NEMO 2018
PROGRAMME

# Next Generation Enterprise Modelling in the Age of Internet of Things

OMLAB®

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# General Information

**Summer School Venue**
University of Vienna
Faculty of Computer Science
Währinger Straße 29
1090 Vienna, Austria
T +43 1 4277-78943

**Public means of transport**
Tram: 37, 38, 40, 41, 42
Tram station:
Spitalgasse/Währinger Straße
Trip planning:
http://www.wienerlinien.at

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Fire department 122

**Organisation & Technical Team**

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# Welcome

The "Next Generation Enterprise Modelling" (NEMO) Summer School welcomes you to its 5th Edition, hosted by the University of Vienna.

As in the previous editions, this year's summer school will bring together a wide international community of academics and students with interests in various aspects of modelling. Since in today's enterprises modelling methods are widely used on every level and for numerous purposes, NEMO 2018 will cover different domains and approaches of modelling, addressing especially:

- Foundations of Conceptual Modelling, e.g. formal methods and tools for the creation, transformation, and application of modelling methods.
- Technologies for Conceptual Modelling, e.g. model execution technologies, meta-modelling platforms, model compilers, adaption to diverse devices and multi-client applications.
- Application Domains, e.g. Enterprise Information Systems, e-Government, and Ambient Assisted Living.
- Cross-cutting Issues, e.g. information security, privacy, risk manament and governance, and quality assurance of models and methods.

Participating students have the opportunity to acquire knowledge by listening to more than 40 speakers from all over the world, covering current topical developments. And in order to consolidate it, practical courses will take place. There, students will develop prototyping solutions to different kinds of problems and will discuss issues encountered in enterprises and practice. But to form a community, common experiences to bond are needed as well. Different cultural activities and social events will assure the start of a closely linked international community of young specialists.

We would like to thank all the speakers and their teams, who supported us with their commitment and work along the way in order to create this event.

The summer school could not have been realized without the work of the organisational team at the Research Group Knowledge Engineering and the support of the Faculty of Computer Science at the University of Vienna.

We hope that you all will have an extraordinary time, learning and enjoying your time at the NEMO Summer School.

Dimitris Karagiannis

Heinrich C. Mayr

HOSTS

OMiLAB®
www.omilab.org

Vision: an active global community for conceptual modelling that benefits from open artefacts.

Community network: supported by a non-profit organisation (NPO) headquartered in Berlin, Germany and governed by a Scientific Advisory Board (SAB).

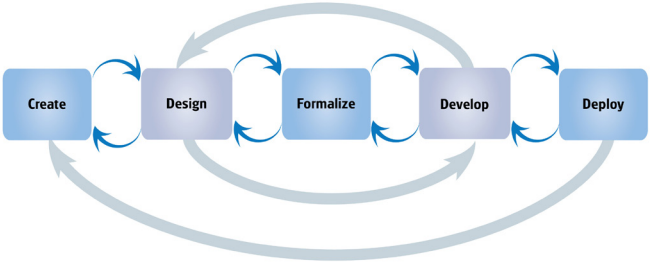
Operations: dedicated research and experimentation spaces for modelling method engineering equipped with tools to explore method creation and design, experiment with method engineering and deploy software tools for modelling. They act as facilitators to the development and application of methods to communities who value models, and implicitly modelling methods.

Operation spaces can be set up as (a) virtual labs or as (b) physical and virtual facilities. They can be affiliated with academia as well as industrial organisations.

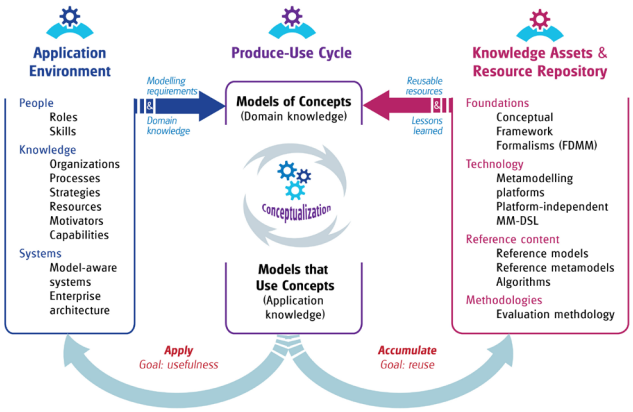
Individual activities are organized in projects in the different labs. A project is a collaborative space where individual engineers and teams can work together. It includes all contributions concerning a modelling method, starting from creation, to implementation all the way to exploitation.

Openness: to all those interested, either as individuals or as institutions. It acts as a platform where participants can bring in ideas related to modelling and engage in the exploration process. OMiLAB follows a user-driven approach in its understanding of the term "model" thus users are not limited to a certain domain or functional area of organisations. There are useful models in widely different domains like information technology, biology, chemistry, or medicine as well as various models for functional areas like procurement, marketing, logistics and engineering.

the AMME Lifecycle




The AMME Framework




## Network Benefits:

- dialogue between scientists, educators and innovators,
- access to infrastructure and open-source services,
- strong and sustainable communities, that are active in domain-specific issues,
- amplification instruments which leverage the impact of the activities performed,
- conferences, workshops, seminars,
- common projects,
- research and teaching stays, internships and traineeships, and
- publications.

