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Explain 

OMiLAB Training Module 7

Educational And Scientific Exploitation

Learning Goals

- Understand the importance of the OMiLAB topics in Higher Education Institutions (HEI)
- Learn how to exploit the OMiLAB
  - In Education
    - Through the description of potential courses
    - Through the presentation of potential theses structures
  - In Research
    - By positioning OMiLAB-related research in the broader context of Design Science Research, Agile Modelling Method Engineering, and Cyber-physical Systems

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- The aim of this course is to show the exploitation possibilities offered by the OMiLAB
- Exploitation will be showcased primarily in two areas
  - Lecturing
    - Courses
    - Theses
  - Research

ARE OMiLAB TOPICS RELEVANT FOR HEI EDUCATION?

Are OMiLAB Topics Relevant for HEI Education?

- Recommendations for Higher Education Institution study programs
  - Jung, R., and C. Lehrer. "Guidelines for Education in Business and Information Systems Engineering at Tertiary Institutions." Business & Information Systems Engineering 59.3 (2017): 189-203.
  - Topi, H. et al. (2017) "MSIS 2016 Global Competency Model for Graduate Degree Programs in Information Systems," Communications of the Association for Information Systems: Vol. 40 , Article 18.
  - Lunt, Barry M., et al. "Curriculum guidelines for undergraduate degree programs in information technology." Retrieved March 2 (2008): 2009.
- Industrial studies on knowledge profile demands from industry
  - Germany's digital association (BITKOM) studies
- EU-funded research projects

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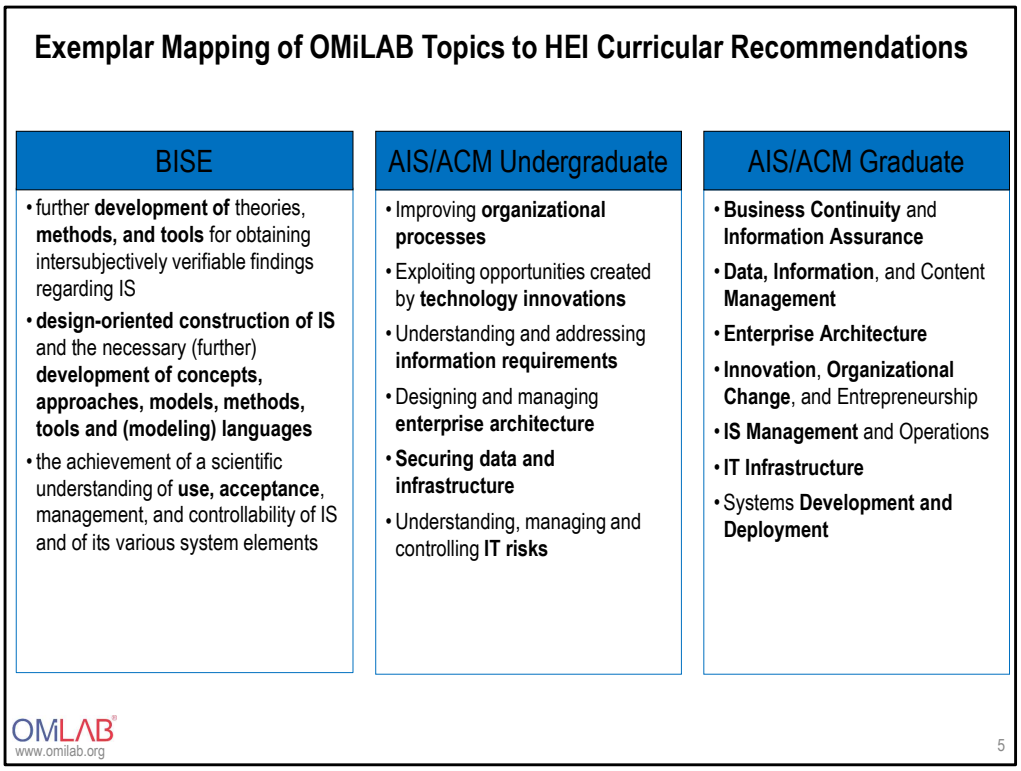
- Here is a list of scientific literature and sources that confirm the relevance of conceptual modelling in particular and OMiLAB topics in general for Higher Education institutions



- On this slide, three concrete examples are given, for each, fitness to the OMiLAB topics is highlighted in bold font
- BISE : Business and Information Systems Engineering, http://bise-journal.com/
- AIS: Association for Information Systems, http://aisel.aisnet.org

HOW CAN THE OMiLAB FACILITATE HEI COURSES?

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Potential for HEI Courses related to the OMiLAB

- The OMiLAB brings lots of opportunities of involvement in HEI courses
- Resources of the OMiLAB can be used, e.g.,
  - Bee-Up for conceptual modelling
  - Scene2Model tool for business model innovation
  - ADOxx platform for metamodelling
  - Cyber-physical elements like mBot and Dobot for robotics and Robotic-Process Automation
- Moreover, the topics covered in the OMiLAB can be used in research-oriented courses like Seminars on Master level
  - Domain-specific Conceptual Modelling
  - How to design a new modelling method
  - Metamodelling platform comparison
  - Evaluation techniques for conceptual modelling research

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- This slide emphasizes the heterogeneity of topics that are covered in the OMiLAB
- OMiLAB resources can help in both, teaching and research (which will be exemplified in the following)

Structure for Describing OMiLAB-related Courses

Name	The name of the course
Study level	The study level the course is aimed for, i.e., Bachelor, Master, PhD
Lecturing format	The format in which the course is being taught, i.e., as a lecture, as a seminar, as a practical lecture, or as a mix of aforementioned.
Group size	Any restrictions on group size, if applicable.
Course Goals	What are the goals of this course?
Competences	Which competences shall be established by participants of this course.
OMiLAB Resources	Which OMiLAB resources are used in this course.
Key References	A list of key references for this course and/or further reading material.

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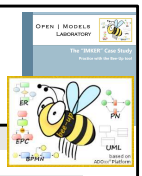
- This slide shows the blueprint for describing the following courses
- It explains all used criteria

OMiLAB Course: Fundamentals of Conceptual Modelling



Name	**Fundamentals of Conceptual Modelling**
Study level	Bachelor level
Lecturing format	This course can be taught primarily using frontal lecturing, although some aspects need to be practiced by the students in order to gain also practical modelling experience.
Group size	No restrictions on group size apply.
Course Goals	The aim of this course is to introduce students to the fundamentals of conceptual modelling. Students shall gain insights into the scientific and conceptual foundations the conceptual modelling discipline builds upon. A comparison of modelling tools and drawing tools as well as between general-purpose and domain-specific modelling languages shall establish a fundament where further, more specialized modelling courses can rely on. Students shall not be theoretically introduced to some of the most important information systems modelling standards like ER, UML, and BPMN, but shall also practically exercise with those languages using appropriate tooling.
Competences	• Understanding the fundamentals of conceptual modelling • Awareness of standardized modelling languages like ER, UML, and BPMN • Ability to compare different modelling languages based on their purpose • Ability to create valid models of different standard modelling languages
OMiLAB Resources	• Bee-Up modelling tool, http://omilab.org/bee-up • IMKER Case Study http://vienna.omilab.org/repo/files/Bee-Up/The_IMKER_Case_Study.pdf
Key References	• Karagiannis, D., Buchmann, R. A., Burzynski, P., Reimer, U., Walch, M. (2016). Fundamental conceptual modeling languages in OMiLAB. In Domain-Specific Conceptual Modeling (pp. 3-30). Springer, Cham.

