VT „Managing Data-Driven Business Models (MD²B)“	
Code: XXXX	
Lecturers Prof. Dr. Frank Danzinger Prof. Dr. Jianing Zhang Associated Lecturer(s)	**Module Coordinator** Prof. Dr. Frank Danzinger Prof. Dr. Jianing Zhang

Intended Learning Outcomes

The digitization of business models is advancing relentlessly. Still driven by the original internet technologies (social, mobile, analytics and cloud technologies [SMAC]), new transformative digital technology drivers are constantly emerging (e.g., IoT, blockchain, robotics). They all that have one thing in common: The amount of data available (datasphere) is growing exponentially. As a result, established business models have to change (digital transformation) and new, data-driven business models arise. In this business environment, the integrated management of digital technologies, resulting data and digital business models becomes a core competency for business students.

The structure of the specialization "Management Data-Driven Business Models (MD²B)" is based on the CRISP-DM model, an open, cross-industry standard (Shearer 2000). Module 1 develops competencies in the context of business and data understanding, which includes a deep understanding of digital technologies. Module 2 and Module 3 tackle data science related aspects of data driven business. Focusing on the fundamentals of Machine Learning and Artificial Intelligence, the solid command of foundational models and algorithms are complemented by core skills in programming. Module 4 aims at competencies in the areas of business evaluation and implementation and thus includes central issues of the development and management of digital business models.

Overall, the MD²B specialization specifically prepares students to design management and development tasks in the context of data-based projects and digital business models and for use in different roles and business sectors.

Module 1: Digital Technologies and Data for Digital Business Models

Students gain a solid knowledge of the theoretical foundations of digital value creation and data-driven business models. In addition, they can accurately place their new knowledge in the context of the IoT-Data-Chain and the CRISP DM cycle. They are able to recognize the significance and fundamental mechanisms of transformative technologies (e.g., IoT, Blockchain, 3D printing) and data-science based processes (AI/AI, ML). Moreover, they can describe and assess through the use of appropriate tools the impacts on customer behavior, business models and ecosystems. In sum, the module will enable students to understand and design important steps of the first CRISP phase "Business Understanding".

Module 2: Machine Learning and Artificial Intelligence: Basic Concepts

Students understand the technological foundations and concepts underlying the collective term Artificial Intelligence. They have the competence to cast real world problems into the cohorts of supervised and unsupervised learning. Students understand the key technological concepts and importance of database design and high performance computing. Students know how to launch the deployment of AI models.

Module 3: Applied Data Science: Machine Learning, AI and use cases
Students are able to master pivotal methods and algorithms from Machine Learning (ML). They have solid ground rock knowledge in the Mathematical and Statistical key concepts underlying ML. Students have the competence to translate daten-driven challenges into ML models and solve them with the use of adequate algorithms and software. Students are able to handle data in a fast and robust way, they can calibrate different models and algorithms to the data, compare and interpret the results and choose the most adequate solution.

Module 4: Implementing and Managing Data-Driven Business Models
Students acquire a sound knowledge base for the implementation and management of data-driven business models. They understand data-driven value creation in the context of interactive, service-oriented value creation and in light of changing customer requirements. Students learn core development methods and practice the use of associated tools. Particular emphasis is placed on the management concepts of hypothesis-driven development, digital maturity, servitization, digital ecosystems and potential digitization paths. Overall, the module enables students to understand and design important steps of the CRISP phases "Business Evaluation" and "Implementation".

Additionally students train their skills in team work as well as preparing and presenting communication topics in front of the audience.

