

Digital Society

Professor Philipp Sandner, Alexander Loth, Levente Szabados, Gergely Szertics

Introduction

Emerging technologies are driving a significant part of business growth. The capability to understand and adopt these new technologies is going to shape competition and success on a global scale. In this course, we are aiming at providing an overview over the most important new technologies and at shaping your mindsets that will allow you to exploit their potentials.

We are going to focus on the following major areas:

1. Artificial intelligence, machine learning and robotics : technologies that are already available today, and how they give new opportunities to automation, mass-customization and transparency in all industries and corporate functions;
2. Blockchain technology: its potential use - by entrepreneurs & incumbents – to change the world of money, finance and beyond.
3. Data-driven decision making: how and why to collect, analyze and interpret big data with simple tools;
4. Impact on work and society: how emerging technologies are going to shape business, your future work as an executive, and society as a whole.

In the spirit of an EMBA program, the course does not require nor teach any technical knowledge. Instead, it will focus on the core principles of each technology as well as their potential to disrupt existing business models but also to create new eco systems in both business-to-consumers and business-to-business markets. In particular, we will cover what these technologies imply for managers and executives as well as strategy and implementation, and discuss the different ways to adopt them in an organization.

Objective

The objective of the course is that every participant has a good grasp of emerging technologies and their potentials for their own business, and is able to build an implementation roadmap for a specific technology.

Through understanding use-cases, elaborating on a specific big data task, brainstorming on areas of adaptation and elaborating first steps of implementation in specific organization you should have a clear sense of the opportunities these emerging technologies are going to bring to the business.

Learning Outcomes

Knowledge:

On successful completion of this module, students will have a thorough comprehension of major trends in emerging technologies and their relevance in management, i.e. they

- understand the fundamental principles of new, emerging technologies and their role and impact in the modern firm
- possess a good grasp of the basics of AI, robotics and blockchain technology and potential applications
- know about use-cases for these technologies in business in general and in their own organizations in particular
- are familiar with current state-of-the-art approaches and key concepts of applied analytics of big data
- understand how technology trends are going to reshape the labour market on a shorter and longer time scale
- will be able to discuss how technology affects society, ethics and legislation processes and will be aware of the dilemmas we will have to face in these domains

Skills:

On successful completion of this module, students can apply key concepts of emerging technologies to their business environment and work context, i.e. they

- are able to use theory, concepts, and methods to solve real-world key challenges related to emerging technologies
- are able to develop clear and logical arguments to convince others of the value of having a concept for the adoption of emerging technologies
- identify opportunities for using emerging technologies in an organization and assess the threats and benefits of implementing them
- assess how blockchain technology can disrupt companies' business models in multiple industries
- analyze and categorize companies' strategies with respect to emerging technologies
- have a fundamental data literacy and can perform and interpret data analytics tasks
- are able to give educated guess on the effects of the change in the labor market to their HR strategy

Competencies:

On successful completion of this module, students can take responsibility and have leadership competencies in the areas of emerging technologies, i.e. they

- are able to coordinate decisions between team members and moderate in-group discussions
- successfully analyze strengths and weaknesses of enabling technologies
- understand the interdependence between enabling technologies, data analytics, and the future of business and work
- can map real-world situations to possible applications of AI, robotics, and blockchain technology
- can lead change towards data-driven cultures in all functions and hierarchical levels of their organizations
- create business plans around emerging technology implementations, build a rough strategy and roadmap for their organizations, and lead change into their organizations

Content

The course is designed to give you a broad overview of some of the most important "mega"-trends in and driven by technology as well as to challenge you to think about their possible impact on you as a manager, citizen, and (future) leader in business and society.

Artificial intelligence (AI) and robotization are already bringing business impacts and will change business and society. Forrester research forecasts that 70% of companies are going to adapt AI by 2030.

