV view</p> <p>Learning objectives: (1) Explain the open innovation perspective and what external technology sources are; (2) Explain how networks and collaboration with external parties are possibly expanded into a larger scope thanks to an open approach of</p>			<p>Session 5 Course-book Chapter 5, pp.131-159. Articles 7 & 8.</p>

Date	Topic	Contact hours		Readings
		Theory	Practice	
	<p>innovation; (3) the importance of external technology sourcing and spill-over effects; (4) the inputs from users for innovation.</p> <p>Time reserved for group presentation of the selected case company at the end of the morning session. Each group has 5 min for pitching and 5 min for feedback. On-site approval will be made.</p> <p>Session 6: The external side: Open innovation and Networks for innovation - a governance view</p> <p>Learning objectives: (1) Explain the governance perspective towards networked innovation management; (2) recognize various means to mitigate risks in innovation by being embedded in networks.</p>	4	4	<p>Session 6 Course-book Chapter 5, pp.131-159. Articles 9 & 10.</p>
April 10	<p>Session 7: The internal side: R&D Management, Operations, and processes</p> <p>Workshop: Chapter 6, pp.160-196 and Chapter 8, pp.235-266</p> <p>Learning objectives: (1) clearly recognize the role of R&D in relation to technological innovation; (2) distinguish the underlying patterns of learning with regard to R&D within an organization.</p> <p>Session 8: Decision Making under Uncertainty and course summary</p> <p>Group exercise on class: The hypothetical learning plan assignment, using MS Teams (Planner add-on). Time reserved for Q&A regarding the group assignment of the case company.</p> <p>Learning objectives: (1) Explain how to conceptually define uncertainty; (2) understand and use different tools (stage-gated and learning plan) to cope with uncertainty along the innovation process.</p>	4	4	<p>Session 7 Course-book Chapter 6, pp.160-196 and Chapter 8, pp.235-266 Session 8 Articles 11 & 12.</p>

Self-study and assessment

Type of assignment	Hours	Evaluation, %
Online lecture attendance	14	10
On-class assignments, and discussion (on sessions 4 and 8)	7	15
presentations on April 2 (session 2 COVID-19 innovation) or April 3 (Session 3 service blueprint), as well as the pitching April 9 (Session 5)	7	15
Group report (innovation case)	100	60
Total:	128	100

Note: In case a student fails in the course, the re-take will be an individual report with in-depth discussion about some topics in innovation management. The details will be arranged between the lecturer and the failed student. The re-take will only count for the last 60% of the course and has no implications on the class attendance and on-class performance.

Assignments

Group report. The grade will be based on a **group written report** of no more than 5000 words (including everything except the cover, table of content and the reference list) which must be submitted to the **teacher by email AND uploaded on e-learning platform of ISM no later than April 23rd, 2021 (23:59).** The detailed instruction for the group report, which is called the '**innovation case**', is provided in the appendix of the syllabus. Groups of students must select a case company, formulate its basic introduction, and present it on the lecture of **April 9, 2021**.

Class attendance. Students are required to attend all the online sessions and organize activities online for the group work, using MS Teams or other digital tools of their preference. But overall communication for the class will be on MS Teams. Students will not be granted for the 10% of the grade if he/she fails to attend the session for two times without notice in

advance. Any non-attendance due to emergency, illness or other urgent incidences must be informed to the lecturer beforehand.

On-class exercise, assignments, presentation and discussion, Students are required to actively participate in on-class exercise, presentations and discussions. Students' performance in this respect will be evaluated based on the lecturer's observation during the course and hand-in assignments.

Required reading:

Course book:

Dodgson et al. (2008): *The Management of Technological Innovation*.

