



# STRATEGIC TECHNOLOGY MANAGEMENT

## Course Outline

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WINTER TERM 2022/2023

## 1 COURSE OVERVIEW

<b>Course Name:</b>	<b>Strategic Technology Management</b>
<b>Degree Programmes:</b>	<ul style="list-style-type: none"> <li>• Master BWL (Innovation, Entrepreneurship and Marketing – core course)</li> <li>• Master Wirtschaftsingenieurwesen (Management des Innovationsprozesses)</li> <li>• Master Wirtschaftswissenschaften (Wahl B)</li> </ul>
<b>Lecturer:</b>	Prof. Dr. Frank Piller and Prof. Dr. Torsten Oliver Salge
<b>Contact:</b>	Fabian Grimm ( <a href="mailto:grimm@time.rwth-aachen.de">grimm@time.rwth-aachen.de</a> , +49 241 80 99199)
<b>Location and Time:</b>	<ol style="list-style-type: none"> <li>1. 08.11.2022; 09:00a.m - 11:00a.m.; Zoom (Link on RWTHmoodle); Kick-off; Lecturer: Prof. Salge</li> <li>2. 06.12.2022; 08:30a.m - 2:00p.m.; HSZ (2110   112); Session 1; Lecturer: Prof. Salge</li> <li>3. 13.12.2022; 08:30a.m - 2:00p.m.; HSZ (2110   112); Session 2; Lecturer: Prof. Salge</li> <li>4. 20.12.2022; 08:30a.m - 2:00p.m.; HSZ (2110   112); Session 3; Lecturer: Prof. Salge</li> <li>5. 10.01.2023; 08:30a.m - 2:00p.m.; HSZ (2110   112); Session 4; Lecturer: Prof. Piller</li> <li>6. 17.01.2023; 08:30a.m - 2:00p.m.; HSZ (2110   112); Session 5; Lecturer: Prof. Piller</li> <li>7. 24.01.2023; 08:30a.m - 2:00p.m.; HSZ (2110   112); Session 6; Lecturer: Prof. Piller</li> </ol> <p><i>Examination:</i></p> <ol style="list-style-type: none"> <li>8. 31.01.2023; 08:30a.m - 2:00p.m.; HSZ (2110   112); Final Project Presentations; Lecturer: Prof. Piller &amp; Prof. Salge</li> <li>9. 16.02.2023, 03:00p.m.; Submission of the Paper via RWTHmoodle</li> </ol> <p>Please note:</p> <ul style="list-style-type: none"> <li>• If possible, the sessions may end before 02:00p.m.</li> <li>• Due to the covid pandemic, switching to an online format may be necessary.</li> </ul>
<b>Content Description:</b>	<p>This course provides an introduction to strategic technology management (STM) based on the analysis of cases studies from practice and results from academic research. The class will revisit some of the foundational concepts and debates in strategic management to examine key strategic decisions at the heart of technology and innovation management.</p> <p>These might pertain for instance to</p> <ul style="list-style-type: none"> <li>• the selection of technology fields,</li> <li>• the composition of innovation portfolios,</li> <li>• the timing of technology development initiatives,</li> <li>• the development of innovation systems,</li> <li>• the search for new ideas,</li> <li>• the involvement of users,</li> <li>• the implementation of modular designs,</li> <li>• the orchestration of strategic alliances,</li> <li>• the protection of intellectual property.</li> </ul> <p>As part of this course, participants will have the opportunity to become familiar with case studies and/or research papers related to these topics. <b>Furthermore, the students have the chance to test their knowledge by crafting a technology strategy for a Dax40 company (see chapter 4 for more details).</b></p>
<b>Qualification Objectives:</b>	<p>Overall goal: Students gain theoretical and practical knowledge in <i>strategic technology and innovation management</i> as preparation for interdisciplinary leadership roles in research and development (R&amp;D) and beyond. After successfully completing this course, the student will have acquired the following learning outcomes:</p> <p><i>Knowledge / Understanding:</i></p> <p>Students:</p> <ul style="list-style-type: none"> <li>• understand and critically reflect upon key concepts and theories in strategic TIM,</li> </ul>