The course gives insight into what AI and machine learning is, and how they are going to change the level of automation, mass customization and business transparency. We are going to introduce the technology behind pattern recognition which was a game changer for the AI industry from around 2010 and which has changed voice, image and language understanding. This way we can introduce how data hungry this technology is, and what this means to practical applications.

Participants will learn how this technology is going to interact with and leverage other emerging trends like the internet of things (IoT), industrial robotics, robotic process automation (RPA), or augmented and virtual realities (AR/VR). Through use cases from all corporate value-chain and support functions, we are going to showcase how these functions (sales, marketing, customer service, manufacturing, R&D) are going to change in the future.

Blockchain is another emerging technology with importance for future business models, digital innovations, and transactions that will be explored and examined in this course. Blockchain, which is the technological underpinning of Bitcoin, has since been discussed as an IT architecture to decentralize trust. In short, the blockchain is an incorruptible distributed ledger for economic transactions that can be programmed to record not just financial transactions but nearly everything of value. Whereas in current markets, intermediaries act as an instance providing trust to enable transactions, blockchain technology allows shifting trust from a central party hosting data and organizing processes to a decentralized network which orchestrates consensus for a joint "truth" of the data held.

Kicking off with a review of blockchain technology's initial application, the cryptocurrency Bitcoin, students will gain an understanding of the commercial, technical and public policy fundamentals of blockchain technology, distributed ledgers and smart contracts in both an open sourced and a private context.

The workshop on **Data Analytics** then allows participants to gain first-hand exposure to this increasingly important application of emerging technologies and to explore its potentials and possibilities in a live setting.

Data Analytics is the science of examining raw data with the purpose of drawing conclusions from that information. It is used in many industries to allow companies and organizations to make better business decisions and in the sciences to verify or disprove existing models or theories. Analytics platforms and machine learning algorithms are not limited to data scientists – increasingly sophisticated business users are driving analytics initiatives to gain competitive advantages.

A “hackathon” workshop explores the most recent trends in the fast growing field of Data Analytics, including what is known as visual analytics, a hands-on approach to interacting with data that does not require any programming skills. It also touches upon the importance of creating an analytics-driven culture that is critical for organizations translating insights into tangible business decisions. Furthermore, we also cover the aspect of communicating with data, which is seen as one of the most relevant skills in today's information age.

The course also addresses the expected future **implications of AI on society**, like the rise of personal assistants, the impact of autonomous vehicles, the debates about ethical issues, consequences for managerial work, and the impact on the job market. We as humans will have to redefine our roles in cooperating with machines that are increasingly smarter in domain-specific tasks than we are. The accelerating rate of change in technologies requires new attitudes in learning, redefines the concepts of jobs and skills needed, and is going to reshape society. We are going to look into ongoing debates about human-level artificial intelligence, when it likely is to be “born”, and what challenges society is going to face with respect to people falling behind, inequalities widening, and social tension possibly increasing.

Last but not least, the course aspires to equip participants with the capabilities to identify and evaluate the **potential impacts of emerging technologies and their business opportunities** for real-world organizations. Therefore, we are going to close the class sessions with a teamwork on identifying technological opportunities for a specific organization and evaluating the possible impact and resources needed to make a business case for investing into a technology project.

Methodology

The course will use a combination of lectures, discussions, teamwork and presentations. Active participation and contribution by the EMBA students are critical ingredients for making it a successful and insightful learning experience.

- Lectures and discussions – presentation of relevant theories, models and frameworks and their implications along with illustrative practical examples.
- Workshop – hands-on exercise about analyzing data and driving business insights by using a real dataset from a real company. Together we jointly examine the relevance and implications for real-world decision situations.
- Group presentations – participants are required to prepare two 5-minute presentations, one on Saturday afternoon and another one for the last day of class. Students will have the chance to present their points of view and argumentation during class.

Preparation

Please make sure to complete the required readings before the course starts, as there will be little to no time during the weekend to catch up on them. Detailed reading instructions are provided in the “Session Plan” below.

