Syllabus
BIS6219E Technology-Management for Emerging Technologies
Prof. Dr. Peter Weiß
Winter Semester 2023/24

Level	Master
Credits	3
Student Contact Hours	2 academic hours: (2 x 45 minutes) / per week
Workload	90 hours, 30 hours within class and 60 hours for self-study and term project
Prerequisites	Basic knowledge in Computer Science and Information Systems
Time	15:30-17:00
Room	W1.2.03
Start Date	Thu, 12.10.2023

Lecturer(s)		
	Name	Prof. Dr. Peter Weiß
	Office	W2.2.25
	Virtual Office	MS Teams
	Office Hours	Wednesday, 11:30-13:00
		Please use my booking system to reserve a free timeslot: see TBA (new booking system and procedure explained during introductory lecture)
	Phone	+49 723 128 6691
	Email	peter.weiss@hs-pforzheim.de (preferred mode of communication)
		(Further details: here)

Outline of the Course

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 misjudgement 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.

Course Intended Learning Outcomes and their Contribution to Program Intended Learning Outcomes / Program Goals

Program Intended Learning Outcomes		Course Intended Learning Outcomes	Assessment Methods	
	After completion of the program the students will be able…	After completion of the course the students will be able…	Presentation	Term Paper
			50%	50%
			Individual	Individual
1	**Responsible Leadership in Organizational Contexts**			
1.1	… to know and to argue relevant leadership principles.	To know and explain the challenges of technology management of emerging technologies and underline related principles and mechanisms which can be applied in an enterprise context. To name and explain technology management components and principles.	X	X
1.2	… to demonstrate their ability to apply relevant leadership principles.	To analyse and communicate information concerning selected emerging technologies.	X	X

				X	X
		To demonstrate awareness of the necessity to master emerging technologies.			
		To argue and elucidate how 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)			
2	**Creative Problem Solving Skills in a Complex Business Environment**				
2.1	… to identify, to demarcate, and to classify problems.	To develop and demonstrate knowledge and understanding about existing problems in technology management and required capabilities, skills and competences to overcome the challenges of technology and innovation management in Information Systems.		X	X
2.2	… to analyze problems independently.	To explain ways and possibilities to scan and organize data, abstracting meaning from information and sharing knowledge about emerging technologies.		X	X
2.3	… to solve problems creatively and implement appropriate solutions in practice.	To know and specify how to 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.		X	X
2.4	… to clarify subject-specific problems.	To explain and demonstrate how to 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.		X	X
3	**Research skills and their Practical Application**				
3.1	… to know relevant methods and can argue them in a professional context.	To know and argue relevant 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.		X	X
3.2	… to competently apply relevant research methods.	To know and argue a Design Science Research approach and why a construction-oriented (technical action) IS research endeavour is vital to succeed.		X	X
		To describe differences in principles of IS management and engineering vs business management approaches.			
		To name and explain required competence in design and application of research and the use of the skills required for analysing and communication potentially complex findings and conclusions.			
3.3	… to demonstrate the ability to develop new knowledge and procedures, integrate knowledge from different areas to expand knowledge in the field.	To know and describe approaches and processes to conduct research in the context of technology management and business and management issues.		X	X
4	**Design skills for specific IT management solutions or** **IT technology management architectures within complex process structures**				
4.1	... to demonstrate specialised IT-specific expert knowledge and expertise to design and realize specific solutions or architectures within complex structures.	To know and characterize selected emerging technology cases based on various views, aspects and perspectives (for example architectural elements).		X	X
4.2	... to demonstrate their ability to apply appropriate specialised problem-solving methods to IT-specific tasks.	To synthesize and apply range of techniques and methods that support technology management with regard to design, production, operation, and improvement of complex technological systems.		X	X
		To refer to concrete technology cases and examples how technology management of emerging technologies needs to be configured and implemented.			

Teaching 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.

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.

Literature and Course Materials

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.

Complementary/ Additional Reading/ Case Material (tentative to be completed / updated):

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.

We use cases published by Harvard Business School Publishing and MIT Sloan Management Review as sources. For selected papers, we have to pay a license fee and the papers are only issued for strict personal use within the course. You are not allowed and permitted to use the material for other purposes outside this course and the assigned tasks.

Assessment

The students will realize and master a technology case (term project). To get credits for the course it is necessary that the student has to complete all the individual assignments (completed term project including the individual presentation (PPT) and discussion in class).

Preparation of technology case (including documentation (term paper) and poster)	50%
Presentation and discussion of case study	50%
Total	**100%**

Further details are overseen and concretized during the first sessions in the class room, including assessment criteria. Important criteria are presented and will be clarified during the first lectures.

Schedule

The time schedule and contents shown is still tentative and will be detailed during the first lecture and session, although it provides adequately a first impression about the structure and contents of the course.

Week 1	**Introductory session** 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

	Case Study #2: Steve Jobs about Technology Management
Week 3	**Current State of Play / Top Technology Trends** **Gartner / Horizon 2020 (2014-2020) and Horizon Europe (2021-2027): European Commission** 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

Academic Integrity and Student Responsibility

Students are encouraged to discuss the course, including issues raised by the assignments. However, the solutions to assignments should be individual original work unless otherwise specified. If

an assignment makes you realize you don't understand the material, ask a fellow student a question designed to improve your understanding, not one designed to get the assignment done.

Any substantive contribution to your work by another person or taken from a publication has to be properly acknowledged in writing and signalled in your contribution (presentation, term paper, discussion). This also applies to an internet source. Failure to do so is plagiarism and will necessitate disciplinary action. Typically, you get not credits for the whole course although you provided other output.

The same standards regarding plagiarism apply to team projects as to the work of individuals, except that the author is now the entire team rather than an individual. Anything taken from a source outside the team should be properly cited (see the School's guidelines).

One additional issue that arises from the team authorship of reports is that all team members must stand behind all reports bearing their names. All team members have quality assurance responsibility for the entire project. If there is irreconcilable disagreement within the team it is necessary to indicate as much in the reports; this can be in the form of a ``minority opinion'' or "dissenting opinion" section where appropriate. In general, each member of the group will receive the same grade on an assignment. However, there may be times when one or more members of a group will "free ride" on the work of other members. The grades of such free riders will be substantially reduced if consistent evidence of free riding is found.

Teaching Philosophy

The lecturer will do anything to support you individual learning process. If you have problems or questions, please speak up in class or contact me personally or send an e-mail or see me at my office. If you have problems with your progress in the course or with a teammate or your team, please see me as early as possible. The longer you wait the fewer options I will have to intervene and to help you.

Student responsibilities and class behaviour

- Read the course syllabus
- Respect each other
- Take responsibility for your action
- Demonstrate professional attitude and professionalism
- Be open and fair
- Act with honesty
- Trust each other
- Demonstrate civility
- Arrive to class on time and do not leave early
- Please let me know in advance if you miss a class
- Demonstrate and respect divergent opinions

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 chal-

lenges 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.

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.
- analyse 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.