

Syllabus for
BIS6219E Technology-Management for Emerging Technologies
WiSe 2021/22

Course: BIS6219E Technology-Management for Emerging Technologies

Weekly hours:	2 academic hours: (2 x 45 minutes)
ECTS-Credits:	3
Workload:	90 hours, 30 hours within class and 60 hours for self-study and term project
Time:	Thursday, 09:45-11:15 (W1.3.06)
Begin:	Thursday, October 7 th , 2021
Level:	Advanced
Prerequisites:	Basic knowledge in Computer Science and Information Systems

Instructor Prof. Dr. Peter Weiß

Office hours: Please use the following link and service to book an appointment:
<https://www.timify.com/de-de/profile/peterweiss/>

Email: peter.weiss@hs-pforzheim.de (preferred mode of communication)

(Further details: see lecturer's personal website at the university; see [here](#))

My aim is to ensure that you succeed in your training. Therefore, I want to provide support. In the case of occurring problems or questions, feel free to contact me, for instance by e-mail. I will answer promptly and if required schedule an appointment. My didactic approach grounds on activation methods and research-based learning styles.

Brief course description

In the course, students will get acquainted with research-oriented and practical questions concerning the adequate and pro-active management of emerging technologies. Examples like Kodak or Nokia have underscored, how the misjudgment of technological development results in decline and destruction of well-established business models. Thus, students will learn how technology trends can be proactively managed and what kind of processes and activities need to be in place to ensure that new and future emerging technologies are reflected by the strategic decision making of companies. Technological development and innovation management are strongly intertwined. Students will get acquainted with typical innovation categories. As well, it will be explored what technology is and how technology evolves. Service orientation and customer orientation appears to be key to react to changes in the environment of the company, such as change of customer preferences induced through emerging technologies. The focus will be on megatrends and emerging mega markets, which are the cause of disruptions and

transformations of whole industries and markets. The role of technology, especially of Information Technologies (IT) appears to be key to sustain in a dynamic technology-oriented business environment. IT develops strong influence on the shape of business models, operations and last but not least on corporate strategies. To manage technology as a business strategy is essential. Thus, business function and technology functions have to work jointly towards a strong competitive position of the company. Aspects as digitization and some examples of new emerging technologies will be the subject of the course. Many companies use emerging technologies to either improve their product or to interact more intensively with their customers to offer innovation and value propositions which are able to differentiate their offerings. Thus, technology and management have to build synergies and need to follow clear strategies and business objectives. In the course, students will get acquainted with service-led strategies and new emerging paradigms such as systems perspective (service systems), which help to conceptualize innovations and the role of emerging technologies to unleash the new business potential for companies.

Prerequisites

There are no special pre-requisites for the course beyond basics in management and being interested in technological matters. Do not take the course if you expect to miss more than one class because attendance and active class participation is critical. The course language is English; thus, you should be able to follow lectures in English as well as to read state-of-the-art academic literature in English.

Learning Objectives

The increasing complexity and dynamics of today's marketplace create an environment in which it is difficult for companies to produce technology-based innovations and market them successfully. Moreover, this environment dramatically increases the uncertainty of technology and innovation management activities. Against this background, a company's systematic technology-, innovation- and product management is increasingly important for success in this dynamic fast changing environment. Based on the fundamentals of technology-, innovation- and product management, the students should understand the necessity to follow a systematic approach to technology management. The lecture presents and discusses approaches and process models with particular focus on challenges of technology innovation and dealing with uncertainty. This integrated consideration of technology innovation management and product management within an interdisciplinary approach should enable the students to analyze and discuss critical issues in the domain. This position is important for practice-oriented research and work in the field of technology innovation and product management. The students will learn to synthesize adequate management procedures and appropriate concepts to establish related structures and processes as well as mechanism to ensure the successful management of technology management.

Upon completion of the course the students are to:

- name and describe the specific challenges for the technology management for emerging technologies.
- recall and associate major technology trends and argue their impact concerning business strategy and operations.
- define and summarize why a systematic approach to technology management for emerging technologies is important and how it influences overall business performance of companies.
- define and explain what innovation and technology management is and how they are to be integrated in an organizational design (major roles, structures, processes, activities).
- name and apply various types of innovation categories giving examples and explain their implications on business strategy and operations.

- point out and discuss why and how service-led strategies combined with emerging technologies are unleashing enormous business potential.
- define and argue what disruptive technologies by using concrete criteria to evaluate emerging technologies.
- know and describe management and organizational functions and responsibilities concerning technology management.
- analyze critically approaches and decisions concerning technology management of companies and anticipate potential risks of failure as well as threats for those companies.
- summarize and illustrate the characteristics of business models, their constituent elements and interrelationships as well as arguing the influence of technologies on respective dimensions.
- give examples of emerging technologies that have or will create mega markets and list influencing factors as well arguments that underscore, why those technologies are able to disrupt or transform existing industries and markets.
- synthesize and evaluate technology management solutions for emerging technologies by combining state-of-the-art approaches and concepts as well as best practices.
- demonstrate deeper understanding and discuss actively state-of-the-art literature and judge the potential of related concepts and ideas to be integrated or applied in real life management and/or application scenario.