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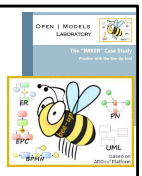
- This slide describes the Fundamentals of Conceptual Modelling course
- The course heavily uses the Bee-Up tool
- The freely available IMKER case study can also be a meaningful support for conductors

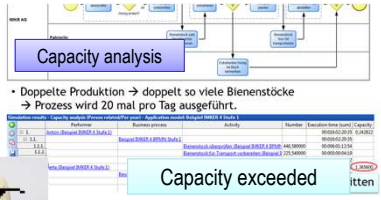
Bee-Up for Fundamentals of Conceptual Modelling - 1



- Bee-Up:
  - Enables modelling in several commonly used languages with one tool only.
  - Provides language-specific mechanisms and language-independent mechanisms by exploiting the different layers of abstraction.

[source: Fundamental Conceptual Modeling Languages in OMiLAB]

- Bee-Up can be used in the Fundamentals of Conceptual Modelling course:
  - … where the students have to learn several modelling languages …
  - … where the students nee to understand that having models provides value.



- and of course:
  - Proof of Concept
  - Cool experiments

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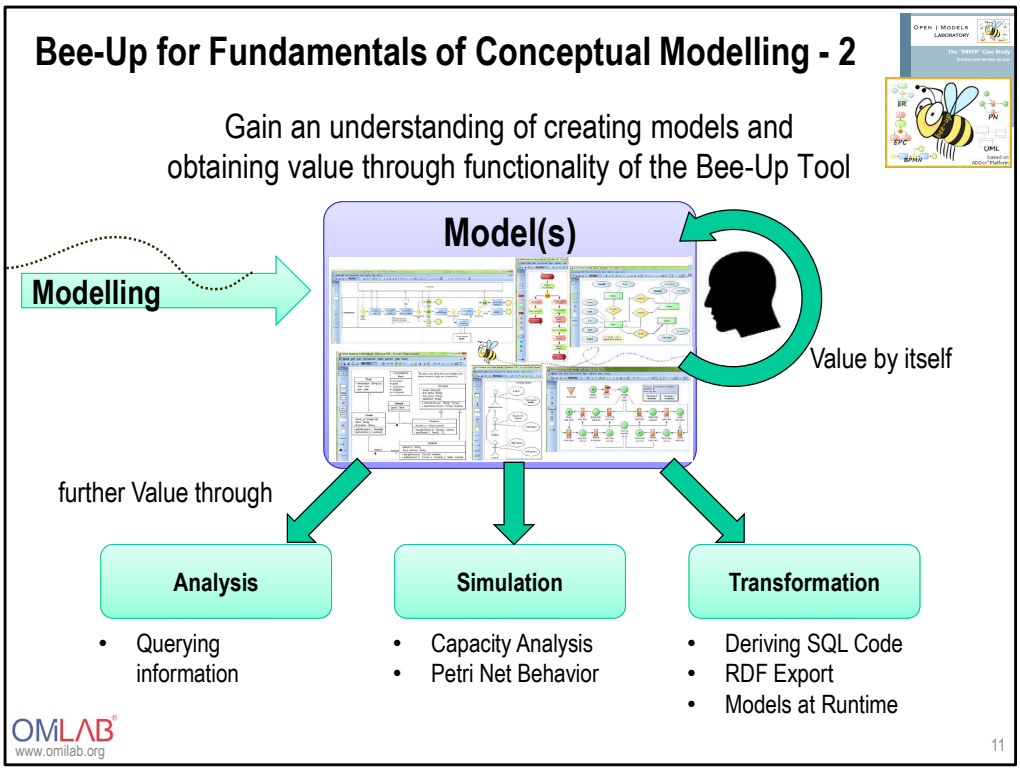
- This slide motivates the use of Bee-Up by explaining the rational for its development
- Bee-Up comprises multiple standard conceptual modelling languages like BPMN, EPC etc..
- Bee-Up further comes with nice functionality that enables the conduction of nice experiments e.g., with physical objects of the OMiLAB



- This slide aims to visualize the power of Bee-Up
  - On top, screenshots show an excerpt of the included modelling languages
  - On the bottom, further model value can be created by using the mechanisms & algorithms of Bee-Up

OMiLAB Course: Domain-specific Conceptual Modelling

Name	**Domain-specific Conceptual Modelling**
Study level	primarily Master level
Lecturing format	Seminar
Group size	The group size should be rather small, i.e., not huge groups with more than 30 students.
Course Goals	The aim of this course is to introduce students to several domain-specific modeling methods for information systems and to apply the associated Tool to case studies. By studying and presenting one of the chapters from the book 'Domain-Specific Conceptual Modeling' the students shall gain insights into scientific work reaching from abstract conceptual analysis to concrete implementation and evaluation of modeling methods and tools. Furthermore, students get an overview over the variety of application fields by the presentations of their colleagues.
Competences	• Understanding of domain-specific conceptual modelling • Ability to compare different DSMLs and corresponding tools • Ability to ideate a potential new DSML • Ability to conduct modelling case studies • Knowledge about the resources and possibilities of realizing such a DSML within OMiLAB
OMiLAB Resources	• DSML Seminar Concept • Modelling tools on https://austria.omilab.org/psm/tools
Key References	• Karagiannis, D., Mayr, H. C., & Mylopoulos, J. (2016). Domain-specific conceptual modeling. Springer International Publishing.

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- This slide describes the Domain-specific Conceptual Modelling seminar course
- The course heavily uses the OMiLAB book and the corresponding modelling tools

OMiLAB tools and OMiLAB book for Domain-specific Conceptual Modelling course

- How could a course be structured by facilitating the OMiLAB book and OMiLAB tools?

1. Initialization

- Provide general introduction to domain-specific conceptual modelling
- Provide guidelines for case study
- Distribute the 25 chapters of the OMiLAB book amongst all students

2. Case Study

- Students or student groups download the openly available modelling tool through OMiLAB and conduct the case study

3. Report

- Students or student groups prepare a report on their case study including the exported models they created
- Students perform a SWOT analysis to reflect about the DSML and the tool they worked with

4. Discussion

- In a plenary session, students or student groups present their case study and their findings including the SWOT analysis
- All students gain a broad understanding of divers DSMLs and their respective strengths

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- This slide shows in detail a possible structure for conducting the course

OMiLAB Course: Business Model Innovation

Name	**Business Model Innovation**
Study level	Bachelor and Master level
Lecturing format	Seminar
Group size	The group size should be rather small, i.e., not huge groups with more than 30 students.
Course Goals	The aim of this course is to introduce students to several design thinking techniques that can be used to question existing and/or innovate new business models. Students shall understand the methods and tools and be enabled to compare them. Using case studies, students can practically exercise with different design thinking techniques to broaden their knowledge. A further goal of this course shall be digitized business models, i.e., how conceptual modelling can contribute in digitizing and further processing of business models.
Competences	• Understanding of business models • Understanding of design thinking techniques and procedures • Ability to compare different design thinking techniques • Ability to ideate a potential new business model by applying a specific technique • Knowledge about the possibilities to digitize design thinking outcomes
OMiLAB Resources	• Scene2Model modelling tool, https://austria.omilab.org/psm/content/scene2model/
Key References	• Miron, E.T., Muck C., Karagiannis D. (2019): Transforming Haptic Storyboards into Diagrammatic Models: The Scene2Model Tool. HICSS 2019: 1-10 • Miron, E.T., Muck C., Karagiannis D., Götzinger D. (2018): Transforming storyboards into diagrammatic models to appear in the LNBIP-Proceedings of the 10th International Conference on the Theory and Application of Diagrams, June 2018, Edinburgh