	<ul style="list-style-type: none"> <li>understand and critically discuss conceptual and empirical research papers on strategic TIM.</li> </ul> <p><i>Abilities / Skills:</i> Students are able:</p> <ul style="list-style-type: none"> <li>to analyze and develop adequate solutions to some of the practical challenges of strategic TIM,</li> <li>to apply important tools in strategic TIM intelligently based on a thorough understanding of their respective strengths and weaknesses.</li> </ul>
<b>Literature:</b>	See below in chapter 2,3 and 4. All papers and cases will be made available on Moodle before each session.
<b>Course Examination:</b>	<p>The final grade can be composed as followed:</p> <ul style="list-style-type: none"> <li><b>Option A:</b> Colloquium (weight: 50%) and student paper &amp; presentation (weight: 50%)</li> <li><b>Option B:</b> Colloquium &amp; presentation (weight: 50%) and written exam (75 minutes in total; 60 minutes writing and 15 minutes case reading time, weight: 50%)</li> <li><b>Option C:</b> Written exam (75 minutes in total; 60 minutes writing and 15 minutes case reading time, weight: 100%)</li> </ul> <p>The exact form of examination (A, B or C) will be announced at the start of the course. Unless announced differently, option <b>A</b> applies. The final grade is the weighted average of the elements, and you need 50 percent of all points to pass.</p> <p><b>Please Note:</b> In addition to the aspects above, all industrial engineers have to pass each of the examination elements individually (according to ÜPO §10 (8) and the program-specific regulations (fachspezifische PO for M.Sc. W.Ing.) §9 (2)). Please, also be aware of the special rules for examination registration and cancelation.</p>
<b>Participation Requirements:</b>	<p><i>Solid command of English</i> and <i>willingness to prepare</i> each class session in advance (in average, each class session demands 5-6 hours of preparation to read one case study and academic papers and watching the lecture videos in advance).</p> <p><i>Class participation</i> has a significant impact on the final grade. In particular, students must demonstrate their understanding in the discussion of the case studies and the scientific papers. Personal participation in the in-class sessions is therefore recommended.</p> <p>To support us in grading your contributions, we kindly ask you to send a recent photo of you (filename: FirstnameLastname.jpg) in an email with the Subject "STM WiSe23 Picture" to grimm@time.rwth-aachen.de by 09th of November 2022 (only in case you want to take this course).</p> <p>In case of the digital realization of the course in winter semester 22/23: We would like to point out to all participants that video transmission is desired and recommended for the online sessions in order to enable an interactive learning atmosphere. In addition, we ask you to indicate a clearly identifiable name so that we can assign your oral participation accordingly. This module is not based on lecture videos, but on a discussion format. The sessions are not recorded. If you do not approve of this format with the necessary digital precautions, please choose another module.</p>
<b>Group Size:</b>	30 participants (max), project group size: 5 (max)
<b>Workload:</b>	30 hours of lecturing. 120 hours of individual and group preparation.
<b>Type of Teaching:</b>	Classroom sessions are likely to comprise a mixture of interactive lectures, case/paper discussions and student presentations.
<b>Language:</b>	English
<b>Credits:</b>	5

## 2 Live Sessions

The course comprises six live sessions, which will be subdivided into three parts consisting of (1) brief review and discussion of the video lecture content and recap questions, (2) in-class paper discussion (3) in-class case study discussion. The order and duration of these elements might vary between sessions. The table below depicts the preliminary schedule.

You find further below a brief description of each session. **Please make sure to complete the pre-assignment (watching the video lectures and answering the recap questions, reading of case studies and scientific papers) before joining the session.** In addition, we strongly recommend reading the supplemental papers, or at least to skim-read these papers.

This course will be managed via the e-learning platform Moodle. All lecture slides, student presentation slides and readings will be deposited here. In addition, we will communicate all important pieces of information (e.g. pptx-Template, group allocation, room changes, course and exam preparation) only via Moodle. It is hence essential for you to **sign up for our Moodle course by 07<sup>th</sup> of November 2022** at the very latest. If you register after that date, we cannot guarantee that we will be able to assign you to a group.

