ISM UNIVERSITY OF MANAGEMENT AND ECONOMICS

TECHNOLOGY AND INNOVATION MANAGEMENT

Course code	*GRAI022*
Compulsory in the programmes	*International Marketing and Management / Innovations and Technology Management / Financial Economics*
Level of studies	*Graduate*
Number of credits	*6 ECTS (36 contact hours + 2 consultation hours, 124 individual work hours)*
Course coordinator (title and name)	*Prof. Dr. Jason Li-Ying*
Prerequisites	*Undergraduate diploma*
Language of instruction	*English*

THE AIM OF THE COURSE:

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.

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.

MAPPING OF COURSE LEVEL LEARNING OUTCOMES (OBJECTIVES) WITH DEGREE LEVEL LEARNING OBJECTIVES (See Annex), ASSESMENT AND TEACHING METHODS

Course level learning outcomes (objectives)	Degree level learning objectives (Number of LO)	Assessment methods	Teaching methods
CLO1. Understanding the phenomena of innovation. Define what innovation is, what different types of innovations are, and explain why innovation is important.	LO1.1	Online lectures, self-study, online group work, case studies.	Active participation in online discussion, small assignments, case analyses assessment, and group project.
CLO2. Pinpoint the role of technology in innovation both in theory and in practice.	LO1.1, LO1.2	Online lectures, self-study, online group work, case studies.	Active participation in online discussion, small assignments, case analyses assessment, and group project.

CLO3. To explain the key concepts of Schumpeterian theory and technology in relation to technological innovation.	LO1.1, LO1.2	Online lectures, self-study, online group work, case studies.	Active participation in discussion, case analyses assessment, and group project.
CLO4. To be able to describe what are the key concepts of resource-based view and its relevance to innovation strategy	LO1.1, LO1.2	Online lectures, self-study, online group work, case studies.	Active participation in online discussion, small assignments, case analyses assessment, and group project.
CLO5. To be able to explain the key concepts of knowledge and learning and its relevance to innovation and the innovation process within an organization.	LO1.1, LO1.2	Online lectures, self-study, online group work, case studies.	Active participation in online discussion, small assignments, case analyses assessment, and group project.
CLO6. To be able to explain the organizational implications, including decision making under uncertainty with regard to innovation and the open innovation perspective and how external resources are possibly expanded into a larger scope thanks to an open approach of innovation.	LO1.2, LO3.1, LO3.2	Online lectures, self-study, online group work, case studies.	Active participation in online discussion, small assignments, case analyses assessment, and group project.
CLO7. To discuss the strengths and weaknesses of the theoretical perspectives form the course curriculum	LO1.2, LO1.3, LO2.1	Online lectures, self-study, online group work, case studies.	Active participation in online discussion, small assignments, case analyses assessment, and group project.

ACADEMIC HONESTY AND INTEGRITY

The course will use a textbook and a collection of published academic articles. All teaching materials will bear proper references to the original sources. This will also apply to students' reports and presentations.

COURSE OUTLINE

Topic	In-class hours	Readings

Session 1: Introduction: What is innovation and why is it important? **Workshop: Mini case on class**: The Driverless Revolution case (Fortune 2012) Time reserved for group discussion regarding the case company search. **Learning objectives:** (1) Define what innovation is and what different types of innovations are: (2) Explain why innovation is important. Session 2: Technology, innovations, and an overview of technological innovation process **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. (3) understand the usefulness of technology innovation tools and self-learn. Prepare to learn in groups about a specific innovation tool supported by a toolset and generative AI. (as a written essay as *assignment 1 to be handed in in one week)*	8	**Session 1** Coursebook: Chapter 1, pp.1-24. Article 1 and 13 **Session 2** Coursebook: Chapter 3, pp.54-92. Articles 2 &3
Session 3: Make innovation happen: Products and Service Innovation **Group exercise on class**: Service innovation *presentation* **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. Session 4: Make innovation happen: Resource-based view and innovation strategy **Group exercise on class**: The RBV *assignment* based on a case video of Theranos.	8	**Session 3** Course-book Chapter 7, pp.197-234. Articles 4 & 5 **Session 4** Course-book Chapter 4, pp.94-132. Article 6

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Session 5: The external side: Open innovation and Networks for innovation - a RBV view **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 **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.	8	**Session 5** Course-book Chapter 5, pp.131-159. Articles 7 & 8. **Session 6** Course-book Chapter 5, pp.131-159. Articles 9 & 10.
Session 7: The internal side: R&D Management, Operations, and processes **Workshop:** 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. Session 8: Decision Making under Uncertainty and course summary **Group exercise on class**: The hypothetical learning plan *assignment*. Time reserved for Q&A regarding the group assignment of the case company. **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.	8	**Session 7** Course-book Chapter 6, pp.160-196 and Chapter 8, pp.235-266 **Session 8** Articles 11 & 12.
	Total: 32 hours	
CONSULTATIONS	2	
FINAL EXAM	2	

FINAL GRADE COMPOSITION

Type of assignment	%
Group Components 40% (specific requirements for each component will be annouced on the course)	
1. An assignment on innovation tools	18%
2. Theranos Case study	7%

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3. Service Blueprint presentation	7%
4. Case company pitching	8%
Individual Components 60%	
5. Final Group report (*individual contribution must be clearly indicated*)	45%
6. On class participation	15%
Total:	**100**

DESCRIPTION AND GRADING CRITERIA OF EACH ASSIGNMENT
(Provide short descriptions and grading criteria of each assignment)

All group components must have proper reference to the sources of information, clear visual or text presentation of the main ideas supported with sound arguments. Guidelines for the final group report (item 5 in the table above) are provided in the appendix. All group work (incl. presentations and reports) must clearly indicate the names of the group members and their contributions to the work.