## Network Resources:

- **Knowledge and procedural resources** like the Agile Modelling Method Engineering Framework (AMME), the Conceptualization Lifecycle, trainings, documentation
- **Technical resources** like open source platforms (e.g. ADOxx, olive), open source tools aiding the modelling engineering work (e.g. GraphRep Generator, Model Annotator, http-based retrieval of models and contents etc.), and service like packaging and deployment
- **Collaboration resources** like events, publications, exploitation opportunities in third-party funded projects, communication and public relations, the NEMO summer school series.

## Contact

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# OMLAB® Best Practices

## The Vienna Node – Austria

Established: 2011

Location: University of Vienna, Faculty of Computer Science, Vienna, Austria

Focus: Knowledge-based Methods and Technologies for Digitalisation

Core competence: Meta-modelling

Resources: Physical node with an CPS-environment and Design Thinking environment

Tools: more than 40 modelling tools

Activities: Research projects, educational activities, NEMO summer school, trainings, conferences

Web: vienna.omilab.org

## The Chonbuk Node – Korea

Established: 2015

Location: Chonbuk National University, School of Engineering, Chonbuk, Korea

Focus: Formal Methods, Internet of Things

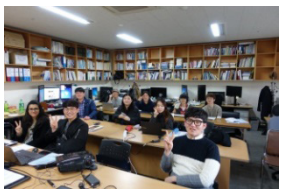
Core competence: Formal specification and verification

Resources: Physical node with an CPS-design room

Tools: SAVE, PRISM, SRRE, SoS Modelling Tool for Simulation-Based Verification

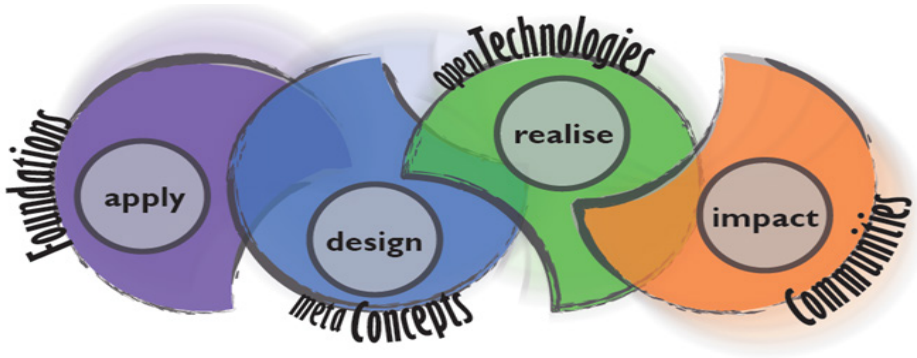
Activities: Industry projects, educational activities, trainings, workshops

Web: korea.omilab.org



# Research Group Knowledge Engineering

**University of Vienna**




To provide transparent, ubiquitous knowledge that can be semantically processed by IT systems is the main research goal of the Research Group Knowledge Engineering. The group develops concepts for modelling languages and methods as well as step models and realizes concrete models. The contributions herewith advert to the research paradigm of design science in business informatics. Thereby realized results are deployed primarily within the research field of modelling methods and find their applicability in the form of information systems in the economy.

According to the development plan of the University of Vienna and the Faculty of Computer Science the scientific work of the research group is associated to the overall defined research focus "Knowledge-based Methods and Technologies for Digitalisation". Within this core area the work accomplished by the group provides novel research results in the areas of Meta-Modelling, Semantic Technologies, Hybrid Method Engineering and Intelligent and Agile Agents.

Based on mathematical and statistical foundations, theoretical approaches are adapted and applied. The fundamental research paradigm relies on concepts of meta-modelling that are further developed and deployed to derive knowledge out of (un)structured data on the one side and to provide transparent knowledge with formal and semi-formal modelling methods on the other side. The developed meta-models are realized with open technologies in form of web based user and context specific applications and made available to the community.

In order to promote the exchange in regards to content and technological advancements in the method engineering community, the group has established the Open Model Laboratory. The dissemination of established know how, the exploitation of recent research results and their further development assure a sustainable impact on the community. The strategic goal of the initiative is to offer modelling methods and their applications freely available for subject matter experts. Technologically the Open Models Laboratory is supported by the ADOxx Platform, that provides open interaction and discussion for its users, as well as the exchange and advancements of modelling methods (vienna.omilab.org).

In the context of international cooperation the group provides research-guided teaching on an advanced scientific level with practical relevance mainly in the area of business informatics.

## Contact

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University of Vienna

Research Group Knowledge Engineering

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# SOCIAL Events

The NEMO Summer School comes with a programme chock-full of lectures and working group sessions: the participants, students and lecturers thus will experience two intensive weeks of insights into the present state of research, theory and practice of modelling.

However, this is only one side of the coin: the other side is the opportunity to meet student colleagues and renowned professors from all over the world, to discuss with them, to exchange ideas, to learn from each other, and to make new friends - all that in the beautiful and exciting capital of Austria, Vienna.

A special „Get Together" evening is planned for the first day. We invite you to enjoy some beer and BBQ food. This event will allow participants to get to know each other right from the start of the summer school and cooperate better during the practical sessions and in the preparation of the student presentations from the last day.

Detailed information will be provided at the summer school.