Course contributions to bachelor programs' common learning goals:

LO	Learning Objective / Outcome	Contributions to learning objectives	Assessment
1. Responsible leadership in organizational contexts	<p>1.1 Students are acquainted with numerous relevant management principles. They are able to explain and discuss them discerningly.</p> <p>1.2 Students are able to apply management principles within an organizational context.</p> <p>1.3 Students are able to reflect discerningly and critically on diverse management principles within an organizational context.</p> <p>1.4 Students comprehend the challenges of ethics and sustainability for responsible business operations and are able to deal with them.</p>	<p>1.4 Information access and abundance, and emerging technologies are advancing, and being developed and disseminated at rates that the human mind often cannot comprehend. Informed students and active discussion of ethical issues will enable society to determine civil and just manners to deal with the nuances of technological advancement (i.e. the Right to Privacy versus the Right to Know; Data Chip Implants in Humans; Neuro-enhancements; Predictive Policing, Human-Machine Interfaces)</p>	Discussions within class, Students' questions for voluntary tutorials, Term Project, and/or Written exam

2. Creative problem solving skills in a complex business environment	<p>2.1 Students are able to recognize and define problems as well as assess their importance.</p> <p>2.2 Students are able to analyze complex in-company and inter-company problems and challenges from different perspectives and/or within an international context.</p> <p>2.3 Students are independently able to develop creative solutions to complex in-company and inter-company problems and challenges.</p> <p>2.4 Students are successfully able to clarify complex problems and solutions to both experts and laymen.</p>	<p>2.1 Develop and demonstrate knowledge and understanding, qualities, skills in technology and innovation management</p> <p>2.2 Scan and organize data, abstracting meaning from information and sharing knowledge</p> <p>2.3 Solve problems and make decisions: establish criteria, using appropriate decision techniques including identifying, formulating and solving business problems; create, identifying and evaluating options; implementing and reviewing decisions; using a range of analytical tools for supporting the technology management process</p> <p>2.4 Communicate effectively: listen, negotiate, and persuade or influence others; develop oral and written communication skills using a range of media, including the preparation of business reports</p>	Discussions within class, Students' questions for voluntary tutorials, Term Project, and/or Written exam
3. Research skills and their practical application	<p>3.1 Students are acquainted with research methods relevant to engineering and management as well as their advantages and disadvantages.</p> <p>3.2 Students are successfully able to apply research methods relevant to engineering and management.</p> <p>3.3 Students are able to implement relevant research methods in such a way as to deliver reliable and innovative results.</p>	<p>3.1 A broad range of theoretical, conceptual and applied material relevant to the study, application and practice of technology management and technological innovation and technology and innovation strategy in almost all organizational, sectoral or industrial settings.</p> <p>3.2 Demonstrate competence in the design and application of research and the use of the skills required for analyzing and communication potentially complex findings and conclusions.</p> <p>3.3 Conduct research into technology management and business and management issues</p>	Discussions within class, Students' questions for voluntary tutorials, Term project, and/or Written exam
4. Design skills for specific IT management solutions or IT technology management architectures within complex process structures	<p>4.1 Expert Knowledge in IT</p> <p>4.2 Application Transfer of Problem Solving Methods for IT-specific Problems</p> <p>4.3 Critical Analysis and Problem Solving for IT-specific Problems</p>	4.2 Synthesizing and operating a range of techniques and methods that inform on the management of design, production, operation, and improvement of technological systems	Discussions within class, Students' questions for voluntary tutorials, Term Project, and/or Written exam

Overview of course content

Motivation: Disruptive Technologies in the hyper-connected world

1. Major Technology Trends and Information Sources (state-of-the art study resources and perspectives)
2. Horizon 2020: EU Research and Innovation Programme.
3. Digitization and Digital Transformation (digital business model perspective)
4. Disruptive Technologies
5. Nature of Technology and how it evolves
6. Open Innovation for Technology and Innovation Management

7. Open Business Models
8. Technology-led Growth Strategies and Innovation Categories

Literature and Teaching Material

1. Arthur, W.B. (2009): The Nature of Technology: What it is and how it evolves. Free Press, New York.
2. Evans, E.: Domain-Driven Design: Tackling Complexity in the Heart of Software. Addison-Wesley, Boston, 2004
3. Bower, Joseph L.; Christensen, Clayton M. (1995): Disruptive Technologies: Catching the Wave. In: Harvard Business Review, 1995.
4. Chesbrough, Henry (2006): Open Innovation: The New Imperative for Creating and Profiting from Technology. Harvard Business School Press. Boston, Massachusetts, 2006.
5. Deloitte (2020): Tech Trends 2020. Beyond the digital frontier. Deloitte University Press. <https://www2.deloitte.com/be/en/pages/technology/articles/deloitte-tech-trends-2020.html>, last visit 30.07.2020.
6. Day, G. S., & Schoemaker, P. J. H. (2016). Adapting to Fast-Changing Markets and Technologies. California Management Review, 58(4), 59–77.
7. Rohrbeck, R.: Harnessing a network of experts for competitive advantage: technology scouting in the ICT industry. R&D Management, Wiley, Volume40, Issue2, March 2010, pp. 169-180.