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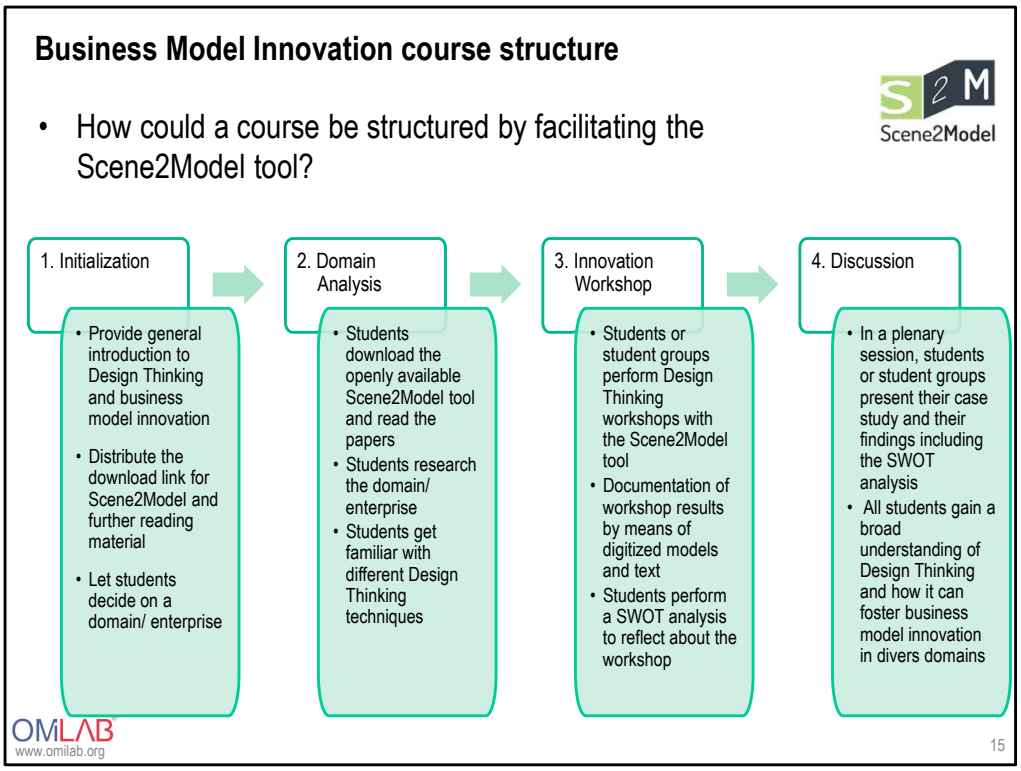
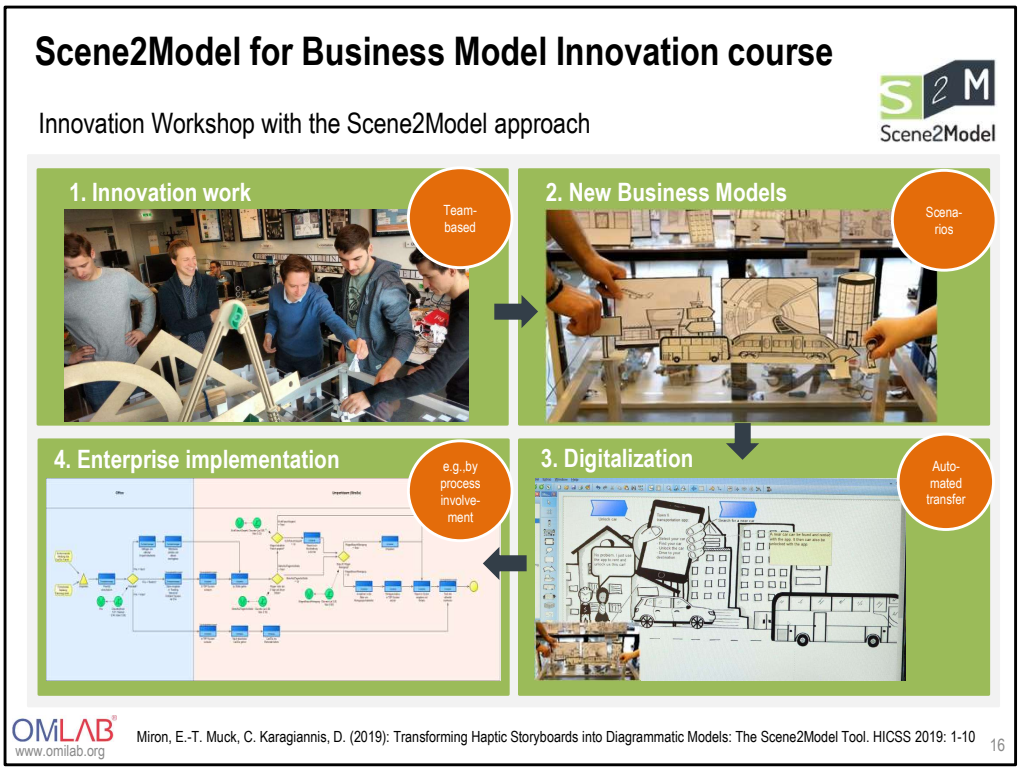
- This slide describes the Business Model Innovation course
- The course heavily uses the Scene2Model tool and innovation workshop approach



- This slide shows in detail a possible structure for conducting the course
- An important pillar of the course will be the innovation workshops which can be conducted
    - Course-internally, i.e., when only students participate, or
    - Externally, by involving also practice partners or enterprises that are interested in being involved in such a workshop



- Emphasize the role and the added value of conceptual modeling in design thinking
  - Digitizing the design thinking artefact
  - Enabling further enrichement of the design thinking artefact
  - Enabling computerized processing of the design thinking artefact
    - Compared to the status-quo where pictures are made which cannot be further processed

OMiLAB Course: Semantic Technologies

Name	**Semantic Technologies**
Study level	Master level
Lecturing format	This course requires a mix of theoretical lectures and practical exercise sessions.
Group size	The theoretical lectures can be conducted with any group size, however, as for the practical exercises a separation into groups of at most 30 students is meaningful.
Course Goals	In this course a model-based approach is employed to conceptualize, implement, and deploy semantic information systems. Thereby, individuals or teams develop semantic information systems while exploring the potential of "smart" models. To deepen theoretical foundations, practical experiments are conducted. In the context of the experiment a semantic information system shall be implemented, and a report shall be written.
Competences	• Design semantic technology applications • Conceptualize and implement scenarios that benefit from semantic technologies • Develop and implement semantic based prototypes
OMiLAB Resources	• s*IoT modelling tool, https://austria.omilab.org/psm/content/siot • Available CPS scenarios: https://austria.omilab.org/psm/omirob
Key References	• Walch, M. (2017): Knowledge-driven enrichment of cyber-physical systems for industrial applications using the KbR modelling approach. In: Agents, IEEE International Conference on, ICA 2017, Beijing, China, July 6-9, 2017, Proceedings. S. 84-89 • Karagiannis, D. & Walch, M. (2017): Service-Driven Enrichment for KbR in the OMiLAB Environment. In: Serviceology for Services - 5th International Conference on, ICServ 2017, Vienna, Austria, July 12-14, 2017, Proceedings. S. 164-177