Photo Sources: https://www.univie.ac.at
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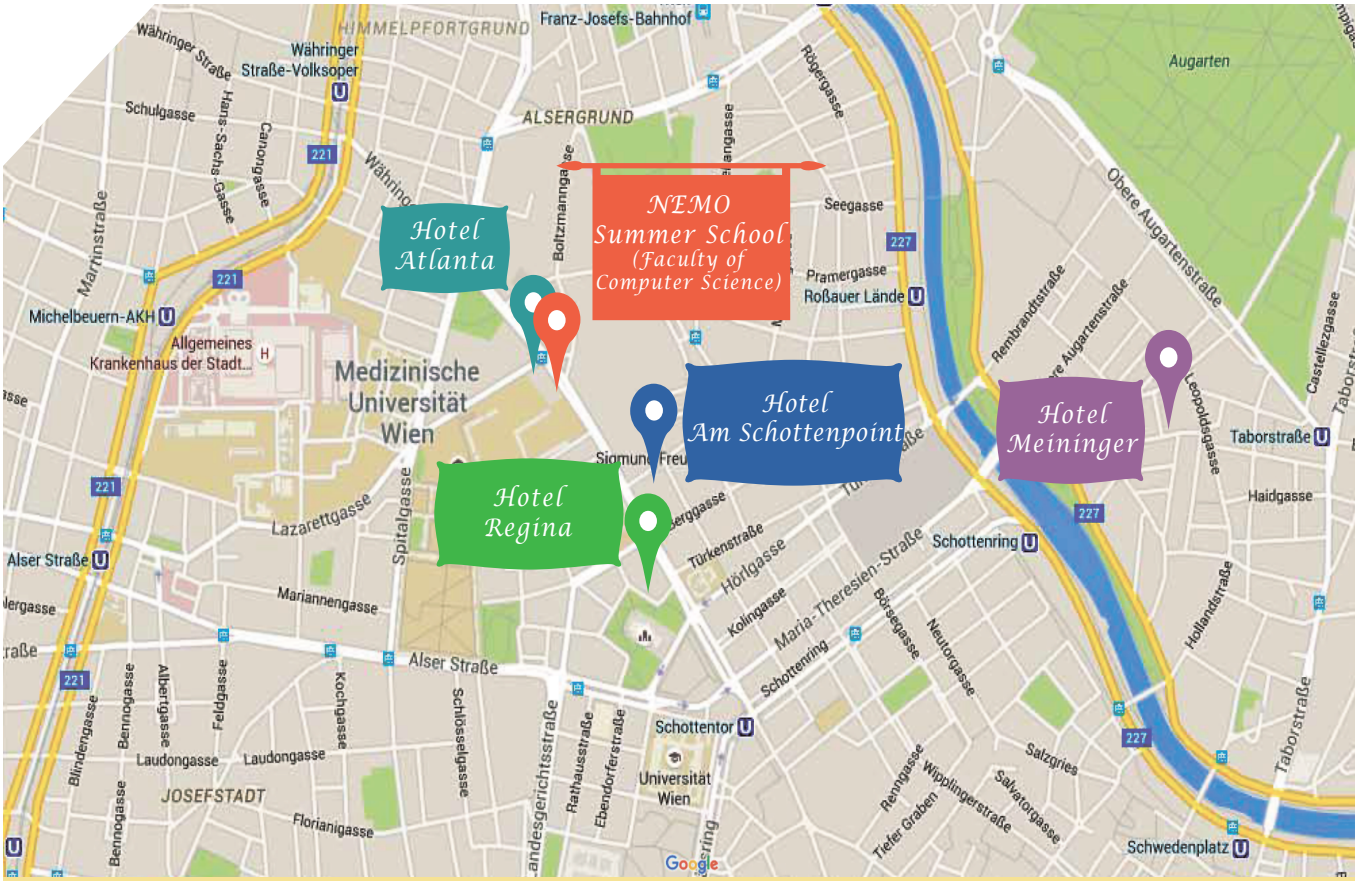
http://www.fodors.com/

# HOTEL CONTACTS & NEMO VENUE

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**Hotel am Schottenpoint*****

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Rooseveltplatz 15, 1090 Vienna
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**NEMO VENUE**

Währingerstraße 29, 1090 Vienna
Tel.: +43 (1) 4277 78943

# Vienna

Vienna = City of
**DREAMS**
Home of Sigmund
Freud = Home of
Psychoanalysis

POPULATION
2.6 milion

= about 1/3
of all Austria

- capital City of
- largest city in
- most visited of

AUSTRIA


50%
Green Space

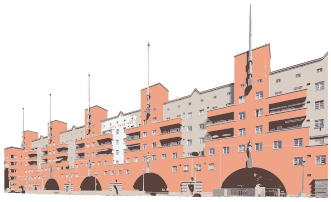
in Vienna

DANCING
is a tradition!
over 400
balls
each year

120 M
of Green Space

per
1 Viennese

- world's oldest ZOO
- Europe's oldest
FERRIS WHEEL
- world's longest
residential BUILDING
(< 1 km in lenght)





Vienna = City of
**MUSIC**
Home to
Mozart,
Beethoven,
Schubert &
J. Strauss

universität
wien

- 651 years of teaching
- founded by Duke Rudolph IV in 1365
- the OLDEST UNIVERSITY in the
German-speaking world