More detailed information about the literature for every chapter will be given within the lectures.

Additional literature

1. Chesbrough, Henry (2006): Open Business Models: How to Thrive in the New Innovation Landscape. Harvard Business School Press. Boston, Massachusetts, 2006.
2. Christensen, Clayton M. (2011): The Innovator's Dilemma: HarperBusiness, New York, 2011.
3. Erickson, T.J.; Magee, J.F.; Roussel, P.A.; Saad, K.N. (1990): Managing Technology as Business Strategy. In: MIT Sloan Management Review. Vol. 31, No. 3, pp. 72-78.
4. Kim, W. Chan; Mauborgne, Renee (2005): Blue Ocean Strategy. Harvard Business School Press. Boston, Massachusetts, 2005.
5. O'Grady, Stephen (2015): The Software Paradox: The Rise and Fall of the Commercial Software Market. O'Reilly, Sebastopol, 2015.
6. Tapscott, Don; Tapscott, Alex (2016): Blockchain Revolution: How the technology behind Bitcoin is changing money, business, and the world. Penguin Random House, New York, 2016.
7. Day, G. S., & Schoemaker, P. J. H. (2000). Avoiding the Pitfalls of Emerging Technologies. California Management Review, 42(2), 8–33.

Didactic Concept and Learning Approach

The course is organized as a lecture in form of seminar, thus throughout the course special emphasis is met on discussion and interaction with the students. Based upon profound knowledge of theory and its implications during the lecture critical discussions are in focus. This covers discussions concerning current policy topics in technology and innovation management. New paradigms and strategic implications will be discussed. The course introduces to S-D logic and service-led growth strategies. Resource-based views are of interest and will be looked into concerning the contribution to develop technology-led strategies. The lecture materials such as slides, case studies and study texts are accessible for students via the e-learning platform (Moodle).

A term project is required for all students in the course. The project is an opportunity for the students to apply the techniques learned in the course. The success of the project will depend in part on how well the students use the existing literature and techniques in the field.

An important part of the learning process is getting feedback. Each group is invited to come to my office during my office hours or based on an individual appointment to get my feedback about the paper and the presentation.

Workload

The workload for the lectures corresponds to 3 ECTS-credits for a total of about 90 hours.

Communication

In support of this course, an e-learning platform (Moodle) will be used which offers several advantages. Firstly, teaching material will be made available via this platform. Secondly, questions that might arise can be discussed among the students through the use of this platform. Finally, general questions can be answered transparently by the lecturer, i.e. all students will be able to see the answers. For specific questions, you may always contact the lecturer in person or via email.

Course assessment

The students will realize a term project. Details are outlined during the first sessions in the class room, as well as assessment criteria. Important criteria are presented and will be clarified during the first lectures.

Grading

The grading approach will be discussed during the first lecture.

Tentative time planning (to be further detailed)

Week 1	Introductory session <ul style="list-style-type: none"> • Introduction to course objectives and course contents/ learning material; organization and structure of course • Assignment of term projects and individual / group work (access and availability of study material)
Week 2	Introductory Case Study – Disruptive Technologies Case Study #1: Kodak: Approach of Disruptive Technologies Discussion and Lessons Learned
Week 3	Current State of Play / Top Technology Trends Gartner / Horizon 2020 (2014-2020) and Horizon Europe (2021-2027): European Commission <ul style="list-style-type: none"> • Explore the technology map, programme's objectives and current and future technology priorities • Current Trends and Advancements in Technologies (e.g. ICT, production, etc.) • Sources for funding of technology initiatives
Week 4	Open Innovation and Open Business Models / Approaches and Challenges of Technology Management Value Propositions, Value Curve Analysis (Blue Ocean Strategy) Dynamic Capabilities
Week 5	Presentation of Case #1: Term Project
Week 6	Presentation of Case #2: Term Project
Week 7	Presentation of Case #3: Term Project
Week 8	Presentation of Case #4: Term Project
Week 9	Presentation of Case #5: Term Project
Week 10	Presentation of Case #6: Term Project
Week 11	Presentation of Case #7: Term Project
Week 12	Intervention #1: Term Project Technology Management of Emerging Technologies
Week 13	Intervention #2: Term Project Technology Management of Emerging Technologies
Week 14	Intervention #3: Term Project Technology Management of Emerging Technologies
Week 15	Intervention #4: Term Project Technology Management of Emerging Technologies
Week 16	Industry Talk
Week 17	Capstone Session Poster presentation (Term Project) Feedback session and Wrap up