Articles:

1. Sharma (1999). *Central Dilemmas of Managing Innovation in Large Firms*. *California Management Review*, 41(3):146-164.
2. Breschi, S., Malerba, F. and Orsenigo, L. (2000), Technological Regimes and Schumpeterian Patterns of Innovation. *The Economic Journal*, 110: 388–410.
3. Jensen, M. B., Johnson, B., Lorenz, E. & Lundvall, B. Å. (2007). Forms of knowledge and modes of innovation. *Research Policy*, 36(5): 680-693.
4. Vargo, S.L. and Lusch, R.F. (2004). Evolving to a new dominant logic for Marketing. *Journal of Marketing*, 68: 1-17.
5. Bitner, M.J., Ostrom, A.L., and Morgan F. N. (2008). Service Blueprinting: A practical technique for service innovation. *California Management Review*, 50(3): 66-
6. Newbert, S. L. (2008), Value, rareness, competitive advantage, and performance: a conceptual-level empirical investigation of the resource-based view of the firm. *Strategic Management Journal*, 29: 745–768.
7. Laursen, K. and Salter, A. (2006): Open for Innovation: the role of openness in explaining innovation performance among U.K. manufacturing firms. *Strategic Management Journal*, 27(2): 131-150.
8. Chesbrough, H. W. and Appleyard, M. M. (2007). Open innovation and strategy. *California Management Review*, 50(1): 57-76.
9. Gulati, R. and Singh, H. (1998). The architecture of cooperation: Managing coordination costs and appropriation concerns in strategic alliances. *Administrative Science Quarterly*, 43(4): 781-814.
10. Ding, R., Dekker, H.C., and Groot, T. (2013). Risk, partner selection and contractual control in interfirm relationships. *Management Accounting Research*, 24(2): 140-155.
11. Lane, D. and Maxfield, R. (2005). Ontological uncertainty and innovation. *Journal of Evolutionary Economics*, 15(1), 3-50.
12. Rice et al., (2008). Implementing a learning plan to counter project uncertainty. MIT Sloan Management Review, 49(2): 54-62.
13. Li-Ying, J. and Nell, P. (2020). Navigating opportunities for innovation and entrepreneurship under COVID-19. *California Management Review*, <https://cmr.berkeley.edu/2020/06/innovation-entrepreneurship/>

Programme learning outcomes	Course learning outcomes (CLO)
Specific outcomes	
S1. Will be able to analyze a company or an organization as an integral unit, which strives for certain goals in a market or social environment by effectively distributing their finite resources among objects and business activities and obtains synergies from coordinated function planning, organization and management.	CLO3, CLO7
S2. Will acquire the knowledge and understanding of the main innovation management theories and approaches and will be able to identify opportunities and possibilities for competitive advantage through innovation.	CLO1, CLO2, CLO5, CLO7

S3. Be able to identify new possibilities in national and international markets, to foresee, to analyze and to assess target markets, their potential, to adapt the old products and services and to develop the new ones for these markets, to communicate effectively one's proposals to the market.	CLO3, CLO6
S.4. Will have developed the insights and skills, necessary to analyse and structure business financial information, to make financial forecasts and apply valuation models, supporting value-adding business decisions.	
S5. Demonstrate the fundamental knowledge of strategic and marketing management concepts and techniques and be able make objective strategic & marketing decisions and present well supported recommendations for future action.	
S.6. Demonstrate knowledge and understanding of organizational and strategic project management process, with special emphasis on its life cycle, and be able to use the tools in managing and delivering innovation projects.	CLO6, CLO7
S7. Acquire the knowledge of how cognitive, behavioural, and emotional outcomes contribute to and sustain organizations, identifying processes and methods that can improve the behaviour, attitudes, and effectiveness of organizational members, with a particular emphasis on innovation and change management.	CLO4, CLO5
S8. Demonstrate knowledge and skills for effective technology transfer activities, have competences to make complex decisions for innovation development and solve technology commercialisation issues, using knowledge transfer models and technology transfer networks for business companies or research institutions.	CLO3
S9. Demonstrate the knowledge of concepts and tools of starting and developing a new technology venture.	CLO6
General outcomes	
G1. Be able to apply modern information technologies in the data gathering, analysis and communication.	
G2. Demonstrate a systematic, critical and constructive thinking in problem identification and solving.	CLO2, CLO3, CLO6, CLO7
G3. Be able to communicate well and express thoughts orally and in writing with specialists and non-specialist audiences.	CLO2, CLO4, CLO5, CLO6
G4. Demonstrate the competences of an independent learner.	CLO2, CLO4, CLO5, CLO6
G5. To communicate and to work effectively in an intercultural and interdisciplinary group or team.	CLO2, CLO4, CLO5, CLO6
G.6. Demonstrate leadership skills.	CLO1-CLO7