9 NOBEL PRIZE WINNERS

15 FACULTIES

# Room Location

**Address:**

**Faculty of Computer Science**
**Währinger Straße 29**
**1090 Vienna**

**Basement:**
Lectures in HS 1
Streaming in PC1
Coffee Break in the Basement Lobby

**1st Floor & 2nd Floor:**
Practice Sessions in:
PC2, PC5

Smart City Exercises:
PC2, PC3 & PC5, PC6

**Ground Floor:**
Registration

**4th Floor:**
Organisation Team
OMiLAB

Sources: https://www.flickr.com/photos/univienna/14520260667/in/album-72157634231687550/

# LECTURE DESCRIPTIONS

# Overview

## Lectures

# Overview

## Lectures (continued)



## OMiLAB Day

# AMME: HOW METAMODELLING CAN SUPPORT DIGITALIZATION

**Prof. Dr. Dimitris Karagiannis, University of Vienna, Austria**

## ABSTRACT

Internet's evolution into a generic platform and a pervasive environment enables the creation, provision and consumption of digital services. Cloud-based deployment models offer transparent access to services for a worldwide group of users. The models support 24/7 availability, location-independence as well as autonomy of resource processing limitations. At the same time, digital services are the basis of new and innovative business models. All of the above is expected to take place in the digital transformation process. Is it really feasible this way?

## BIO

Dimitris Karagiannis is head of the Research Group Knowledge Engineering at the University of Vienna. His main research interests include knowledge management, modelling methods and meta-modelling. Besides his engagement in national and EU-funded research projects Dimitris Karagiannis is the author of research papers and books on Knowledge Databases, Business Process Management, Workflow-Systems and Knowledge Management. He serves as expert in various international conferences and is on the editorial board of several international journals. He is member of IEEE and ACM and on the Special Interest Group on IT Governance of the Austrian Computer Society. He is the founder of the Open Models Laboratory, www.omilab.org.

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**Prof. Dr. Dimitris Karagiannis**
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# FOUNDATIONS AND PRINCIPLES OF CONCEPTUAL MODELLING

**Prof. Dr. Wolfgang Reisig, Humboldt University of Berlin, Germany**

## BIO

Prof. Dr. Wolfgang Reisig is a full professor at the Computer Science Institute of Humboldt-Universität zu Berlin, Germany. Prof. Reisig is the speaker of the PhD school Service-oriented Architectures for the Integration of Software-based Processes, exemplified by Health Care Systems and Medical Technology (SOAMED). Prof. Reisig is a member of the European Academy of Sciences, Academia Europaea. He published and edited numerous books and articles on Petri Net Theory and Applications. He is a Member of the Petri Net Conference Steering Committee since 1982 and a co-editor of the journal „Software and Systems Modelling".

## ABSTRACT

The basic notions of the NEMO summer school include the terms of enterprise modelling, modelling methods, etc. We start with some general observations about those notions and their role in (business) informatics. The second part of this contribution is dedicated to foundations of conceptual modelling. Here we pose the question of what the very basics of (discrete) models are, and how a systematic setting of modelling techniques, in particular for enterprise models, may be achieved. A business process is usually composed of workflows. A reasonable workflow is sound: a sound workflow can always reach its terminal state, and upon termination, no "garbage" remains. We present methods to adequately model and analyse workflows, in particular a most liberal composition operator for workflows that preserves soundness (i.e. composition of two sound workflows is a sound workflow again). This allows to stay in the world of sound workflows during the construction of large workflows and business processes.

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# A METHODOLOGICAL FRAMEWORK FOR ONTOLOGY-DRIVEN INSTANTIATION OF PETRI NET MANUFACTURING PROCESS MODELS

**Prof. Dr. Dimitris Kiritsis, EPFL, Switzerland**

## ABSTRACT

In the last decade, the interest and effort towards the use of ontology-based solutions for knowledge management has significantly increased. Ontologies have been used in manufacturing to provide a formal representation of the domain knowledge in a way that is machine-understandable. However, despite the ability to formally represent the elements of a domain and their relations, ontologies themselves do not provide any kind of simulation and systems behaviour analysis capabilities. Manufacturing system knowledge may be translated into specific executable models by exploiting experience and human logical deduction. This can be also achieved using ontologies and semantic reasoning. The framework presented in this work aims to explore a W3C standard for inference rules, such as Semantic Web Rule Language (SWRL), and OWL ontology models to transform elements of a Knowledge-Base (KB) into Petri Net (PN) primitives. The combination of semantics and mathematical modelling techniques applied to the analysis of a simple automated assembly station highlights the existence of modelling patterns and the effectiveness of inference rules to automatically instantiate PN-based manufacturing system models.

Prof. Dr. Dimitris Kiritsis is Faculty Member at the Institute of Mechanical Engineering of the School of Engineering of EPFL, Switzerland, where he is leading a research group on ICT for Sustainable Manufacturing. His research interests are Closed Loop Lifecycle Management, IoT, Semantic Technologies and Data Analytics for Engineering Applications. He served also as Guest Professor at the IMS Center of the University of Cincinnati, and Invited Professor at the University of Technology of Compiègne, the University of Technology of Belfort-Montbéliard and at ParisTech ENSAM Paris. Prof. Kiritsis is actively involved in EU research programs in the area of Factories of the Future and Enabling ICT for Sustainable Manufacturing. He has more than 220 publications. Since September 2013 Dimitris is Chair of IFIP WG5.7 - Advanced Production Management Systems and from 2013 to 2017 he was member of the Advisory Group of the European Council on Leadership on Enabling Industrial Technologies - AG LEIT-NMBP. He is also founding fellow member of the International Society for Engineering Asset Management (ISEAM), of various international scientific communities in his area of interests including EFFRA and among the initiators of the IOF (Industrial Ontologies Foundry).