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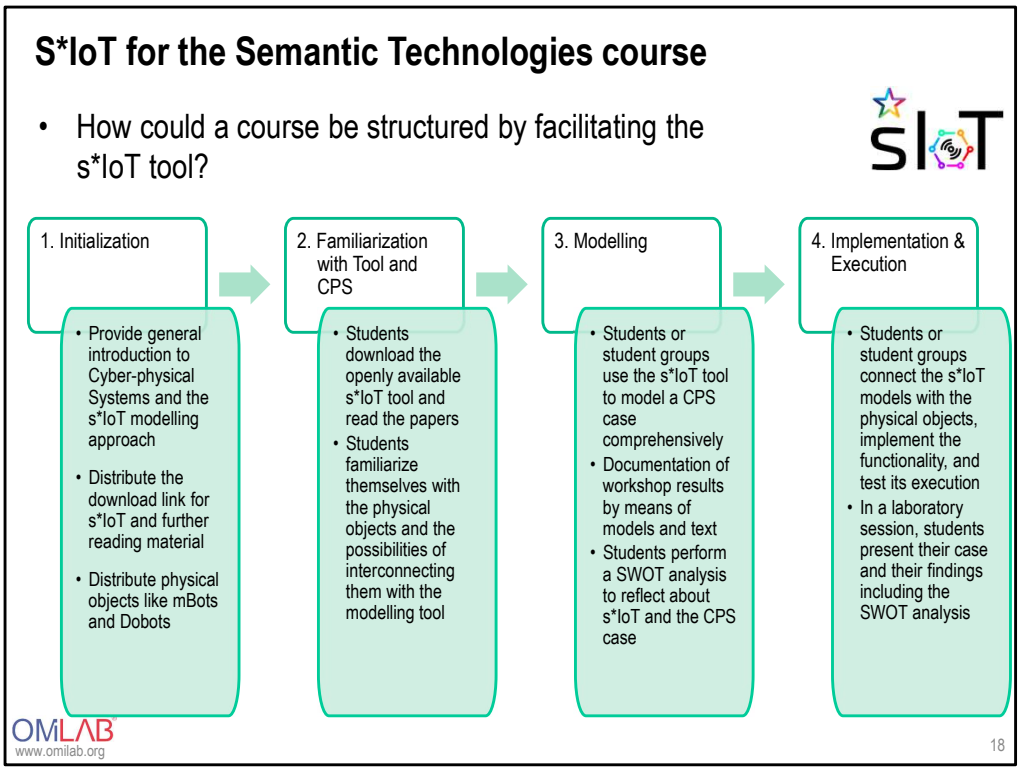
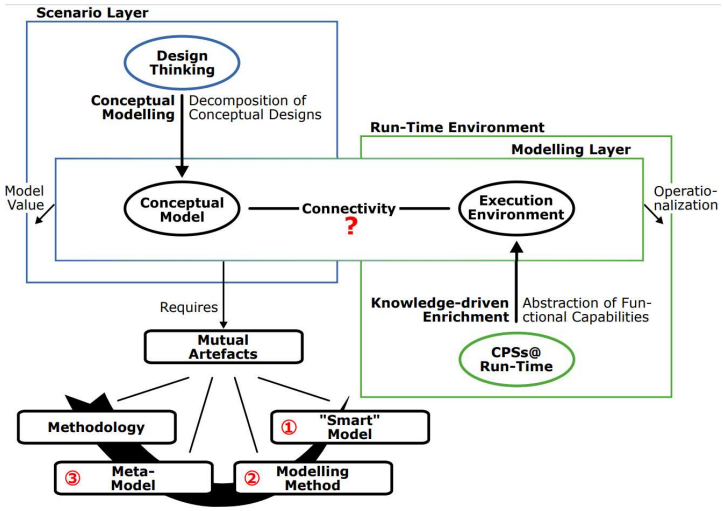
- This slide describes the Semantic Technologies course
- The course heavily uses the s*IoT tool
- The freely available implementations of further CPS scenarios is also very helpful



- This slide shows in detail a possible structure for conducting the course

S*IoT for the Semantic Technologies course

- Connecting the s*IoT models with the physical objects



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Walch, M., Karagiannis, D. (2019). How to connect design thinking and cyber-physical systems: the s* IoT conceptual modelling approach. In Proceedings of the 52nd Hawaii International Conference on System Sciences.

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- Important is the implementation of the connection between the modelling layer and the execution layer
    - Here interfaces and protocols play an important role
    - Important to note it that there are conceptual models on both layers, i.e., the scenario layer and the execution layer
        - They enable a step-wise bridging between the two worlds
        - Here is where the connection needs to be conceptualized
- Other important parts are the “Mutual Artefacts”, e.g, methodology, metamodel, and modelling method

OMiLAB Course: Metamodelling

Name	**Metamodelling**
Study level	Master level
Lecturing format	This course requires a mix of theoretical lectures and practical exercise sessions.
Group size	The theoretical lectures can be conducted with any group size, however, as for the practical exercises a separation into groups of at most 30 students is meaningful.
Course Goals	The aim of this course is to introduce students to the theoretical and conceptual foundations of metamodeling. Students shall gain insights into the scientific discipline of developing new modelling languages. They shall learn the procedure and tools available to support the engineering of new metamodels as well as the development of prototypical tool support using metamodelling platforms.
Competences	• Understanding the principles of metamodelling • Knowledge on the procedure of engineering a new modelling language • Experience in realizing a modelling tool with a metamodelling platform • Understanding the value of conceptual modelling and how it can be enriched by mechanisms & algorithms
OMiLAB Resources	• ADOxx metamodelling community, http://www.adoxx.org/ • ADOxx community and services, https://www.adoxx.org/live/community
Key References	A list of key references for this course and/or further reading material.

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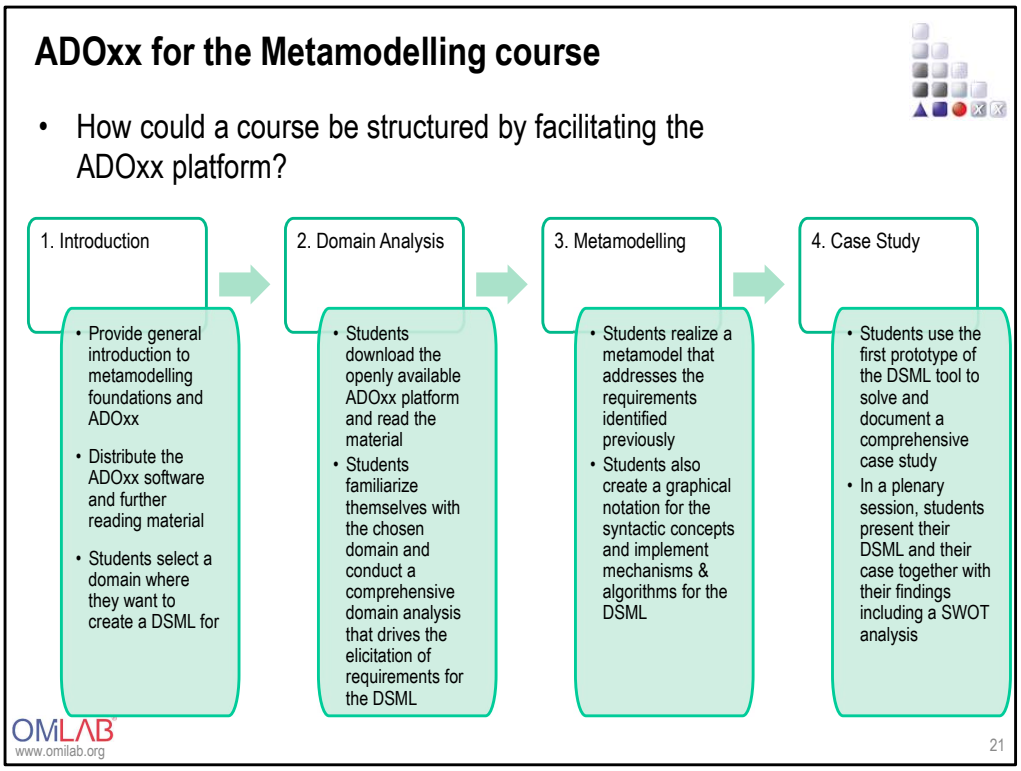
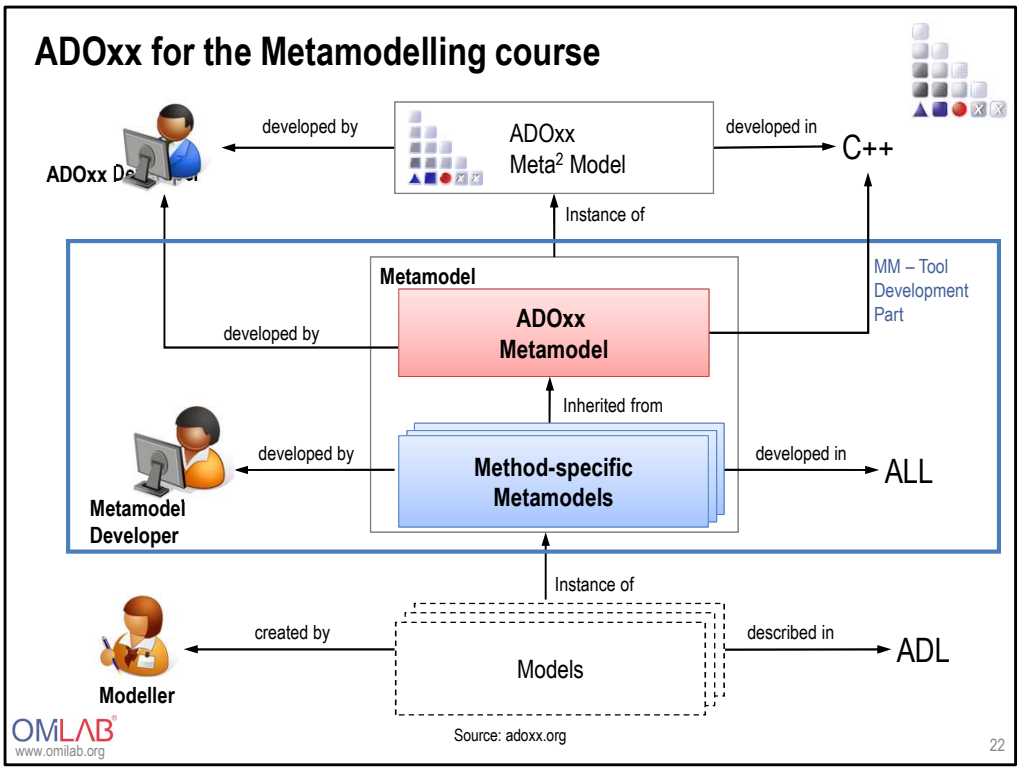
- This slide describes the Metamodelling course
- The course heavily uses the ADOxx tool
- The freely available material and the ADOxx community will be very helpful