Requirements

Students are expected to:

- Attend online class, perform exercise and assignments, and engage in discussions.
- Complete the readings **before** attending the lectures.
- Work constructively in groups by online means

After reading a text you should be able to account for:

- The author's argumentation and viewpoints.
- The structure and composition of the text.

- The school of thought to which the author pledges allegiance and the position of the text vis-à-vis the rest of the curriculum.

You should also think about:

- How might the issues raised be reflected on real-life situations that you've experienced?
- What do you find interesting, useful or frustrating about the text?
- What would you like to have clarified or explained?
- What are the limitations of the theories, tools and methods that you just learned?

Course Timetable

Fridays:		Saturdays:	
12.30-15.45	Class (with short breaks)	9.00-12.15	Class (with short breaks)
15.45-16.45	Afternoon tea break	12.15-13.15	Lunch break
16.45-20.00	Class (with short breaks)	13.15-16.30	Class (with short breaks)

Course Schedule

Part I: Define Innovation

To set the stage for the course, this first block of lectures will help students to clarify what is innovation, why innovation is important, and what is the role of technology in innovation. In addition, students should also be able to take from this point to see (1) technology is a key input, which comes from various source, for innovation; (2) innovation is more than just technology; (3) innovation is not only outcomes but also a process. Various small cases, theoretical perspectives, self-reflection, and on-class discussions are used during the course.

Session 1:--Introduction: What is innovation and why is it important?

(April-2-2021 Friday Afternoon 12:30 – 15:45)

Reading material:

14. Dodgson et al. (2008): *The Management of Technological Innovation*. Chapter 1, pp.1-24.
15. Sharma (1999). *Central Dilemmas of Managing Innovation in Large Firms*. *California Management Review*, 41(3):146-164.

Learning objectives: (1) Define what innovation is and what different types of innovations are: (2) Explain why innovation is important.

Mini case on class: The Driverless Revolution case (Fortune 2012)

Time reserved to introduce all kinds of digital tools that we use for online teaching (MS Teams, Socrative, etc.)

Time reserved for forming groups.

Session 2: Technology, innovations, and an overview of technological innovation process

(April-2-2021 Friday Evening 16:45-20:00)

Reading material:

1. Dodgson et al. (2008): *The Management of Technological Innovation*. Chapter 3, pp.54-92.
2. Breschi, S., Malerba, F. and Orsenigo, L. (2000), Technological Regimes and Schumpeterian Patterns of Innovation. *The Economic Journal*, 110: 388–410.
3. Jensen, M. B., Johnson, B., Lorenz, E. & Lundvall, B. Å. (2007). Forms of knowledge and modes of innovation. *Research Policy*, 36(5): 680-693.
4. Li-Ying, J. and Nell, P. (2020). Navigating opportunities for innovation and entrepreneurship under COVID-19. *California Management Review*, <https://cmr.berkeley.edu/2020/06/innovation-entrepreneurship/>

Learning objectives: (1) Pinpoint the role of technology in innovation both in theory and in practice; (2) Identify relevant issues about innovation when exposed to a real-life situation.

Group presentation on COVID 19 innovation cases by some groups

Part II: Understand Innovation

In this part of the course, we establish a sound understanding on how innovation works within and among organizations. Innovations are viewed as a process that builds on internal resources and external linkages. A resource-based view and a networked perspective set the scene to understand technological innovations. External interactions within networked innovation management are expected as an extension of internal resources and a mediator for risks and uncertainties pertaining to innovation. Students are also introduced to the role of knowledge as a crucial resource for innovation, and value creation and capture as the drive for innovation in firms. In parallel to lectures in this stage of the course, students are also required to carry out a group assignment, applying the knowledge learned in the lectures. Eventually, the output of this assignment will be an original case study generated, refined and analysed by groups of students. For more detailed information, see the appendix.