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# STRATEGIC ACTORS MODELLING - FROM REQUIREMENTS ENGINEERING TO ENTERPRISE MODELLING

**Prof. Dr. Eric Yu, University of Toronto, Canada**

## BIO

Prof. Dr. Eric Yu is Professor at the University of Toronto, Canada. His research interests are in the areas of information systems modelling and design, requirements engineering, knowledge management, and software engineering. Books he has co-authored or co-edited include: Social Modelling for Requirements Engineering (MIT Press, 2011); Conceptual Modelling: Foundations and Applications (Springer, 2009); and Non-Functional Requirements in Software Engineering (Springer, 2000). He is co-editor for the MIT Press book series on Information Systems. He serves on the editorial boards of several academic journals including Requirements Engineering, IET Software, Int. Journal of Information Systems Modelling and Design, Int. Journal of Agent Oriented Software Engineering, and Journal of Data Semantics. He was Program Co-chair for the 27th and 33rd Int. Conference on Conceptual Modelling (ER'08, ER'14).

**Contact:**
**Prof. Dr. Eric Yu**
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eric.yu@utoronto.ca

## ABSTRACT

Complex IT systems today interconnect numerous devices, systems, and data sources to serve many stakeholders. Understanding the needs and wants of diverse stakeholders is a prerequisite for building successful and sustainable systems. In this lecture I will present a goal-oriented approach to enterprise modelling. We start with foundations in goal-based approaches to requirements engineering. An overview of the i* (iStar) strategic actors modelling language will then be presented, with examples of analysis and design in enterprise contexts. More complex examples will include using i* to model and analyze enterprise capabilities, as well as coopetition in business ecosystems.

# MULTI-PERSPECTIVE ENTERPRISE MODELLING AS A FOUNDATION OF IT-BUSINESS ALIGNMENT

**Prof. Dr. Ulrich Frank, University of Duisburg-Essen. Germany**
**Alexander Bock, University of Duisburg-Essen. Germany**

## ABSTRACT

While it is undisputed that today's enterprises depend crucially on IT, many companies still struggle with exploiting the potential of IT to a full extent. On the one hand, that requires adapting IT infrastructures of ever increasing complexity to changing needs of the business, on the other hand, it recommends rethinking organisational structures and business processes to create new opportunities for the efficient use of IT. In the long run, the digital transformation may even require to reinvent the entire business model, which will usually imply a major restructuring of a company and its IT. IT-Business alignment can be mastered only, if a professional perspective on the business is combined with elaborate knowledge of the IT. The field of enterprise modelling is addressing this demand by integrating models of the business, such as goal models or business process models, with models of the IT, such as models of the IT infrastructure, object models etc. In his talk, Ulrich Frank, will give an overview of "Multi-Perspective Enterprise Modelling" (MEMO) to demonstrate how enterprise models support various kinds of business and IT related analyses that support both, IT managers and line managers and that thereby serve as a pivotal instrument to foster IT Business alignment. For this purpose, he will give an overview of the domain-specific modelling languages that are part of MEMO, the language architecture and the language specification. The presentation will be supplemented by a tutorial on the use of MEMO4ADO, a tool that facilitates the construction of integrated enterprise models using the MEMO languages.

## BIO

Prof. Dr. Ulrich Frank holds the chair of Information Systems and Enterprise Modelling at the Institute of Computer Science and Business Information Systems at the University of Duisburg-Essen. His main research topic is enterprise modelling, i.e. the development and evaluation of modelling languages, methods and corresponding tools. "Multi-Perspective Enterprise Modelling" (MEMO), a method for enterprise modelling that was developed under his supervision is among the most elaborate methods available today. In recent years, he focused especially on multilevel DSMLs and corresponding tools. Together with Tony Clark from Sheffield University, he conducts the project "Language Engineering for Multilevel Modelling" (LE4MM). Ulrich Frank is on the editorial board of multiple journals. He has been actively involved in numerous conferences and various major research projects. He had assignments as visiting researcher/professor in various countries. He is a review board member of the German National Science Foundation and the founding director of the international student exchange network IS:link.

Alexander Bock is currently a member of the Research Group for Information Systems and Enterprise Modelling at the University of Duisburg-Essen, Germany. Alexander holds a M.Sc. and B.Sc. in Business Information Systems from the University of Duisburg-Essen. His research interests include human decision making and problem solving and the use of conceptual models to facilitate these He is concerned also with enterprise modelling, computerized decision support, and the theory and philosophy of modelling.