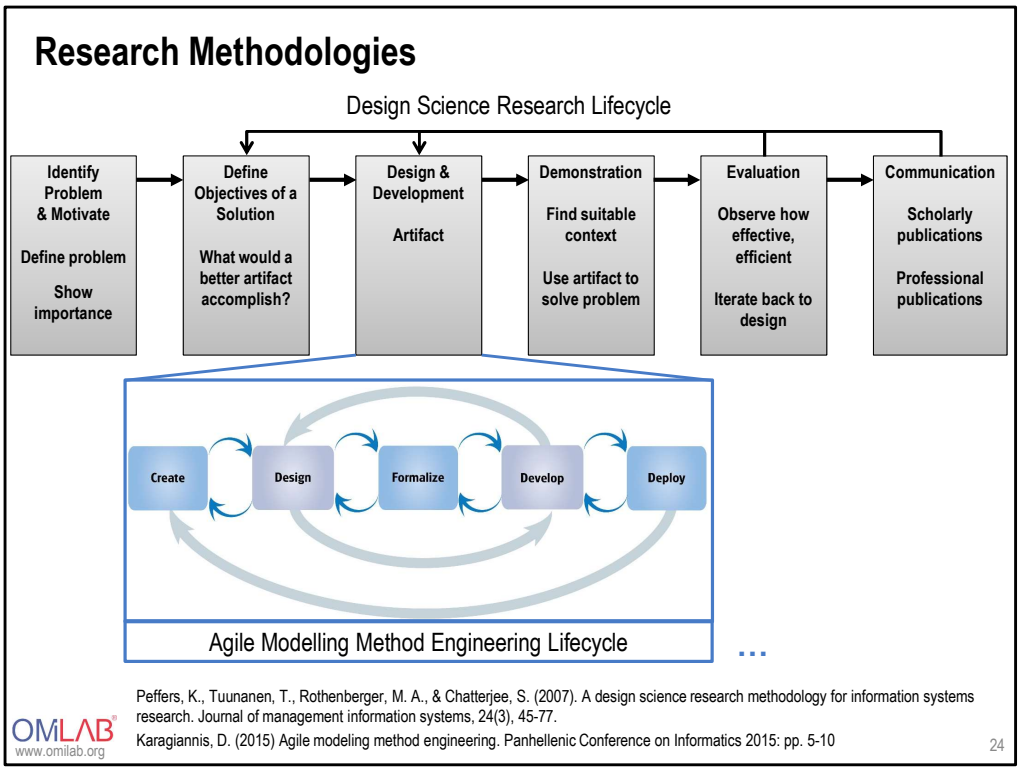
- This slide shows in detail a possible structure for conducting the course
- The course heavily involves practice exercises with ADOxx
- Thus, theoretical lectures on metamodeling need to be accompanied by practical hands-on sessions



When using the ADOxx platform, one follows the generic structure as shown here. Students play the roles of

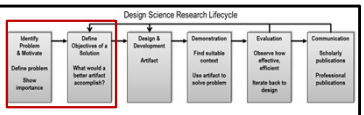
- **Metamodel developer** in defining an inheritance relationship between the ADOxx metamodel and the domain-specific metamodel concepts they want to realize
- **Modeller** when creating sample models and using the tool prototype in a first evaluation

HOW CAN OMiLAB RESEARCH BE POSITIONED WITHIN THE SCIENTIFIC COMMUNITY?



- First describe the generic design science research methodology lifecycle
- Then show, how AMME fits into this bigger lifecycle when focussing on the engineering of modelling methods
- When the artefact to be created is not a modelling method, other sub-methodologies (instead of AMME) might me suggested

Design Science Research Lifecycle - 1



- **Activity 1: Problem identification and motivation.**

Define the specific research problem and justify the value of a solution. Justifying accomplishes two things: it motivates the researcher and the audience to pursue the solution and to accept the results and it helps to understand the reasoning associated with the researcher's understanding of the problem.

Resources required for this activity include knowledge of the state of the problem and the importance of its solution.

- **Activity 2: Define the objectives for a solution.**

Infer the objectives of a solution from the problem definition and knowledge of what is possible and feasible. The objectives can be **quantitative**, such as terms in which a desirable solution would be better than current ones, or **qualitative**, such as a description of how a new artifact is expected to support solutions to problems not hitherto addressed. The objectives should be inferred rationally from the problem specification.

Resources required for this include knowledge of the state of problems and current solutions, if any, and their efficacy.

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Peffers, K., Tuunanen, T., Rothenberger, M. A., & Chatterjee, S. (2007). A design science research methodology for information systems research. Journal of management information systems, 24(3), 45-77

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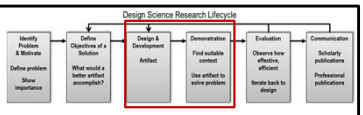
- This slide now describes the first two phases of the generic DSR lifecycle
  - Very important to identify stakeholders and purpose of an artefact / modelling method
  - Then derive functional / non-functional requirements for the artefact
- Emphasize the relationship to research conducted in an OMiLAB

Design Science Research Lifecycle - 2



- **Activity 3: Design and development.**

Create the artifact. Conceptually, a design research artifact can be any designed object in which a research contribution is embedded in the design. This activity includes determining the artifact's desired functionality and its architecture and then creating the actual artifact.

Resources required for moving from objectives to design and development include knowledge of theory that can be brought to bear in a solution.

- **Activity 4: Demonstration.**

Demonstrate the use of the artifact to solve one or more instances of the problem. This could involve its use in experimentation, simulation, case study, proof, or other appropriate activity.

Resources required for the demonstration include effective knowledge of how to use the artifact to solve the problem.