Content
Courses in the Lecture

- Module 1: Digital Technologies and Data for Digital Business
- Module 2: Machine Learning and Artificial Intelligence: basic concepts
- Module 3: Applied Data Science: Machine Learning, AI and use cases
- Module 4: Implementing and Managing Data-Driven Business Models

Detailed Description of Course content
Module 1: Digital Technologies and Data for Digital Business

- CRISP-DM-Cycle and IoT-Data-Chain
- Business models as a description language
- Patterns of digital business models
- Digital Technologies for smart products and data-driven business models
- Selected Tools for Business Understanding

Module 2: Machine Learning and Artificial Intelligence: basic concepts

- Key technological concepts for AI and data
- Supervised and Unsupervised Learning
- Database design and High Performance Computing (HPC)
- (Cloud) Deployment and model improvement
- Managing Data Science and AI teams

Module 3: Applied Data Science: Machine Learning, AI and use cases

- Recapitulation of Mathematical and Statistical foundations
- Rehash of Business Statistics
- Introduction to Machine Learning

- Regression models and error measurements
- Logistic and multinomial regression, k-Nearest-Neighbors
- Confusion matrix, ROC/AUC
- Bayesian Statistics and Naïve Bayes
- Programming in R and/or Python

Module 4: Implementing and Managing Data-Driven Business Models

- Digital Maturity and Barriers to digital and data-driven business models
- Service Dominant Logic, servitization and interactive value creation
- Digital Development paths and industry 4.0
- Data-driven development of digital business models

Teaching & Learning Methods

- Interactive lecture
- Presentations by students
- Real life cases
- Exercises
- Guest lectures and/or study trip

Media

Presentation with projector, flipchart, whiteboard, zoom-sessions etc.

Relation / Interface to other Modules

Additional Information

- Module 1 and Module 4 are offered in one lecture slot (4x45 min.). The course units 1 to 6 deal with the topics of module 1, the course units 7-12 deal with the topics of module 4. The semester project/exam for module 1 is completed in the middle of the semester. The semester project/exam for module 4 has to be provided at the end of the semester.
- Module 2 and Module 3 build upon each other and are therefore offered in a sequential order during semester. Exercises and programming sessions will be integrated into the lectures.

Literature

Module 1: Digital Technologies and Data for Digital Business

- Gassmann, O.; Sutter, P. (2019): Digitale Transformation gestalten. Hanser. München.
- Kosner, A. W. (2015): Google Cabs And Uber Bots Will Challenge Jobs 'Below the API'. Forbes.
- Ponsard, Christophe; Touzani, Mounir; Majchrowski Annick (2017): Combining Process Guidance and Industrial Feedback for Successfully Deploying Big Data Projects. In: Open Journal of Big Data (OJBD) 3 (1), S. 26–41.
- Porter, M. E.; Heppelmann, J. E. (2014): The Internet of Everything. Spotlight on Managing the Internet of Things. In: Harvard Business Review, November 2014, S. 1–23.
- Rogers, David L. (2017): Digitale Transformation. Das Playbook. Wie Sie Ihr Unternehmen erfolgreich in das digitale Zeitalter führen und die digitale Disruption meistern. MITP.
- Shearer, C. (2000): "The CRISP-DM Model: The New Blueprint for Data Mining," Journal of Data Warehousing, vol. 5 (4).
- Teece, D. J. (2010): Business Models, Business Strategy and Innovation. In: Long Range Planning 43 (2-3).
- Presentations by lecturers

Module 2: Machine Learning and Artificial Intelligence: basic concepts

- Brown, R.D. (2018). Business Cases Analysis with R. 1st ed. Berkeley, Apress.
- Hull, J. C. (2020). Machine learning in business an introduction to the world of data science. 2nd Edition, Toronto, Independently published.
- Milani, F. (2019). Digital Business Analysis. 1st ed. Springer, Cham.
- Otola, I., Grabowska, M. (2020). Business Models: Innovation, Digital Transformation, and Analytics. Boca Raton: CRC Press.
- Presentations by lecturer