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**Contact:**
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# CAPABILITY-ORIENTED ENTERPRISE MODELLING FOR MASTERING DYNAMIC BUSINESS CONTEXTS

**Prof. Dr. Jelena Zdravkovic, Stockholm University, Sweden**

## BIO

Prof. Dr. Jelena Zdravkovic is the Vice Head of the Department of Computer and Systems Sciences at Stockholm University. She has PhD in Computer and Systems Sciences at Royal Institute of Technology (KTH) from 2006, as well as the MBA in E-commerce. Jelena has published around 100 refereed papers in international conferences and scientific journals on the topics of enterprise modelling, business/IT alignment and requirements engineering. She has participated in several national and international projects on the interoperability, service modelling, and model-driven engineering. In her department Jelena is the head of the study program „Enterprise Systems and Service Design", and the main responsible for the subjects Requirements Engineering and System Integration. She is in the Editorial Board of Springer BISE and RE Journals, as well as a regular reviewer for a number of other international journals including several of Springer, Elsevier's Journal of Systems and Software and Information & Software Technology Journal, as well as IEEE Computing journal. Jelena has organized a number of international conferences and workshops in the IS Engineering discipline, and she serves in the program committees of many of them.

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## ABSTRACT

A significant objective of today's enterprise Information Systems (IS) is to be congruent with the business environments which they are meant to support. A major concern is how Information Systems can successfully adapt to support frequent variations in business conditions originating, for instance, from changes in customers' demand, environmental aspects, regulations, and many others. The need for enterprises to operate in changing environments has been addressed by proposing a capability-oriented approach that integrates organizational development with IS development taking into account changes in the application context of the solution. It requires a number of organizational concepts to be modelled, such as business goals, processes, resources, Key Performance Indicators (KPIs), as well as the data for describing business environmental contexts for organizations capabilities. In the lecture, I intend to outline the capability-oriented approach for supporting model-driven organisations, as well as to present the current experiences of developing capability-oriented enterprise models in industrial and data-driven cases.

# THE ROLE OF REQUIREMENTS IN THE DIGITAL AGE: REQUIREMENTS ENGINEERING REVISITED

**Prof. Dr. Martin Glinz, University of Zürich, Switzerland**

## ABSTRACT

Requirements Engineering (RE) has been applied with remarkable success for specifying the requirements for systems or products. However, as RE has traditionally been performed as a heavy-weight, upfront process for creating a comprehensive specification, it has been criticized or even declared obsolete in recent years, particularly by the proponents of agile development. In this talk, I will shed light on the role of requirements in today's digital world and discuss how modern RE can contribute to shaping, evolving and sustaining digital systems and products. I will also discuss how this relates to enterprise modelling.

## BIO

Martin Glinz is a full professor emeritus at the University of Zurich (UZH). From 1993 until 2017, he was a professor of Informatics at UZH's Department of Informatics. From 2007-2016, he also was the department head. His interests include requirements and software engineering – in particular modelling, validation, quality, and evolution. He received a Dr. rer. nat. in Computer Science from RWTH Aachen University in 1983. Before joining the University of Zurich, he worked in industry for ten years where he was active in software and requirements engineering research, development, training, and consulting. He is on editorial boards and program committees of major journals and conferences in software and requirements engineering and served as general chair, program chair, steering committee chair and organizer for the top international conferences in his field. For his research and services, he has received several awards. He is a member of the International Requirements Engineering Board (IREB), where he chairs the IREB Council.

**Contact:**

**Prof. Dr. Martin Glinz**

University of Zürich, Switzerland

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# ENTERPRISE ARCHITECTURE MANAGEMENT (EAM)@HILTI

**Dr. Martin Petry, Hilti, Liechtenstein**

## BIO

Dr. Martin Petry became Hilti's CIO in 2005. He is responsible for Hilti's 400 IT employees based in Switzerland, US and Malaysia. Since 2009 he is also in charge of Hilti's Business Excellence initiatives and EVP. Since 1993 Martin has held various leadership roles in Liechtenstein, Switzerland, Great Britain and Japan. He has developed Hilti's ground-breaking IT Strategy and has lead its implementation, in particular Hilti's standard global data structures and business processes supported by a global SAP system with ERP, BI, CRM and SCM which is now being used by 20,000 Hilti employees in more than 50 countries. Recently Martin has initiated various cloud computing / SaaS initiatives at Hilti and he has lead the development of the comprehensive Information Technology at Hilti strategy which is now the foundation of all digital and software initiatives in the Hilti group. Martin earned his PhD in applied mathematics from Georg-August University in Goettingen, Germany.

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Hilti, Liechtenstein
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## ABSTRACT

Nowadays, when reading management and IT journals, one inevitably crosses the terms of digitalization of businesses. The increasing digitalization of business processes as well as its penetration into IT-based service processes is in full motion. The afore-mentioned journals sometimes fall all over themselves by presenting news and business ideas, which seem to be enabled by digitalization. One should consider though that the wave of digitalization did not descend on us overnight. Rather, it is a process that is already on its way since years and it is keeping the IT departments of corporations busy. It is vital – especially for pioneering IT departments – to transform the corporations' IT architectures and landscapes to allow for digitalizing business. Oftentimes, this is a long and painful process as the historically grown IT applications – such as e.g. ERP applications – have mostly not been designed for digitalizing a corporation's business. Hence, a lot of conceptual and process work is needed before one should embark onto the journey of making a corporation's IT architecture and landscape ready for digitalizing its business.