We kindly ask you to **send a recent photo** of you (filename: FirstnameLastname.jpg) in an email with the Subject "STM WiSe23 Picture" to [grimm@time.rwth-aachen.de](mailto:grimm@time.rwth-aachen.de) by **09th of November 2022**. Without your picture, the grading process of your class contributions will be more challenging.

All lectures, discussions, and student presentations will be in the English language.

**Please Note:** The supplemental readings are subject to change. The final readings will be made available on RWTHmoodle.

### Session 1: Ensuring Adaption

<p>Description:</p>	<p>This first session is meant to explore why adopting a strategic approach to technology management is of utmost importance for the performance and survival of firms operating in dynamic environments. We will draw on the theory of structural inertia and the dynamic capabilities view to examine the relative benefits and costs of exploiting existing technologies versus exploring new technological opportunities. We will then identify the circumstances under which a focus on technological exploration or exploitation appears most critical for firm survival. We will conclude by describing some of the key managerial decisions in the field of STM.</p>
<p>Learning Objectives:</p>	<ul style="list-style-type: none"> <li>• Revisit some of the key concepts with relevance to STM</li> <li>• Understand the need for a delicate balance between technological exploitation and exploration</li> <li>• Learn how to apply arguments from the theory of structural inertia and the dynamic capabilities view to aspects of STM</li> <li>• Identify key managerial decisions in the field of STM</li> </ul>
<p>Supplemental Readings:</p>	<p>William P. Barnett and John Freeman. "Too much of a good thing? Product proliferation and organizational failure." <i>Organization Science</i> 12.5 (2001): 539–558.</p>

	<p>Michael T. Hannan and John Freeman. "Structural inertia and organizational change." <i>American Sociological Review</i> 49.2 (1984): 149–164.</p> <p>J. Jansen, F. Van Den Bosch and H. Volberda, H. "Exploratory innovation, exploitative innovation, and performance: Effects of organizational antecedents and environmental moderators." <i>Management Science</i> 52 (2007): 1661-1674.</p> <p>Charles A. O'Reilly and Michael L. Tushman. "Ambidexterity as a dynamic capability: Resolving the innovator's dilemma." <i>Research in Organizational Behavior</i> 28 (2008): 185-206.</p> <p>David J. Teece. "Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance." <i>Strategic Management Journal</i> 28.13 (2007): 1319–1350.</p>
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## Session 2: Allocating Resources

<b>Description:</b>	Given the scarcity of their resources, firms need to be selective in their technology development initiatives. Scoping the organizational playing field by identifying strategic priorities for technology development is hence paramount for effective STM. In this session, we will turn to the market- and resource-based views in the field of strategy for guidance on this important question. Building on these insights, we will compare and contrast the market pull and technology push model. We will also explore a number of strategy and technology portfolios, which are simple, yet useful tools to map and assess a set of development options. Last, we will discuss the importance of timing by juxtaposing the benefits, challenges and requirements of first-mover and follower strategies.
<b>Learning Objectives:</b>	<ul style="list-style-type: none"> <li>• Gain insights into the debate between the market-based view and the resource-based view in strategic management and its relevance for STM</li> <li>• Distinguish market pull and technology push approaches</li> <li>• Learn how to use strategy and technology portfolios</li> <li>• Appreciate the complexities of resource allocation decisions for technology development</li> </ul>
<b>Supplemental Readings:</b>	<p>Jay B. Barney. "Firm Resources and Sustained Competitive Advantage." <i>Journal of Management</i> 17.1 (1991): 99-120.</p> <p>Jay B. Barney, M. Wright and D.J. Ketchen. "The resource-based view of the firm: Ten years after 1991." <i>Journal of Management</i> 27.6 (2001): 625–641.</p> <p>Michael E. Porter. "The five competitive forces that shape strategy." <i>Harvard Business Review</i> 86.1 (2008): 78–93.</p>

## Session 3: Timing Entry

<b>Description:</b>	The timing of resource allocation is as important as deciding which technology to pursue. In particular, whether a company is the first to enter a new market often measures the success or failure of a new business. In this session, we will explore the right timing of a technology strategy in depth.
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<b>Learning Objectives:</b>	<ul style="list-style-type: none"> <li>• Understand the importance of timing in technology development</li> <li>• Identify some of the key strategic requirements for first movers and followers</li> <li>• Discuss advantages and disadvantages of being a first mover or fast follower</li> </ul>
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## Session 4: Designing Processes