Module 3: Applied Data Science: Machine Learning, AI and use cases

- Bamberg, G., Baur, F., Krapp, M. (2011). Statistik. 16. Aufl. München: Oldenbourg Verlag.
- Crawley, M.J. (2012). The R Book. 2. Aufl. Wiley.
- Hull, J. C. (2020). Machine learning in business an introduction to the world of data science. 2nd Edition, Toronto, Independently published.
- James, G., Witten, D., Hastie, T., Tibshirani, R. (2013). An Introduction to Statistical Learning: with Applications in R. New York, Springer.
- Ligges, U. (2004). Programmieren mit R. New York, Springer.
- Wickham, H., Grolemund, G. (2016). R for Data Science. 1st Edition, O'Reilly UK Ltd.
- Xie, Y. (2015). Dynamic Documents with R and Knitr. 2nd Revised Edition. Chapman & Hall/CRC: the R Series.
- Presentations by lecturer

Module 4: Digital Technologies and Data for Digital Business

- Baines, T. S.; Lightfoot, H. W.; Evans, S.; Neely, A.; Greenough, R.; Peppard, J. et al. (2007): State-of-the-art in product-service systems. In: Proceedings of the Institution of Mechanical Engineers: Journal of Engineering Manufacture 221 (10), S. 1543–1552.
- Gassmann, O.; Sutter, P. (2019): Digitale Transformation gestalten. Hanser. München.
- Klötzer, C., Pflaum, A. (2015): Cyber-Physical Systems (CPS) in Supply Chain Management: A definitional approach.
- Krause, S.; Pellens, B. (2018): Betriebswirtschaftliche Implikationen der digitalen Transformation. Wiesbaden: Springer Gabler.
- Lusch, R.; Vargo, S. (2016): Service-dominant logic. Reactions, reflections and refinements. In: Marketing Theory 6 (3), S. 281–288.
- Neely, A. (2011): Exploring the service paradox: How servitization impacts performance of manufacturers.
- Piller, F. T.; Möslein, K.; Ihl, C. C.; Reichwald, R. (2017): Interaktive Wertschöpfung kompakt. Open Innovation, Individualisierung und neue Formen der Arbeitsteilung. Wiesbaden: Springer Gabler.
- Ries, E. (2011): The Lean Startup. Penguin Group. London.
- Verhoef, P. C.; Broekhuizen, T.; Bart, Y.; Bhattacharya, A.; Qi D., J.; Fabian, N.; Haenlein, M. (2019): Digital transformation. A multidisciplinary reflection and research agenda. In: Journal of Business Research.
- Presentations by lecturer

Organisation

<table>
<tr><td>ECTS-Credits
12</td><td>SWS
8</td><td>Language
English</td></tr>
<tr><td>Type of module
Study Focus</td><td>Turn
Summer Semester</td><td>Duration
1 Semester</td></tr>
<tr><td colspan="3">Studyphase:
3rd Year, 5th till 7th Semester</td></tr>
<tr><td colspan="3">Prerequisite for participation in the Module
§6 study and examination regulations
no passed courses as prerequisite
Recommended Preparation / Reading
General interest in and openness for digital technology, data applications and their prerequisites, willingness to learn and practice programming, sound understanding of fundamental mathematical and statistical concepts.</td></tr>
<tr><td colspan="3">Workload
12 ECTS- x 30 hours: 360 hours,
combined out of:</td></tr>
<tr><td>Course Attendance

120 hours</td><td>Preparation / Homework / Self-study

120 hours</td><td>Time for Exercises and Group Work

20</td></tr>
<tr><td>Semester Project / Presentation Preparation

80 hours</td><td>Exam Preparation

20 hours</td><td>Exam Time

60 minutes</td></tr>
<tr><td colspan="3">Prerequirement for Exam
Final mark as a result of four single marks
Attendance, at most 3 „sick days“</td></tr>
<tr><td colspan="2">Type of Exam
Presentation, term paper, data science project, written exam</td><td>Weighting of Final Grade
Each module equally weighted with 25%</td></tr>
</table>