# QUALITY ASSURANCE FOR BPMN MODELS

**Prof. Dr. Andrea Polini, University of Camerino, Italy**

## ABSTRACT

Quality of delivered models is an important aspects when a modelling approach is proposed. Problems discovered during the modelling phase permit to save a lot of money with respect to issues discovered later, and when specific deployment activities are already in place. For such a reason it is in general important to complement modelling methods with strategies to check their qualities, and in particular with automatic tools permitting to spot possible issues. The lesson, after a general introduction, will focus on the Business Process Modelling Notation, and qualities such as understandability and correctness. Understandability will be introduced considering a specific guidelines framework that provides suggestions on how to derive BPMN models that are easier to understand. Correctness will be discussed considering a formal semantics developed according to the SOS style and to the possibility to automatically check general properties such as safeness and soundness, as well as domain specific properties.

## BIO

Prof. Andrea Polini is an Associate Professor at University of Camerino. He got his PhD from Scuola Superiore „Sant'Anna" in Pisa. His research interests are in the area of Software Engineering, and in particular on Quality Assurance Strategies for Complex Software Systems, and on Business Process Modelling and Verification. Prof. Polini has conducted research activities within many EU projects and in particular he acted as Scientific Leader for the Learn PAd EU project. He also participated as research member to the FP6 STREP Telcert project, to the FP6 STREP Plastic project, to the FP7 IP TAS3 project. He was WP co-leader in the FP7 IP CHOReOS project, for which he was also responsible for the UNICAM unit. Prof. Polini has been reviewer, among the others, for ICSE 2015, AST11-18, CompSac2018, PESOS12-15, ViDaS10, EGOVIS12-16, ICST10-12, WebTest09, A-MOST08, TAP08, SOQUA07, ICSEA06, CD2005 and he organized events associated to relevant conferences in the Software Engineering domain, such as QASBA11-13, ARAMIS08, IW-SOSwE07, IW-SOSwE06, and WS-MaTe 06. Currently he is the responsible for the Computer Science Division, and UNICAM Rector Delegate for the Development of Digital Infrastructures.
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# PARTICIPATORY ENTERPRISE MODELLING WITH THE 4EM METHOD

**Prof. Dr. Janis Stirna, Stockholm University, Sweden**
**Dr. Birger Lantow, University of Rostock, Germany**

## BIO

Prof. Dr. Janis Stirna has received a degree of Doctor of Philosophy in Computer and Systems Sciences from the Royal Institute of Technology, Sweden in 2001 and Associate Professor (docent) from Jönköping University, Sweden in 2008. In 2015 he was promoted to full professor at Department of Computer and Systems Science (DSV), Stockholm University.

Stirna's current research interests include enterprise modelling and requirements engineering methods and tools, organisational patterns, knowledge management and transfer of best practices. Stirna is an author or co-author of some 70 research reports and publications as well as two text books on Enterprise Modelling.

Dr. Birger Lantow is a post-doctoral researcher and teacher at the chair of Business Information Systems at the University of Rostock. He holds a diploma in Industrial Engineering. In 2010, he received his PhD on the topic of „Load Optimization in Wireless Sensor Networks" from the University of Rostock. Besides his research, Birger organised the study program on the topic of information infrastructures and held major responsibilities on the implementation of the Bologna Process for the study program of Business Information Systems. Recent research focuses on Enterprise Architecture Management and Enterprise Modelling as well as Knowledge-based Systems.

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## ABSTRACT

Companies are often involved in Enterprise Modelling (EM) activities that address various business problems usually relayed to business and IT development or improvement of the quality of business operations. This can be done from a number of perspectives, e.g., strategy (goals, challenges, opportunities), business operations (processes, actors, resources), information (concepts, products), information technology (requirements, components), etc. However, to develop efficient solutions and to ensure their fit, all of these perspectives need to be analyzed in an integrated way, which is a core principle of EM. In practice, EM activities often involve groups of people, i.e. the models are created in a participatory way. This presentation will discus participatory EM and the 4EM method with a particular focus on modelling business strategies.

# TEACHING CONCEPTUAL MODELLING: HOW TO GUIDE THE CONCEPTUAL MODELLING PROCESS OF STUDENTS?

**Prof. Dr. Monique Snoeck, KU Leuven, Belgium**

## ABSTRACT

Conceptual modelling is an example of such complex learning task as it requires rigorous analytical skills and experience to externalise requirements into high-quality formal representations - conceptual models. These skills are very difficult to teach to novice modellers mainly due to the lack of tools that can continuously guide them in the learning process. In this talk I will address the scaffolding of CM learning, based on Bloom's revised taxonomy. This will be paired with a report about the use of automated feedback and simuation to guide the student's learning process for conceptual modelling. Furthermore, lessons from student modelling behaviour as observed from logging the modelling process of students will be presented. The findings include a set of typical modelling and validation patterns that can be used to improve teaching guidance for domain modelling courses. From a scientific viewpoint, the outcomes of the work can be inspirational outside of the area of domain modelling as learning event data is becoming readily available through virtual learning environments and other information systems.

## BIO

Prof. Dr. Monique Snoeck holds a PhD in computer science from the KU Leuven. She is full professor in the Department of Decision Sciences and Information Management of the Faculty of Economics and Business of the KU Leuven and visiting professor at the University of Namur (UNamur). She has a strong research track in conceptual modelling, requirements engineering, software architecture, model-driven engineering and business process management. Main guiding research themes are domain modelling, business process modelling, model quality, model-driven engineering, and e-learning. Previous research has resulted in the Enterprise Information Systems Engineering approach MERODE, and its companion e-learning and prototyping tool JMermaid. She is author of 2 books, (co)-author of over 40 peer-reviewed journal papers and 60 peer-reviewed conference papers.