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Peffers, K., Tuunanen, T., Rothenberger, M. A., & Chatterjee, S. (2007). A design science research methodology for information systems research. Journal of management information systems, 24(3), 45-77

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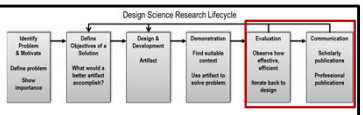
- This slide now describes the second two phases of the generic DSR lifecycle
- Emphasize the relationship to research conducted in an OMiLAB
    - Especially Design -> AMME approach
    - Especially Demonstration -> Exploitation (see last two slides of this course)

Design Science Research Lifecycle - 3



- **Activity 5: Evaluation.**

Observe and measure how well the artifact supports a solution to the problem. This activity involves comparing the objectives of a solution to actual observed results from use of the artifact in the demonstration. It could include a comparison of the artifact's functionality with the solution objectives from activity 2, objective quantitative performance measures such as budgets or items produced, the results of satisfaction surveys, client feedback, or simulations. Conceptually, such evaluation could include any appropriate empirical evidence or logical proof.

It requires knowledge of relevant metrics and analysis techniques.

- **Activity 6. Communication.**

Communicate the problem and its importance, the artifact, its utility and novelty, the rigor of its design, and its effectiveness to researchers and other relevant audiences such as practicing professionals, when appropriate. In scholarly research publications, researchers might use the structure of this process to structure the paper.

Communication requires knowledge of the disciplinary culture.

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Peffers, K., Tuunanen, T., Rothenberger, M. A., & Chatterjee, S. (2007). A design science research methodology for information systems research. Journal of management information systems, 24(3), 45-77

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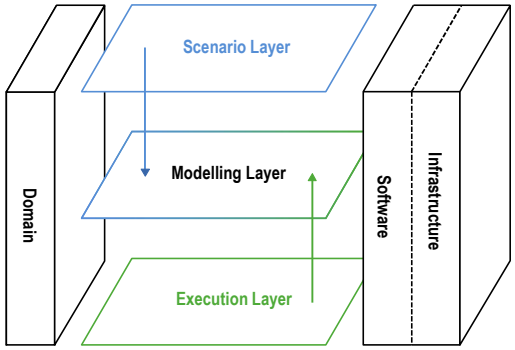
- This slide now describes the last two phases of the generic DSR lifecycle
  - Evaluation can be conducted in manifold ways, and OMiLAB also provides some examples (to follow later)
  - Communication: see last two slides of this course
- Emphasize the relationship to research conducted in an OMiLAB

IN WHICH RESEARCH AREAS IS OMiLAB ACTIVE?

The OMiLAB Digital Product as a Research Framework

The OMiLAB framework uses different layers and perspectives

- Layers establish a particular scope for the research
- Perspectives establish a further specialization w.r.t. a focus



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- In the following, we will use the generic digital product concept as a framework for positioning OMiLAB research
- From scenario layer to modelling layer we apply refinements
- From the execution layer to the modelling layer we apply abstraction
- Orthogonally to the layer are the perspectives one can take, i.e., focusing on the domain, the software, or the infrastructure of a digital product

The OMiLAB Digital Product as a Research Framework - 2

Different possibilities of partitioning OMiLAB research

- 1 v. multiple layers
- 1 v. multiple perspectives
- Multiple layers and perspectives combined
- Instantiation of whole framework

Scope and complexity increase with any additional layer and perspective

- Adaptation to research horizon (3-, 6-,12 months, multiple years)
- Adaptation to research goal (bachelor, master, or PhD thesis)
- Adaptation to research contribution (workshop, conference, or journal paper)

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- Using this framework, OMiLAB research can be positioned in one cell, one layer, one perspective, or as an overall instantiation of the framework
- All these examples will be illustrated by examples in the following

OMiLAB Research Examples – 1 Layer

- Examples for one-layer research can be e.g.,
  - **Scenario layer**
    - Workshops, questionnaires, or literature surveys aiming to define specific scenarios
    - Conducting brainstorming and innovation workshops with practice partners
  - **Modelling layer**
    - Conducting a modelling project with a practice partner
    - Conducting research to understand, how modelling languages are used
    - Foundational research in conceptual modelling and metamodeling, like evaluation techniques, metrics, formalization of modelling methods, design patterns
  - **Execution layer**
    - Establishing a taxonomy of execution layer concepts and properties
    - Researching e.g., the capabilities of cyber-physical systems
    - Research on technological aspects of metamodelling and interoperability

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- This slide exemplifies OMiLAB research that concentrates only on one of the three layers in isolation
- It is important to state, that this is a stringent differentiation, thus the different layers need to be treated in isolation when presenting an example

OMiLAB Research Examples – 1 Perspective

- Domain
  - Research in this area aims e.g.,
    - To contribute a clearer and more comprehensive of domain requirements
    - Investigate the specifics of a domain in order to support future development efforts
- Software
  - Research and development in the latest software trends
    - Metamodelling platform development[1]
    - Utilization of metamodelling platform features[2,3]
    - Interoperability
    - Model-aware software engineering[4]

[1] H.-G. Fill, D. Karagiannis (2013): On the Conceptualisation of Modelling Methods Using the ADOxx Meta Modelling Platform. Enterp. Model. Inf. Syst. Archit. Int. J. Concept. Model. 8(1): 4-25 (2013)
[2] D. Bork (2018): Metamodel-Based Analysis of Domain-Specific Conceptual Modeling Methods. PoEM 2018: 172-187
[3] N. Visic, H.-G. Fill, R.A. Buchmann, D. Karagiannis (2015): A domain-specific language for modeling method definition: From requirements to grammar. RCIS 2015: 286-297
[4] R.A. Buchmann, M. Cinpoeru, A. Harkai, D. Karagiannis (2018): Model-Aware Software Engineering - A Knowledge-based Approach to Model-Driven Software Engineering. ENASE 2018: 233-240

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- This slide then shows, how the different perspectives can be researched individually
- The examples at the bottom show, how existing research from the OMiLAB community fits to the different categories

OMiLAB Research Examples – Multiple Layers & Perspectives

- TOGAF-based Enterprise Architecture Management[1,2]
  - **Domain:** Enterprise Architecture Management
  - **Scenario:** Digital Enterprise Ecosystems & Smart Mobility
  - **Modelling:** ArchiMate
  - **Software:** ADOxx Metamodelling Platform
  - **Contribution:**
    - An extension of an existing (standard) modelling method
    - New language concepts
    - New mechanisms & algorithms
    - Empirical evaluation using a focus group and Task Technology Fit theory

[1] B. Pittl, D. Bork (2017): Modeling Digital Enterprise Ecosystems with ArchiMate: A Mobility Provision Case Study. ICServ 2017: 178-189
[2] https://austria.omilab.org/psm/content/team

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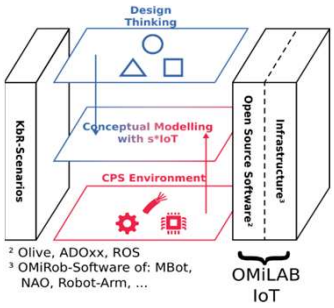
- This slide shows one OMiLAB research example that, as often, touches different layers and perspectives of the digital product framework
- In this research, a standard modelling language, ArchiMate, has been extended in order to fit to the specific requirements derived from a smart mobility scenario.