<b>Description:</b>	In this session, we will explore how organizations can design effective and efficient innovation process. For this purpose, we will review a number of distinct process models and unpack the concept of organizational creativity. We will also illuminate the challenging task of attempting to change the rules of the game, that is, received wisdom about how business ought to be conducted in a particular industry. Last, we will explore the theme of employee resistance likely to be associated with major process changes and disruptive innovation.
<b>Learning Objectives:</b>	<ul style="list-style-type: none"> <li>• Become familiar with distinct innovation process models</li> <li>• Understand the concept and value of organizational creativity</li> <li>• Get to know the idea of blue ocean strategy</li> <li>• Appreciate the sources of employee resistance and learn how to deal with it.</li> </ul>
<b>Supplemental Readings:</b>	<p>Robert G. Cooper, and Elko J. Kleinschmidt. "An investigation into the new product process: steps, deficiencies, and impact." <i>Journal of Product Innovation Management</i> 3.2 (1986): 71-85.</p> <p>Cooper, Robert G. "The Stage-Gate® idea-to-launch process: Update, what's new, and NexGen systems." <i>Journal of Product Innovation Management</i> 25.3 (2008): 213-232.</p>

## Session 5: Engaging Partners

<b>Description:</b>	The locus of technology development and competition is shifting from the individual organization to the organizational ecosystem. As a result, the long dominant closed innovation model is gradually being replaced by more open approaches as part of which organizations broaden the range of external partners they rely upon to fuel their technology development efforts. Establishing and managing this ecosystem thus become a vital task of STM. In this session, we will draw on the relational view of the firm to explore the merits and challenges associated with such a more collaborative model. We will also identify key resources and capabilities firms need to establish if they are to establish, cultivate and benefit from a strong innovation ecosystem.
<b>Learning Objectives:</b>	<ul style="list-style-type: none"> <li>• Become familiar with the relational view of the firm as an extension of the resource-based view</li> <li>• Identify critical interdependencies among ecosystem members</li> <li>• Understand the merits and challenges of a collaborative approach to technological exploration and exploitation</li> <li>• Unpack the notion of orchestration capabilities and discuss other enablers of effective ecosystem leadership.</li> </ul>
<b>Supplemental Readings:</b>	Ron Adner. "Match your innovation strategy to your innovation ecosystem." <i>Harvard Business Review</i> 84.4 (2006): 98–107.

	<p>Carliss Baldwin and Eric von Hippel. "Modeling a paradigm shift: From producer innovation to user and open collaborative innovation." <i>Organization Science</i> 22 (2011): 1399–1417.</p> <p>Charles Dhanaraj and Arvind Parkhe. "Orchestrating innovation networks." <i>Academy of Management Review</i> 31.3 (2006): 659-669.</p> <p>Jeffrey H. Dyer and Harbir Singh. The relational view: Cooperative strategy and sources of interorganizational competitive advantage. <i>Academy of Management Review</i> 23.4 (1998): 660–679.</p>
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## Session 6: Capturing Value

<b>Description:</b>	Intellectual Property (IP) represents the output or intangible product of an individual's mind or intellect. IP can be an invention with patentable potential, copyright, a design, trademark, process or the practical application of a good idea (know-how). It is the typical outcome of a successful innovation process. IP can be one of the most valuable assets of an organization, as it can become a source of competitive advantage and bring considerable value to an organization when managed appropriately and effectively. Managing Intellectual Property is the process by which an organization can accurately identify, capture, evaluate, protect and monitor IP frequently for the purposes of further exploitation, usually commercialization of some kind.
<b>Learning Objectives:</b>	<ul style="list-style-type: none"> <li>• Understand the different concepts of intellectual property</li> <li>• Get an idea what a patent is and how the process of obtaining a patent works</li> <li>• Frame intellectual property issues around appropriability and strategy.</li> <li>• Explore complementary strategic protection mechanisms</li> </ul>
<b>Supplemental Readings:</b>	<p>Pisano, Gary. "Profiting from innovation and the intellectual property revolution." <i>Research Policy</i> 35.8 (2006): 1122-1130.</p> <p>Reitzig, Markus. "Strategic management of intellectual property." <i>MIT Sloan Management Review</i> 45.3 (2004): 35-40.</p> <p>David J. Teece "Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy." <i>Research Policy</i> 15.6 (1986): 285-305.</p> <p>Karl Ulrich and Steven Eppinger. Product Design and Development. McGraw-Hill 2008/2011, Chapter 14 on "Patents and Intellectual Property".</p>

## 3 Colloquium

Your in-class participation comprises two key elements:

- 1) the case study discussions and
- 2) the paper discussions.