All written assignments and presentations must follow ISM's guidelines on how to use generative AI with proper references.

Individual components of the assessment requires that the tasks performed individually and in time. Item 6 (on class participation) requires diligent participation on all/most lectures. Missing a large number of the lectures will result in a reduced score for this item.

REQUIRED READINGS

Course book:

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

ADDITIONAL READINGS

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.

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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. Hidalgo, A., & Albors, J. (2008). Innovation management techniques and tools: a review of theory and practice. R&D Management, 38(2), 113-127.

ANNEX

DEGREE LEVEL LEARNING OBJECTIVES

Learning objectives for the <u>Master of Business Management</u>
Programme:
Innovations and Technology Management

Learning Goals	Learning Objectives
Students will be innovative decision makers	LO1.1. Students will be able to define the business problem and develop **innovative solutions**.
	LO1.2. Students will become **independent learners** and develop their own comprehension of scientific theories, models, and concepts.
	LO1.3. Students will be able to demonstrate critical thinking in problem solving.
Students will be socially responsible leaders	LO2.1. Students will be able to evaluate past and current practices in their discipline from an **ethical perspective**.
Students will be effective communicators	LO3.1. Students will develop and deliver a **coherent oral presentation**.
	LO3.2. Students will develop and deliver a **coherent written research paper**.

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 coffee 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.

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

(May-10-2024 Friday Afternoon 12:30 – 15:45)

Reading material:

1. Dodgson et al. (2008): *The Management of Technological Innovation*. Chapter 1, pp.1-24.

2. Sharma (1999). *Central Dilemmas of Managing Innovation in Large Firms. California Management Review,* 41(3):146-164.

3. Hidalgo, A., & Albors, J. (2008). Innovation management techniques and tools: a review of theory and practice. R&D Management, 38(2), 113-127.

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 for forming groups and search for innovation tools to learn

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

(May-10-2024 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.

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; (3) understand the usefulness of technology innovation tools and self-learn.

Prepare to learn in groups about a specific innovation tool supported by a toolset and generative AI (this is a written essay as assignment 1 to be handed in in one week)

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 views as a process that builds on internal resources and external linkages. A resourced-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 analyzed by groups of students. For more detailed information, see the appendix.

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Session 3: Make innovation happen: Products and Service Innovation

(May-11-2024, 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: Service innovation presentation

Session 4: Make innovation happen: Resource-based view and innovation strategy

 (May-11-2024, 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 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 already on May 11. The choice of innovation case needs to be approved by the teacher at the presentation, which will take place on May 17.

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

(May-17-2024, 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

(May-17-2024, 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

(May-18-2024, 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 discussion on class: Boeing 787 Dreamliner

Session 8: Decision Making under Uncertainty and course summary

(May-18-2024, 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 exercise in class: The hypothetical learning plan assignment, using *MS Teams (Planner add-on) or Trello.*

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

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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 **May 17, 2024 (session 5)**. The students are required to build up their innovation case, bit by bit, based on their own research about the case company. **This is a group report, but individual contributions to the report will be evaluated as individual performance.**

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 (which make it sufficient to pass) 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.
- ***Individual contribution (who wrote which parts) must be clearly indicated.***

The good or excellent report (which leads to excellent performance) 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;

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- Juxtapose **theoretical** perspectives and discuss their applicability and limitations in reality.

Special rules on using generative AI in the report

When writing the report, we apply some specific rules to the final individual report. Failing to comply with these rules will directly result in a fail for the report.

(1) ChatGPT or other chatbot tools are allowed to be used as supporting and advising tools

(2) When making reports, text citing ChatGPT or other chatbot tools must be clearly marked and referenced.

(3) Facts suggested by ChatGPT must be verified by other data sources.

(4) Text citing ChatGPT may not exceed 30% of the total length of the report;

(5) A reflection of how ChatGPT was used to facilitate report writing and learning must be attached as an appendix to the final report.

In relation to point (2) above, text citing ChatGPT must be properly referenced in the report. In principle, you need to treat the chat thread on ChatGPT as a source of reference and always refer to it.

Example: if you used two chat threads, then

A.   You can use a normal reference style in brackets after a sentence generated by AI. E.g., "Innovation is the driving force of economic growth, which nowadays dependent on sustainable development of new technologies on new energy sources, climate change, health, and agriculture (ChatGPT 2023. Chat thread 1)". "Resource-based view (RBV) is a fundamental organizational theory that explains the differences in performance across industrial firms as a result of different resources endeavor across organizations (ChatGPT 2023. Chat thread 2)". In this way, you can specify multiple chat threads and name them using numbers.

B.   In the end of report there needs to be a reference list, in which the links of all the chat threads must be pasted in the reference list.

C.   To generate a URL link of a particular chat thread, you will find on the top right corner of your chat screen a symbol of ⬆ in ChatGPT, click it and paste the link to your reference list. Other generative AI tools have similar functions.

SUBMISSION

Once your assignment report is completed, the finalized version of your report must be uploaded to ISM's e-learning platform in **pdf** format *AND* by email to prof. Jason Li-Ying (yinli@dtu.dk) by **June 14th, 2024 (Friday) at 23:59.**