Session 3: Make innovation happen: Products and Service Innovation

(April-3-2021, Saturday morning 9:00 – 12:15)

Reading material:

1. Dodgson et al. (2008): *The Management of Technological Innovation*. Chapter 7, pp.197-234.
2. Vargo, S.L. and Lusch, R.F. (2004). Evolving to a new dominant logic for Marketing. *Journal of Marketing*, 68: 1-17.
3. Bitner, M.J., Ostrom, A.L., and Morgan F. N. (2008). Service Blueprinting: A practical technique for service innovation. *California Management Review*, 50(3): 66-

Learning objectives: (1) distinguish product and service innovations; (2) understanding the relationship between product and service innovations; (3) recognize that innovation is not only a process and but also the success of innovations rely on what the offerings are; (4) understanding products and service innovation needs to create value.

Group exercise on class: On campus service innovation presentation by some groups

Session 4: Make innovation happen: Resource-based view and innovation strategy (April-3-2021, Saturday afternoon 13:15 – 16:30)

Reading material:

1. Dodgson et al. (2008): *The Management of Technological Innovation*. Chapter 4, pp.94-132.
2. Newbert, S. L. (2008), Value, rareness, competitive advantage, and performance: a conceptual-level empirical investigation of the resource-based view of the firm. *Strategic Management Journal*, 29: 745–768.

Learning objectives: (1) explain the key concepts of resource-based view; (2) distinguish resources and capabilities; (3) understand what innovation strategy is and what types of innovation strategies in relation to different patterns of resources and capabilities are.

Group exercise on class: The RBV **assignment** based on a case video of Theranos (short report to be submitted later).

Time reserved for group discussion regarding the choice of case company.

Remarks: The group assignment, making an innovation case by groups of students, starts on the 1st lecture day. Students start exploring the opportunities to find a case company on April 2nd. The choice of innovation case needs to be approved by the teacher on the presentation, which will take place on April 9th.

Session 5: The external side: Open innovation and Networks for innovation - a RBV view

(April-9-2021, Friday Afternoon 12:30 – 15:45)

Reading material:

1. Dodgson et al. (2008): *The Management of Technological Innovation*. Chapter 5, pp.131-159.
2. Laursen, K. and Salter, A. (2006): Open for Innovation: the role of openness in explaining innovation performance among U.K. manufacturing firms. *Strategic Management Journal*, 27(2): 131-150.
3. Chesbrough, H. W. and Appleyard, M. M. (2007). Open innovation and strategy. *California Management Review*, 50(1): 57-76.

Learning objectives: (1) Explain the open innovation perspective and what external technology sources are; (2) Explain how networks and collaboration with external parties are possibly expanded into a larger scope thanks to an open approach of innovation; (3) the importance of external technology sourcing and spill-over effects; (4) the inputs from users for innovation.

Time reserved for group presentation of the selected case company at the end of the morning session. Each group has 5 min for pitching and 5 min for feedback. On-site approval will be made.

Session 6: The external side: Open innovation and Networks for innovation - a governance view

(April-9-2021, Friday Evening 16:45-20:00)

Reading material:

1. Dodgson et al. (2008): *The Management of Technological Innovation*. Chapter 5, pp.131-159.
2. Gulati, R. and Singh, H. (1998). The architecture of cooperation: Managing coordination costs and appropriation concerns in strategic alliances. *Administrative Science Quarterly*, 43(4): 781-814.
3. Ding, R., Dekker, H.C., and Groot, T. (2013). Risk, partner selection and contractual control in interfirm relationships. *Management Accounting Research*, 24(2): 140-155.

Learning objectives: (1) Explain the governance perspective towards networked innovation management; (2) recognize various means to mitigate risks in innovation by being embedded in networks.