OMiLAB Research Examples - Instantiation of the whole framework

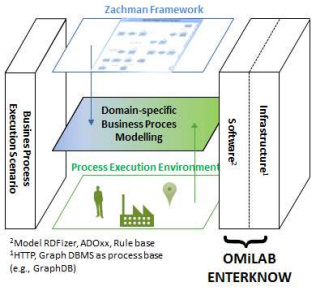
- Development of a new modelling method (s*IoT)
- Execution with cyber-physical systems
- Evaluation in multiple case studies



Instantiation for design thinking based cyber-physical systems

Karagiannis, D. & Walch, M. (2017): Service-Driven Enrichment for KbR in the OMiLAB Environment. In: Serviceology for Services - 5th International Conference on, ICServ 2017, Vienna, Austria, July 12-14, 2017, Proceedings. S. 164-177

- Extending & Adapting a standard modelling method (Zachman)
- Export into semantic structures (RDF) for automated processing
- Evaluation in one case study



Instantiation for ArchiMate based process execution

Harkai, A., Cinpoeru, M. and Buchmann, RA. (2018) "Repurposing Zachman Framework Principles for Enterprise Model-Driven Engineering.", In Proceedings of (ICEIS 2018), - Volume 2, March 21-24, Funchal, Madeira, Portugal, 2018, (pp. 682-689)

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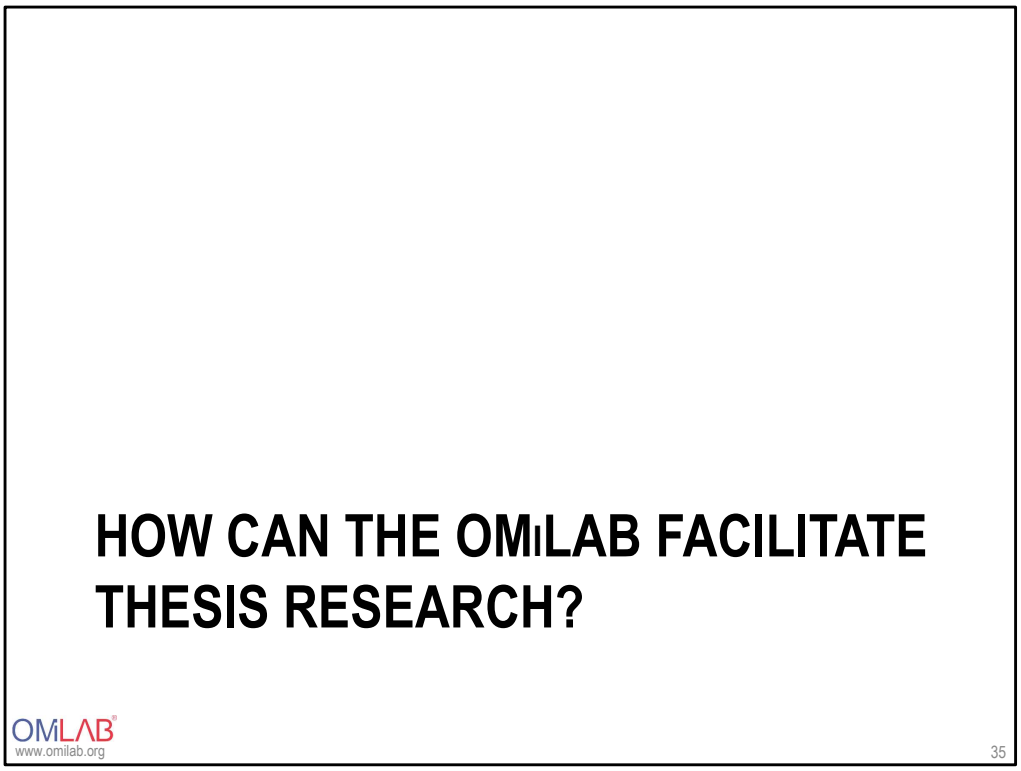
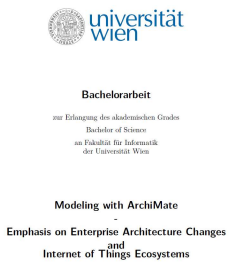
- This slide eventually shows two examples where the whole Digital Product framework has been instantiated.
- The left example is targeting modelling in the domain of cyber-physical systems
- The right example targets modelling in the domain of enterprise architecture, more specifically the Zachman framework, and how a stepwise approach transforms Zachman models into automated process executions



- In the following, examples are provided how OMiLAB can facilitate bachelor, master, and PhD theses

Bachelor Thesis Example: Enterprise Architecture Management

- Modelling with ArchiMate - Emphasis on Enterprise Architecture Changes and Internet of Things Ecosystems[1,2]
  - **Domain:** Enterprise Architecture Management
  - **Modelling:** ArchiMate
  - **Software:** ADOxx Metamodelling Platform
  - **Contribution:**
    - Conceptualization of an ArchiMate 3.0 compliant modelling tool
    - Modelling case study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Bachelorarbeit

zur Erlangung des akademischen Grades
Bachelor of Science
an Fakultät für Informatik
der Universität Wien

Modeling with ArchiMate
-
Emphasis on Enterprise Architecture Changes
and
Internet of Things Ecosystems

[1] Requirements Engineering for Model-Based Enterprise Architecture Management with ArchiMate. EOMAS@CAiSE 2018: 16-30, https://doi.org/10.1007/978-3-030-00787-4_2

[2] https://austria.omilab.org/psm/content/team

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- This example shows a bachelor thesis conducted at the University of Vienna
- In its core, it contributed a conceptualization of ArchiMate 3.0 and its implementation on ADOxx
- Evaluation has been performed using a modelling case study

Master Thesis Example: Business Continuity Management

- Conceptualization of a Modelling Method for Business Continuity Management[1,2]
  - **Domain:** Business Continuity Management
  - **Modelling:** BPMN
  - **Software:** ADOxx Metamodelling Platform
  - **Contribution:**
    - An extension of an existing (standard) modelling method
    - New language concepts for Risk-related aspects
    - New mechanisms & algorithms for Risk Assessment and Analysis
    - Empirical evaluation using questionnaires and case studies
    - Development of a new empirical evaluation method for notation intuitiveness[1]


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MASTERARBEIT / MASTER'S THESIS

Titel der Masterarbeit / Title of the Master's Thesis

„Conceptualization of a Modelling Method for Business Continuity Management"

verfasst von / submitted by

angestrebter akademischer Grad / in partial fulfillment of the requirements for the degree of

Diplom Ingenieur (Dipl. Ing.)

[1] Intuitive Understanding of Domain-Specific Modeling Languages: Proposition and Application of an Evaluation Technique. ER 2019: pp. 311-319, https://doi.org/10.1007/978-3-030-33223-5_26

[2] http://othes.univie.ac.at/54881/

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- This example shows a master thesis conducted at the University of Vienna
- It contributed a conceptualization of a business continuity management modelling method and its implementation on ADOxx
- A second core contribution was a novel empirical evaluation technique that can be used to improve the intuitiveness of modelling language notations
- Evaluation of the new modelling method has been conducted by applying the new evaluation technique with 30 students from the University of Vienna

PhD Thesis: Conceptual Modelling of Cyber-physical Systems

- Language-Oriented Modeling Method Engineering[1,2]
  - **Domain:** Metamodelling, DSL Engineering
  - **Scenario:** DSL for Metamodels
  - **Modelling:** Modelling Languages
  - **Software:** ADOxx Metamodelling Platform; Xtext, Eclipse
  - **Contribution:**
    - A domain-specific language for specifying modelling languages
    - Specification of the DSL, called MM-DSL in EBNF
    - Automated generation of an ADOxx tool from the DSL code

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DISSERTATION / DOCTORAL THESIS

Titel der Dissertation / Title of the Doctoral Thesis

„Language-Oriented Modeling Method Engineering"

verfasst von / submitted by

angestrebter akademischer Grad / in partial fulfilment of the requirements for the degree of

Doktor der technischen Wissenschaften (Dr. techn.)

Wien, 2016 / Vienna 2016

[1] Visic, N., Fill, H. G., Buchmann, R. A., & Karagiannis, D. (2015). A domain-specific language for modeling method definition: From requirements to grammar. In 2015 IEEE 9th International Conference on Research Challenges in Information Science (RCIS) (pp. 286-297). IEEE.