Also, go to <http://www.tableau.com/support/esdalt> and **download and install the latest version of Tableau Desktop**. The download comes with a 14 days trial. If you like to use Tableau longer, feel free to register for a free student license at <https://www.tableau.com/academic/students>.

Important: bring your laptop to class. You will need it to work with Tableau and for preparing the in-class pitch competition.

Required Readings (= mandatory)

- Agrawal A., Goldfarb, A. Goldfarb & Gans J. (2018), Prediction Machines: the simple economics of artificial intelligence, HBR Press. Selected chapters only.
- McKinsey Global Institute (2017), Artificial Intelligence: the next digital frontier?, <https://www.mckinsey.com/business-functions/mckinsey-analytics/our-insights/how-artificial-intelligence-can-deliver-real-value-to-companies>
- Schatsky, D. & Muraskin, C. (2015). Beyond bitcoin: Blockchain is coming to disrupt your industry. Deloitte
- Nakamoto, S. (2008). Bitcoin A Peer-to-Peer Electronic Cash System, Working Paper.
- Iansiti, M. & Lakhani, K. R. (2017). The Truth About Blockchain, Harvard Business Review, Jan./Feb.
- Taylor, S. (2015). Blockchain: understanding the potential, Barclays.
- Loth, A. (forthcoming). Visual Analytics with Tableau, Wiley. Pre-publication proofread copy, Chapters 1-3. *Note: you will receive a complimentary copy of the complete book once published (likely January 2019).*
- World Economic Forum (2018): The Future of Jobs Report 2018, “Key findings”, pages vii-ix, only http://www3.weforum.org/docs/WEF_Future_of_Jobs_2018.pdf
- McKinsey Global Institute (2017), Technology, jobs and the future of work <https://www.mckinsey.com/featured-insights/employment-and-growth/technology-jobs-and-the-future-of-work>
- Harari, Y.N. (2018), The myth of freedom <https://www.theguardian.com/books/2018/sep/14/yuval-noah-harari-the-new-threat-to-liberal-democracy>

Additional Reading Suggestions (= voluntary)

- Corea, F. (2018). AI Knowledge Map: How To Classify AI Technologies, Forbes <https://www.forbes.com/sites/cognitiveworld/2018/08/22/ai-knowledge-map-how-to-classify-ai-technologies/>
- Deloitte (2017), The robots are ready, are you? <https://www2.deloitte.com/nl/nl/pages/technology/articles/robotic-process-automation-report-2017.html>
- Workfusion (2016), How Workfusion uses machine learning <https://www.workfusion.com/download-smart-people-smart-machines/>
- Buterin, V. (2017). A Next Generation Smart Contract & Decentralized Application Platform, White Paper.
- Dearborn, J. (2015). Data Driven: How Performance Analytics Delivers Extraordinary Sales Results, Wiley.
- Davenport, T.H. (2006). Competing on Analytics, Harvard Business Review, January.
- McAfee, A. & Brynjolfsson (2012). Big Data: The Management Revolution. Harvard Business Review, October.
- Davenport, T.H. & Bean, R. (2018). Big Companies Are Embracing Analytics, But Most Still Don't Have a Data-Driven Culture, February.
- World Economic Forum: Future of jobs report 2018, http://www3.weforum.org/docs/WEF_Future_of_Jobs_2018.pdf
- Harari, Y.N. (2017), Homo Deus: A Brief History of Tomorrow

Requirements

The maximum credit that you can earn is 50 points. Together with your performance points earned in “Global Economy”, these points will determine your grade in the module “Global Economy & Digital Society” (5 ECTS).