**Jointly**, they will count for **50 percent of your final grade**.

As for the **in-class case study discussions**, it is necessary for all course participants to

carefully read the cases at home and be ready to discuss the questions listed in the case study described below (see chapter 3.1). The material is available on RWTHmoodle. This is an individual task.

As for the **paper discussions**, it is necessary for all course participants to carefully read the compulsory scientific papers at home and be ready to discuss the paper in the sessions. Besides, the students must discuss the papers in groups before each session. For this, each group must write a short paper discussion (~500 words) and upload it one day before the session at 3 p.m. on RWTHmoodle. Please use the docx.-template “Paper-Discussion Template” provided on RWTHmoodle and name the file “GroupNumber-SessionNumber” (e.g. Group-9\_Session2.docx).

We will grade each student individually based on their contributions to class discussions. For that, please send a recent photo of yourself (selfie or portrait) for our class book to [grimm@time.rwth-aachen.de](mailto:grimm@time.rwth-aachen.de) by 9<sup>th</sup> of November (please no group photos or sunglasses).

### 3.1 Case Studies

During the sessions, we will discuss one **case-study** every week. The case study papers are available on RWTHmoodle. Please read the case studies prior to our sessions in order to participate in a fruitful discussion. Ideally, you would even think about the corresponding questions.

**Please Note:** The cases are subject to change. The final cases will be announced and made available via RWTHmoodle.

#### Case 1: Polaroid: Entering Digital Imaging

Polaroid Corporation, historically the best-known brand in instant photography, faced a host of challenges in 1997. Although Polaroid had enjoyed spectacular growth from the late 1940s through the late 1970s, its history since then had been more troubled. When its sales declined in the 1980s, Polaroid had attempted to expand into electronic- and digital-imaging technologies. During that decade, Polaroid’s R&D expenses averaged 8.8% of total revenues, and by 1989, 42% of the firm’s R&D dollars were devoted to electronic-imaging technologies. This research had led to several major technological breakthroughs, but few of the products that resulted from this effort had been successful. Its new-product failures had been extremely costly and had led to substantial losses and layoffs; Polaroid’s workforce had shrunk from 21,000 in the late 1970s to about 10,000 in 1997. Most leading stock analysts and business publications were skeptical that Polaroid could turn things around. Internally, there was no consensus on how Polaroid could increase its sales and profits. Although Polaroid currently offered a wide range of traditional and digital-imaging products, in 1996 its established product lines in instant-camera and film accounted for 90% of its overall sales of almost \$2.2 billion, and its digital imaging products had lost \$120–\$130 million.

Read the case and answer the following questions:

- How did the top management team attempt to pursue technological exploitation (i.e. analog camera capabilities) and technological exploration (i.e. digital camera capabilities) at the same time? Which challenges did they encounter?
- What inertial forces were at play in the case of Polaroid? That is, why was it so difficult for Polaroid to adapt its offerings to the requirements of the digital age?



- How would you evaluate the management performance during the transition process?
- If consulted during the process, what measures would you have proposed to facilitate the technological adaptation process?

## Case 2: Applied Research Technologies

Applied Research Technologies, Inc. (ART) is a diversified technology company which has built its success on its entrepreneurial culture and its reliance on innovation as a source of its ongoing competitive advantage. The case concentrates on the challenges faced by Peter Vyas, the Filtration Unit's manager, who must decide whether to request \$2 million in project funding from his boss, Cynthia Jackson, the vice president of the division to which he reports. Similar filtration projects have failed twice before, damaging the credibility of the Filtration Unit and Vyas personally. We also learn that Jackson has recently been appointed to her job as division vice president and has been given the challenge of "turning around or shutting down" the Filtration Unit. To complicate matters further, the Filtration Unit must coordinate with the new technical center in India, which identified and developed the technology on which the new product is based. The students must decide what to do from both a business unit manager perspective as well as a division VP. This two-tier decision focus provides the opportunity to analyze the management decision process at different levels of the organization.