[2] http://othes.univie.ac.at/43056/

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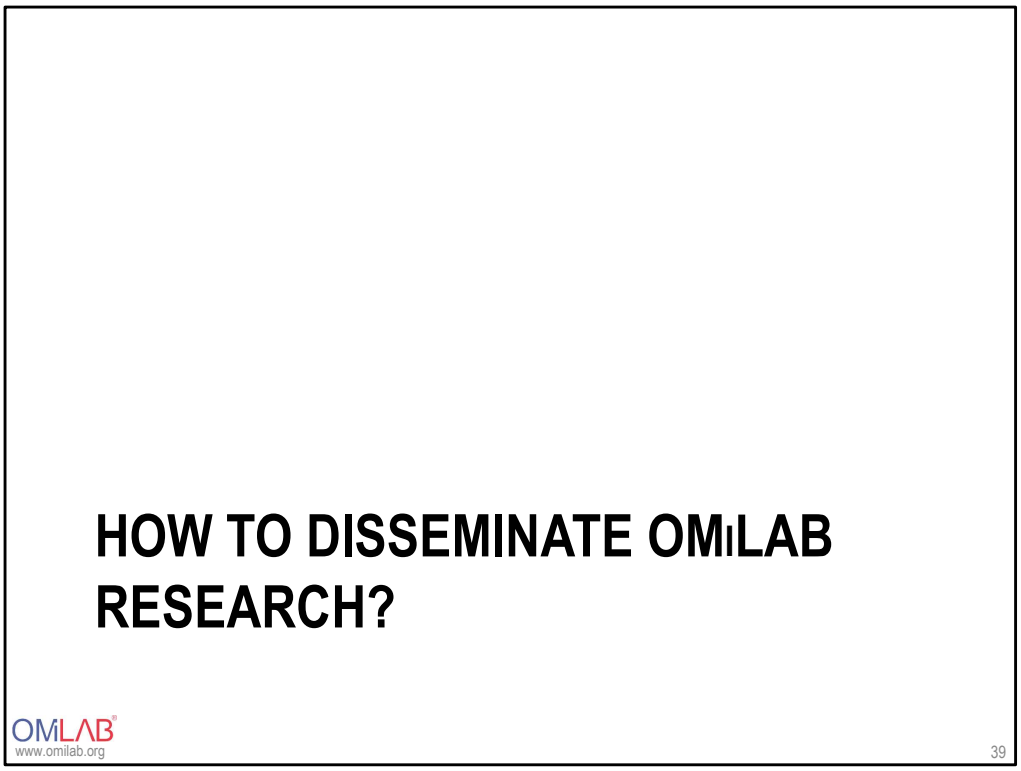
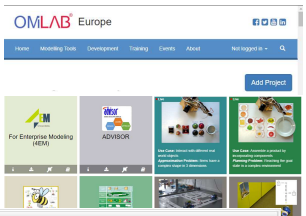
- This example shows a PhD thesis conducted at the University of Vienna
- In its core, it contributed a domain-specific language for specifying modelling methods, more precisely the modelling language of a modelling method
- The DSL, called MM-DSL has been specified in EBNF
- The DSL has been implemented in Eclipse using Xtext, thereby providing an Integrated Development Method for using the DSL
- Evaluation has been performed by specifying a modelling language with the DSL and automatically generating the corresponding ADOxx modelling tool



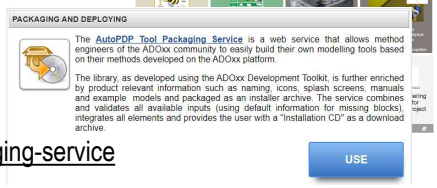
- Once we have OMiLAB research results, the question remains how to disseminate them?

Dissemination within OMiLAB Network

- Participate in the OMiLAB Community
  - Initiate a new project space within an existing OMiLAB node or propose a new OMiLAB node
    http://www.omilab.org



- Deploy your Tool
  - You can deploy your developed modelling tool free of charge:
    https://www.adoxx.org/live/autopdp-packaging-service



- Present your results
  - Presentation and sharing of OMiLAB research results at the international NEMO Summer School of current and future conceptual modelling researchers.
    https://nemo.omilab.org/

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- This slide shows three dissemination possibilities within the OMiLAB network
  - By participating in the OMiLAB community: Initiating a project in an existing OMiLAB node, or proposing a new OMiLAB node
  - By deploying the modelling tool and providing a free Windows Installer
  - By participating and presenting the results at the Next-generation Enterprise Modeling (NEMO) Summer School Series

Scientific Dissemination

- Selected OMiLAB Affiliated Scientific Events
  - Enterprise Modelling Track at ECIS
  - Modelling Method, Techniques, and Tools Mini-track at AMCIS
  - Enterprise Modelling Track at Wirtschaftsinformatik
  - PrOse Workshop at PoEM
- Selected Journals where OMiLAB research has potentially a good fit
  - Business & Information Systems Engineering
  - Requirements Engineering
  - Software and Systems Modeling
  - Enterprise Modeling and Information System Architectures
  - CSIMQ Complex Systems Informatics and Modeling Quarterly

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- Members of the OMiLAB network are heavily involved in organizing scientific conferences, workshops, and tracks
- Moreover, several top-level scientific journals have OMiLAB research output in its topical scope

Self-control questions

- How can you use the resources provided by the OMiLAB to facilitate your university courses?
- How can you position the OMiLAB-related research toward scientific publication?
- How can you focus individual research activities within the OMiLAB Digital Product framework?
- How can you disseminate OMiLAB research results within the OMiLAB community?
- How can you disseminate OMiLAB research results to an international scientific community?
- What are affiliated events and good venues for presenting OMiLAB research?

References

- Bork, D., Fill, H. G., Karagiannis, D., Miron, E. T., Tantouris, N., & Walch, M. (2015). Conceptual modelling for smart cities: A teaching case, Interaction Design and Architecture(s)
- Bork, Dominik. "A framework for teaching conceptual modeling and metamodeling based on Bloom's revised taxonomy of educational objectives." (2019): HICSS 2019, pp. 7701-7710.
- Buchmann, R. A., & Ghiran, A. M. (2017). Engineering the Cooking Recipe Modelling Method: a Teaching Experience Report. In PrOse@ PoEM.
- Buchmann, R. A., Ghiran, A. M., Döller, V., & Karagiannis, D. (2019). Conceptual Modeling Education as a "Design Problem". Complex Systems Informatics and Modeling Quarterly, (21), 21-33.
- Buchmann, R., Ghiran, A. M., Döller, V., & Karagiannis, D. (2019). Conceptual Modelling in Education: a Position Paper.
- Ghiran, A. M., Osman, C. C., & Buchmann, R. A. (2019). A Metamodeling Approach to Teaching Conceptual Modeling" at Large".
- Gregor, S., & Hevner, A. R. (2013). Positioning and presenting design science research for maximum impact. MIS quarterly, 337-355.
- Harkai, A., Cinpoeru, M. and Buchmann, RA. (2018) "Repurposing Zachman Framework Principles for Enterprise Model-Driven Engineering.", In Proceedings of the 20th International Conference on Enterprise Information Systems (ICEIS 2018), - Volume 2, March 21-24, Funchal, Madeira, Portugal, 2018, (pp. 682-689)
- Karagiannis, D. (2015) Agile modeling method engineering. Panhellenic Conference on Informatics 2015: pp. 5-10
- Karagiannis, D. & Walch, M. (2017): Service-Driven Enrichment for KbR in the OMiLAB Environment. In: Serviceology for Services - 5th International Conference on, ICServ 2017, Vienna, Austria, July 12-14, 2017, Proceedings. S. 164-177
- Peffers, K., Tuunanen, T., Rothenberger, M. A., & Chatterjee, S. (2007). A design science research methodology for information systems research. Journal of management information systems, 24(3), 45-77.