For a balanced and comprehensive assessment of participant learning, these 50 points are distributed as follows across multiple deliverables:

<i>Type</i>	<i>Individual/ Team</i>	<i>Due Date</i>	<i>Points</i>
Class participation	Individual	In class	10
Data analytics & use-case challenges	Team	In class	20
Post-module assignment: your personal “map of opportunities”	Individual	Sunday, December 2, 2018, 23:59h CET	20
Total			50

Class participation: active contributions to the class sessions and in-class activities. One aspect that will be critical to your future success as executive is your ability to critically and constructively discuss about emerging technologies and data analytics. Both quantity and quality of your participation (including constructive questions) will count as long as it brings the class forward.

Data analytics & use-case challenges: you will be split into small teams of 4-5 students and presented with two in-class challenges. Under the supervision and with the support of the lecturers, you will work on these challenges during class time and then present your findings with short 5-minute pitches to the class (given the short pitches, only 1-2 representatives should present on behalf of the entire team). Each challenge will count equally towards your grade.

- *Data analytics challenge:* for the data analytics “hackathon” workshop (Saturday afternoon), participants will be given a small data set and a list of management questions. They will work hands-on with the Tableau analytics software to work with the data set, build interactive analyses, graphically visualize them with the software tools, and arrive at their answers to the posed questions. Each team will then have 5 minutes to present their solution in front of class.
- *Use-case challenge:* in the first session on Friday, participants will be presented with a use-case challenge. This use-case challenge will ask the participants to elaborate a plan/roadmap how emerging technologies could in their opinion be used to improve efficiency or gain new revenues in a specific, constrained sample business setting. Participants can then gather and develop ideas during the remainder of the sessions, before they will be given time (during class time) to synthesize their suggestions in a very short slide deck. In our closing sessions, teams will have 5 minutes each to pitch their presentation with their proposed solution in front of class and to the “board of innovation”. To prepare for this challenge ahead of class, please make sure to consult at least the tables on pages 23-24 of the required reading *McKinsey Global Institute (2017), Artificial Intelligence: the next digital frontier?*

Map of opportunities (post-module): As a follow-up assignment and transfer to practice, participants create for their own organization, department or immediate work environment a map of opportunities that connects emerging technologies with potential business impacts, key implementation steps, and potential cost structure. The map of opportunities should contain at least five specific processes that the organization could benefit from with short, rough estimations on the expected outcome, the financial, human and organizational resources needed to implement the technology, and the potential difficulties and risks of the implementation. More details will be announced in class.

The evaluation and grading will be based on how comprehensive, concrete and realistic your map is with respect to these requirements, in particular the number of ideas, the validity of these ideas (e.g. underpinned with similar use-cases that are available/researched), and the thoroughness of the thinking about potential difficulties of implementation.

SESSION PLAN

Friday, November 23, 2018

Levente Szabados & Gergely Szertics

13:30 – 15:00 **Theme:** Introduction & presentation of the “use case” challenge

Topics: key concepts of emerging technologies (robotics, IoT, data science, machine learning, AI, blockchain) and their interrelations, human cognition vs machine cognition vs organizational information processing, concept of an organizational opportunity map

Readings:

- Agrawal A., Goldfarb, A. Goldfarb & Gans J. (2018), Chapters 1-2
- McKinsey Global Institute (2017), Artificial Intelligence: the next digital frontier, pages 1-20

15:15 – 16:45 **Theme:** Artificial Intelligence

Topics: machine learning use-cases in industries and functions, insights from 500 use-cases, examples of predictions and recommendations in business

Readings:

- Agrawal A., Goldfarb, A. Goldfarb & Gans J. (2018), Chapters 3-4
- McKinsey Global Institute (2017), Artificial Intelligence: the next digital frontier, pages 20-80

17:00 – 18:30 **Theme:** Robotics and automation

Topics: Robotic process automation, embodied robotics, optimal process control (e.g. self-driving vehicles, optimized production processes)

Readings (voluntary):

- Deloitte (2017), The robots are ready, are you?
<https://www2.deloitte.com/nl/nl/pages/technology/articles/robotic-process-automation-report-2017.html>
- Workfusion (2016), How Workfusion uses machine learning
<https://www.workfusion.com/download-smart-people-smart-machines/>