Please read the case and answer the following questions:

- As Peter Vyas, how would you handle the expenditure request for the re-launch of the mini water oxidation system?
- As Cynthia Jackson, would you approve the expenditure request if Vyas sends it up to you?
- How effective has Vyas been as a front-line manager at ART? How effective has Jackson been as an ART division vice president?
- How has ART been able to foster innovation and an entrepreneurial environment in the context of a large corporate entity?

## Case 3: Disruption in Detroit: Ford, Silicon Valley, and Beyond (A)

The (A) case focuses on the Ford Motor Company in the spring of 2016. Ford's then-CEO Mark Fields and his senior management team face disruptive technologies and market trends that will ultimately force the automaker to modify its current business model. These sources of disruption include electric vehicles, connectivity, autonomous vehicles, changing patterns of car ownership and use, and the global emergence of subcompact cars. Having experienced a successful financial turnaround under the leadership of its prior CEO Alan Mulally during and after the 2008-2009 recession, Ford must now decide whether its current investment in responding to these new emerging technologies is too much, too little, or just right.

- In what ways are consumer preferences changing in Ford's different market segments and geographies? Are consumers able to articulate what they will be eager to buy five years from now?

- How significant are the new industry entrants and their technologies? Have any of them introduced truly disruptive innovations that are potentially lethal for established automakers?
- Which Research & Development initiatives should the company bet on, and how aggressively should it invest to build new capabilities?
- What kind of partnerships should Ford initiate to acquire technologies that it cannot or does not want to build in-house?
- Does the concept of “disruption” provide a helpful model for understanding Ford’s current dilemmas? What are the limitations of this model, and are there other ideas that are more useful for understanding Ford’s competitive landscape?
- How can a company reinvent itself when it has such a long history, an established business model, and massive legacy infrastructure? Has Mark Fields chosen the right approach?

#### Case 4: Optimizing Firm-Internal Innovation Processes: Bang & Olufson – Design Driven Innovation

A successful company, recognized worldwide for exquisite design of consumer electronics products, strives to better integrate software design into its traditional physical product design processes to...

- How would you describe Bang & Olufson’s competitive situation in the spring 2006? What are they good at? What should they be worried about?
- Let’s take a closer look at the B&O design process to try to better understand how it works — how would you describe it?
- Is the design process s at B&O written down anywhere? Should it be? Why or why not?
- What are the strength and weaknesses of this design process? How changeable is this design process?
- What is your assessment of the IdeaLab approach to changing the B&O design process? Will it work?

#### Case 5: Unilever

This case focuses on the Unilever Foundry, a platform for Unilever to engage with start-ups and entrepreneurs, providing them with access to Unilever’s brands as a means of enabling their growth while bringing innovative technology back to the company.

Please read the case and answer the following questions:

- Assess Unilever’s innovation activities over the last 15 years. What has worked well and what has not?
- What is the distinctive approach taken by Jeremy Bassett and the Foundry team?
- What advice would you give Jeremy now?

#### Case 6: ARM Holdings: IP Licensing to Internet of Things

This case is about the strategic implications of patents on a business model. For this, it shows how a IP-centric business model can stimulate growth, but also confronts the reader with the strategic decision of how to adapt this business model to new markets.

ARM has flourished in the semiconductor industry and paved the pathway for intellectual property (IP) Licensing to become a celebrated business model, further strengthened by an ingenious partnership model and an eco-system. So far, ARM has primarily operated in the processor and consumer electronics industry which typically has a few large players in the market. However, the company's strategic shift towards the IoT market poses a new set of risks and challenges. The IP Licensing business model and strategy that has worked for ARM in the processor market may not necessarily work for the firm in the IoT market.