Session 7: The internal side: R&D Management, Operations, and processes

(April-10-2021, Saturday morning 9:00 – 12:15)

Reading material:

1. Dodgson et al. (2008): *The Management of Technological Innovation*. Chapter 6, pp.160-196 and Chapter 8, pp.235-266

Learning objectives: (1) clearly recognize the role of R&D in relation to technological innovation; (2) distinguish the underlying patterns of learning with regard to R&D within an organization.

Mini case on class: Boeing 787 Dreamliner

Session 8: Decision Making under Uncertainty and course summary

(April-10-2021, Saturday afternoon 13:15 – 16:30)

Reading material:

1. Lane, D. and Maxfield, R. (2005). Ontological uncertainty and innovation. *Journal of Evolutionary Economics*, 15(1), 3-50.
2. Rice et al., (2008). Implementing a learning plan to counter project uncertainty. MIT Sloan Management Review, 49(2): 54-62.

Learning objectives: (1) Explain how to conceptually define uncertainty; (2) understand and use different tools (stage-gated and learning plan) to cope with uncertainty along the innovation process.

Group assignment on class: The hypothetical learning plan assignment, using MS Teams (Planner add-on)

Time reserved for Q&A regarding the group assignment of the case company.

Appendix

Guidelines for innovation case selection and group assignment

THE GROUP

A group must be composed of 4-5 students. In order to ensure diversity in the groups as much as possible, we **suggest** that a group should **NOT**,

- Be composed of students of only one gender. So all-boys or all-girls group are not recommended;
- Be composed of students from only one discipline.

THE TASK

The task is to write a case about a particular innovation of a company or an innovative company, upon the choice of each group of students. This task will be informed to the students on the 1st session. This means that starting from the 1st session, students should try to form groups and each group needs to decide on working on an innovation case, with which the group is familiar or has access to sufficient information about. A finalized group composition and the choice of your case for each group need to be decided and a presentation on the company's basic introduction needs to be made on the lecture of April 9th, 2021 (session 5). The students are required to build up their innovation case, bit by bit, based on their own research about the case company.

THE PURPOSE

To ensure that you have met the learning objectives of the course, i.e., explain them and apply the theories in the curriculum in a critical manner to an applied context.

WHAT IS ELIGIBLE FOR A SELECTED CASE?

Any company that you feel inspired by its innovations can be eligible for the case study. You can either focus on the innovation management issues of this case company with regard to a particular product/service innovation or the overall practice of the company. The case can also be based on a particular innovative project that some of you are working on. While searching for secondary data about this company on the internet is inevitable, you are also encouraged to collect primary data through interviews, which can be arranged with the case company. Therefore, you shall also consider how you can get access to this company. A company that your father/mother works for, one where you used to have an internship, or one you know an insider contact person may become handy. If you have any difficulties, please come to ask the teachers, and we will try to assist you.

THE SPECIFICATIONS

An acceptable report must:

- Be written with no more than 4000 words (including everything excluding the cover, table of content, and the reference list).
- Clearly address no less than 3 specific aspects of technology and innovation management of the case company.
- Make explicit references to and applications of the relevant theories, frameworks, and/or methods that you learned from this course.

The good report will also:

- Clearly address as many specific aspects of innovation management of the case company as possible;
- Provide concrete solutions to some identified challenges of the company;
- Make sound arguments for any bold statements;
- Reflect on the availability and adequacy of data;
- Juxtapose theoretical perspectives and discuss their comparative limitations and advantages in reality.

SUPPORT

To make sure your selected case company is eligible and appropriate, we design a presentation session for feedback on April 9th, 2021. You are also welcomed to discuss with the teacher any time during the course period via email or face-to-face talk at the teacher's office.

SUBMISSION

Once your assignment report is completed, the finalized version of your report must be uploaded to ISM's e-learning platform in **Word** or **pdf** format **AND** by email to prof. Jason Li-Ying (vinli@dtu.dk) by **April 23rd, 2021 (Friday) at 23:59.**