After hours

19:00 – 20:30 **Presentation:** „Battle of the (fake) news: Saving journalism in the digital age – and what managers can learn from it”

Dr Alexandra Borchardt
Director of Leadership Programmes
Reuters Institute for the Study of Journalism
University of Oxford

20:30 – 22:00 **Social event:** drinks, snacks & networking

Saturday, November 24, 2018*Prof. Philipp Sandner*

09:15 – 10:45 **Theme:** Blockchain (Part 1) – Introduction & Fundamentals of Blockchain Technology

Topics: blockchain technology's initial applications, cryptocurrency Bitcoin

Readings:

- Nakamoto, S. (2008). Bitcoin A Peer-to-Peer Electronic Cash System, Working Paper.
- Schatsky, D. & Muraskin, C. (2015). Beyond bitcoin: Blockchain is coming to disrupt your industry. Deloitte

11:00 – 12:30 **Theme:** Blockchain (Part 2) – Applications and use cases of Blockchain Technology in Energy, Industry and Finance

Topics: commercial, technical and public policy fundamentals, distributed ledgers, smart contracts

Readings:

- Taylor, S. (2015). Blockchain: understanding the potential, Barclays.
- Iansiti, M. & Lakhani, K. R. (2017). The Truth About Blockchain, Harvard Business Review, Jan./Feb.

12:30 – 13:30 Lunch break

Alexander Loth

13:30 – 15:00 **Theme:** Data-driven decisions: data analytics workshop (Part 1)

Topics: introduction to data analytics, "Tableau" crash course, workshop

Reading:

- Loth, A. (forthcoming). Visual Analytics with Tableau, Chapters 1-3.

15:15 – **17:30** **Theme:** Data-driven decisions: data analytics workshop (Part 2)

Topics: workshop (continued), results presentations, wrap-up.

Reading: --

Important note:

Due to the workshop character of this afternoon, there is a possibility that class may stretch a bit beyond the regular class time. However, we should be finished by **17:30h** the latest. Details to be agreed in class.

Sunday, November 25, 2018*Levente Szabados & Gergely Szertics*

09:15 – 10:45 **Theme:** The impact of emerging technologies – Executive work

Topics: human capital, workforce efficiency, workforce upskilling, structural skills gap: capability of cooperating with technology (specializing on decision making), capability of building technology, business model disruption

Readings:

- Agrawal A., Goldfarb, A. Goldfarb & Gans J. (2018), Chapters 6, 14 and 15
- McKinsey Global Institute (2017), Technology, jobs and the future of work
<https://www.mckinsey.com/featured-insights/employment-and-growth/technology-jobs-and-the-future-of-work>
- World Economic Forum (2018): The Future of Jobs Report 2018, “Key findings”, pages vii-ix, only, http://www3.weforum.org/docs/WEF_Future_of_Jobs_2018.pdf

11:00 – 12:30 **Theme:** The impact of emerging technologies – Society

Topics: skills pressure, widening capability gap in society, utopias (freeing people from menial work) and dystopias (rise of Luddites, surveillance state), mass predictability: redefining the value of freedom

Readings:

- Agrawal A., Goldfarb, A. Goldfarb & Gans J. (2018), Chapter 19
- Harari, Y. N. (2018), The myth of freedom

12:30 – 13:30 Lunch break

13:30 – 15:00 **Theme:** Pitch sessions – team preparations

Topics: organizational opportunity map, ideation, development and presentation of use-cases.

Reading: McKinsey Global Institute (2017), Artificial Intelligence: the next digital frontier.