Please read the case and answer the following questions:

- Why did ARM choose an IP-centric business model? What were the reasons for it and what were the reasons against it?
- Describe ARM's conventional business model with the OEMs and semiconductor companies. What role does IP play in the business model, what are its strengths and what are its limitations?
- What could be ARM's response to the growing IOT market?

### Background information:

To get a background of the patent system, **watch this video before reading the case** (it explains the US patent system but is also relevant for this case):

<https://www.youtube.com/watch?v=vZ1SBP8u1s>

## 3.2 Paper Discussion

Each paper addresses an important phenomenon in the sphere of strategic technology management. Papers can be conceptual or empirical and have been published in leading peer-reviewed journals in the field of Strategic Technology Management such as the *Strategic Management Journal*, *Management Science*, *Research Policy* or the *Journal of Product Innovation Management*.

Papers relevant to the session will be announced prior to each session and made available on RWTHmoodle. The papers listed in the following table serve as orientation. Please note that this table may be subject of change.

A paper discussion touches on the following points:

- (1) Introduction & Reference to STM
- (2) Paper Description
  - Research Question
  - Conceptual Framework
  - Research Design
  - Contributions to strategic technology management research and practice
- (3) Paper Discussion
  - Strengths
  - Weaknesses
  - Possible Refinements and Extensions
- (4) Conclusion

We would like to stress that a paper discussion needs to go beyond simply summarizing the content. Rather, you are asked to engage with it critically by discussing its strengths and weaknesses and its contributions to our understanding of key aspects of strategic technology management.

## Schedule for Paper Discussions

**Please Note:** The papers are subject to change. The final selection will be announced and made available via RWTHmoodle.

#	Date	Papers
<b>PD1</b> Why?	06.12.2022	Tripsas, M., Gavetti, G., 2000. Capabilities, cognition, and inertia: Evidence from digital imaging. <i>Strategic Management Journal</i> 21.11: 1147–1161.  Optional:  Timo O. Vouri and Quy N. Huy. “Distributed attention and shared emotions in the innovation process: How Nokia lost the smartphone battle.” <i>Administrative Science Quarterly</i> (2016).
<b>PD2</b> Where?	13.12.2022	Phaal, R., Farrukh, C.J.P., Probert, D.R., 2004. Technology roadmapping—A planning framework for evolution and revolution. <i>Technological Forecasting and Social Change</i> 71, 5–26. <a href="https://doi.org/10.1016/S0040-1625(03)00072-6">https://doi.org/10.1016/S0040-1625(03)00072-6</a>
<b>PD3</b> When?	20.12.2022	Ashton Hawk, Goncalo Pacheco-De-Almeida and Bernard Yeung. “Fast-mover advantages: speed capability and entry into the emerging of Atlantic basin LNG.” <i>Strategic Management Journal</i> 34.13 (2013): 1531-1550
<b>PD4</b> How?	10.01.2023	Holger Ernst, Wayne D. Hoyer and Carsten Rübstaamen. “Sales, marketing and R&D cooperation across new product development stages: Implications for success.” <i>Journal of Marketing</i> 74.5 (2010): 80-92.
<b>PD5</b> With whom?	17.01.2023	Ron Adner and Rahul Kapoor. “Value creation in innovation ecosystems: How the structure of technological interdependence affects firm performance in new technology generations.” <i>Strategic Management Journal</i> 31.3 (2010): 306-333.
<b>PD6</b> So what?	24.01.2023	Nils J. Foege, Ghita D. Lauritzen and Torsten Oliver Salge. “Reconceptualizing the paradox of openness: How solvers navigate sharing-protecting tensions in crowdsourcing.” <i>Research Policy</i> 48.6 (2019): 1323-1339.

## 4 Integrated STM Group Project

Your work on the integrated STM Group Project will count for the other **50 percent of your final grade**.

The Strategic Technology Management course teaches fundamental theories and frameworks through scientific papers and their application in case studies. For this reason, the integrated STM Group Project is an important part of the course as it integrates the theories and best practices into one project. The course participants will apply the course content in analyzing one of the [DAX40](#) companies.

Compared to the case studies in the live sessions, the students will examine one of the DAX40 companies concerning all the six aspects taught (Why? Where? When? How? With whom? So what?). Thus, the result of the group's work is a complete technology strategy. Whereas gaining insights requires in-depth research in each course module, students must also connect the insights of each field. Each group chooses the company on its own.