15:15 – 16:45 **Theme:** Live pitches (5 mins each), wrap up & introduction to the post-module assignment

Reading: --

Faculty



Prof. Dr. Philipp Sandner is head of the Frankfurt School Blockchain Center at the Frankfurt School of Finance & Management. The expertise of Prof. Sandner in particular includes blockchain technology, crypto currencies, digital transformation and entrepreneurship. He advises companies concerning their blockchain activities, e.g. the first European crypto fund or the Korean blockchain startup HYCON. Prof. Sandner is a member of the FinTechRat of the Federal Ministry of Finance and, additionally, founding member of the German Blockchain Association e.V. and the Multichain Asset Managers Association.

Before joining Frankfurt School, he co-founded a consulting company specialized in the area of innovation strategy IP and technology transfer. He has been research fellow at the Technical University Munich, the Ludwig-Maximilians-University Munich and the Berkeley Center for Law & Technology. Previous to that, he studied business administration focusing on computer science at the University Mannheim.

Born in 1980. From 2000 to 2005, studies of business administration at Mannheim University and Copenhagen Business School. From 2005 to 2009, lecturer at the Institute for Innovation Research, Technology Management and Entrepreneurship at the Ludwig-Maximilians-University Munich. In 2008, visiting research fellow at the Berkeley Center for Law & Technology at the University of California at Berkeley. In 2008, Master of Business Research and, in 2009, doctoral degree (Dr. oec. publ.) at the Munich School of Management at the Ludwig-Maximilians-University Munich on "The Valuation of Intangible Assets". From 2010 to 2012, lecturer at the Chair of Strategy and Organization at the Technical University Munich. From 2010 to 2015, co-founder and partner of Munich Innovation Group, a consulting company specialized in the area of innovation strategy, IP and technology transfer.

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Alexander Loth is Digital Strategist at Tableau Software and alumnus of our very own Executive MBA program.

He has 10+ years of experience in the Enterprise software space, focused primarily on Digital Transformation, Data Science, and Business Analytics. He guides organizations to evolve their analytics-driven culture. Prior to Tableau, Alexander was Data Scientist at CERN and worked as consultant for Capgemini and in software engineering at SAP.

Recently, brandwatch.com named him one of the twenty most influential twitter authors on the topic of digital transformation in Germany, see

<https://www.brandwatch.com/de/2017/11/einflussreiche-twitter-autoren-rund-um-das-thema-digitale-transformation/> (article in German). An English edition of his recent book "Datenvisualisierung mit Tableau" (mitp, 2018) will soon be published by Wiley. Every Executive MBA student will receive a complimentary copy of this book once it is available, which is a matter of weeks.

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Gergely Szertics is heading AI Partners, a consulting firm specializing in helping companies live with the business potentials artificial intelligence brings.

He leads AI implementations and business transformations for Hungarian and German companies. He is the driver of the initiative to create a world map of AI providers and use-cases to show that artificial intelligence already brings business value. He is a guest lecturer in several universities and executive education programs teaching tech implementation, organisational theory and organisational development.

Prior to AI Partners, Gergely founded and was CEO of a start-up that developed a natural-language-processing-based knowledge management system. He won several start-up competitions with the company and lead it through several investment rounds.

He earned an economist degree from Budapest Corvinus University and has 10+ years of experience in organisational development especially in large group techniques and positive psychology based techniques (Appreciative Inquiry, Open Space, Solution focused coaching, World Café).

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Levente Szabados, originally a programmer as well as Buddhist theologian (MA), has a background in cognitive science, Data Science Specialization, from Johns Hopkins Bloomberg School of Public Health.

He has 10+ years of experience in leading research and development efforts in various fields of AI as lead of research as well as CTO for multiple startup companies, winning the “Get in the Ring” and “Central European Startup Awards – Hungary” in 2015 and 2016.

He is well versed in classical knowledge-based expert systems as well as the cutting-edge techniques of Deep Learning. His primary area of expertise is time series prediction and Natural Language Processing.

He also acts as a motivational public speaker with the ability to engage and inform large audiences on complex topics and encourage innovation based on his experience in developing and implementing effective AI systems and procedures.

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