Guiding questions in your analysis are:

- **Assessment:** What opportunities and threats must the company respond to ensure its survival and remain competitive?
- **Priorities:** Where should the firm allocate its resources?
- **Priorities:** When should the firm allocate resources?
- **Processes:** How can the firm optimize its innovation processes?
- **Partners:** How can the firm establish and maintain a powerful ecosystem?
- **Protection & Value Capture:** How can the firm protect its core technologies and capture value?

The sessions provide further key questions which could be of help for your analysis!

The examination consists of two elements. First, the groups must present their analysis results. Then, the groups must write an analysis report. The following sections contain further information on the two elements.

The groups will present their analysis on the 31st of January 2023. The presentation of the results should take a maximum of 15 minutes. An additional 10 minutes will be reserved for discussion. Due to the limited time, the students must carefully decide what and what not to present. The groups can decide on what topic of the six-session themes they put special emphasize on, but each topic should have its place during the presentation. The presentation should be from the point of view of a consulting company, which now has to convince its customer of a new technology strategy. For this purpose, on the one hand, the results of the analysis are to be elaborated and communicated. On the other hand, concrete recommendations for action are to be given.

The presentations are held with PowerPoint. You find a pptx-template on RWTHmoodle but you are free to use your own slide design. The submission deadline for the final slide deck is the 30th of January, 2022 at 03:00 p.m. on RWTHmoodle (filename: GroupNumber\_CompanyName.pptx)

After the presentation, each group has to provide feedback to one of its peer groups. The peer groups will be announced with the final group allocation. You will find a feedback template in advance of the presentation day on RWTHmoodle. The feedback must be

uploaded by the 5<sup>th</sup> of February at 3 p.m. on RWTHmoodle (filename: OwnGroupNumber\_PeerGroupNumber.docx).

Finally, the groups will document the analysis in a business report with 5000 +/-500 words (text body excluding title page, TOCs, appendix, and references). The [„TIME - Guideline for scientific working“](#) defines the „Formal guidelines“ (chapter 4) and style of “Quotations and sources/references declarations” (chapter 5). It is up to the students to define a proper structure. Students should explicitly refer to business reports, annual reports (investor information), consultancy reports, and scientific sources. However, you can make assumptions to support your analysis or refine scenarios, but those assumptions must be highlighted. The last page of the report should be a list of each group member’s individual contributions to the project (presentation and report). This list has to be signed by all members. The submission deadline for the final report is the 16<sup>th</sup> of February, 2022 at 03:00 p.m.

The organization and work on this project take place during the semester. We expect that the groups organize themselves independently and take critical strategic decisions as a team. Those decisions have to be well-argued and documented. Nevertheless, we ask you to upload a preparation sheet on which you define your selected company, a set of rules which facilitate your group work, a list of work packages you think are critical to your analysis and a list of important milestones on your way to the presentation and final submission of the report. The groups must upload the preparation sheet by the 9<sup>th</sup> of December, 3 p.m. This sheet will not be graded but should help you to set up your teamwork. Please use the docx.-template provided on RWTHmoodle.

The group allocation will take place on RWTHmoodle. You can select your preferred group via Moodle. The self-registration for the group assignment starts after the introductory session, 08.11.2022, 12 p.m., and ends by 11.11.2022, 3 p.m. The final group composition will be made available on Moodle by the 14<sup>th</sup> of November. If you decide not to participate in this course, deregister and contact Fabian Grimm (grimm@time.rwth-aachen.de) by 11.11.22, 3 pm.

This semester we pay special attention that each group member fulfills his or her duties and contributes to the project. We do not tolerate free riding under any circumstances. Please report to us in case you face problems with free riding. Free riders receive a 5.0. The work should be mastered as a team. Nevertheless, to ensure fair grading, we keep the option of evaluating each group member individually.

On the 17<sup>th</sup> of November from 4 p.m. – 5 p.m., Fabian Grimm will offer a Q&A session to clarify the remaining questions. The zoom link will be shared via RWTHmoodle.

**We hope you will enjoy the course and look forward to working with you!**