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# A MODEL DRIVEN APPROACH TO SPECIFICATION AND GENERATION OF INFORMATION SYSTEMS AND DATABASES

**Prof. Dr. Ivan Lukovic, University of Novi Sad, Serbia**

## BIO

Prof. Dr. Ivan Luković received his diploma degree (5 years) in Informatics from the Faculty of Military and Technical Sciences in Zagreb in 1990. He completed his Mr (2 year) degree at the University of Belgrade, Faculty of Electrical Engineering in 1993, and his Ph.D. at the University of Novi Sad, Faculty of Technical Sciences in 1996. Currently, he works as a Full Professor at the Faculty of Technical Sciences of the University of Novi Sad, where he lectures in several Computer Science and Informatics courses. He is the head of B.Sc. and M.Sc. study programs in Information Engineering – Data Science. His research interests are related to Database Systems, Business Intelligence Systems, and Software Engineering. He is the author or co-author of over 150 papers, 4 books, and 30 industry projects and software solutions in the area.

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## ABSTRACT

For many years, the most favorable conceptual data model is widely-used Entity-Relationship (ER) data model. A typical scenario of a database schema design process provided by majority of existing CASE tools is to create an ER database schema first and then transform it into the relational database schema and then to the executable database scripts. Such a scenario has many advantages, but also there are serious disadvantages. To overcome them, we discuss here an alternative approach and related techniques that are mainly based on the usage of Model Driven Software Development and Domain Specific Language paradigms. The main idea is to provide the necessary Platform Independent Model meta-level concepts to IS designers, so that they can easily model semantics in an application domain and then apply a number of complex algorithms to produce database schema specifications and IS executable code, without any considerable expert knowledge, by application of a chain of model-to-model and model-to-code transformations.

## Week 1

ADOXX TRAINING DAYS

| | 11 - 13 July | 16 July | 17 July |
|---|---|---|---|
| 09:00 - 10:00 | | **Opening Ceremony**<br>S. Rinderle-Ma, Dean, Fac. of Comp. Science<br>G. Volz, OeAD | **Strategic Actors Modelling: From Requirements Engineering to Enterprise Modelling**<br>E. Yu |
| 10:00 - 11:00 | | **AMME: How Metamodelling can support Digitalization**<br>D. Karagiannis | **Multi-Perspective Enterprise Modelling as a Foundation of IT-Business Alignment**<br>U. Frank, A. Bock |
| 11:00 - 11:30 | | B R E A K | B |
| 11:30 - 12:30 | | **Foundations and Principles of Conceptual Modelling**<br>W. Reisig | **Parallel Practice Session**<br>E. Yu/ U. Frank |
| 12:30 - 14:00 | | L U N C H | L |
| 14:00 - 15:00 | | **A Methodological Framework for Ontology-Driven Instantiation of Petri Net Manufacturing Process Models**<br>D. Kiritsis | **Capability-oriented Enterprise Modelling for Mastering Dynamic Business Contexts**<br>J. Zdravkovic |
| 15:00 - 16:00 | | **Conceptualization of Modelling Methods with ADoxx - Part I**<br>D. Bork | **The Role of Requirements in the Digital Age: Requirements Engineering Revisited**<br>M. Glinz |
| 16:00 - 16:30 | | B R E A K | B |
| 16:30 - 17:30 | | **Conceptualization of Modelling Methods with ADOxx - Part II**<br>D. Bork | **HILTI**<br>**Enterprise Architecture Management @Hilti**<br>M. Petry |
| | | **Get Together \| Open End** | |

## Week 2

LEISURE DAYS

| | 21 - 22 July | 23 July | 24 July |
|---|---|---|---|
| 09:00 - 10:00 | | **Domain Storytelling: A Modelling Approach for Business Processes**<br>H. Züllighoven, S. Hofer | **Supporting Business Process Improvement through a Modelling Tool**<br>F. Johannsen |
| 10:00 - 11:00 | | **Modelling for Ambient Assistance**<br>H.C. Mayr, J. Michael | **The Industrial Transition towards Product-Service-Systems: Articulating Enterprise Modelling and Economic Model Balancing**<br>X. Boucher |
| 11:00 - 11:30 | | B R E A K | B |
| 11:30 - 12:30 | | **Parallel Practice Session**<br>H. Züllighoven/ H.C. Mayr | **Parallel Practice Session**<br>F. Johannsen/ X. Boucher |
| 12:30 - 14:00 | | L U N C H | L |
| 14:00 - 15:00 | | **Value Modelling and understanding Risks in Networks of Enterprises**<br>J. Gordijn | **Capability Oriented Requirements Engineering**<br>P. Loucopoulos |
| 15:00 - 16:00 | | **Modelling Knowledge Action and Time: Action Theories and Their Application in Dynamic Domains**<br>D. Plexousakis, T. Patkos | **Advances in Model Language Engineering**<br>B. Rumpe |
| 16:00 - 16:30 | | B R E A K | B |
| 16:30 - 17:30 | | **DELOITTE**<br>**Champion of Disruption: the Blockcahin**<br>L. Kerschhofer-Wallner | **Domain Specific Modelling of Enterprise Architecture**<br>M. Rossi |

| 18 July | 19 July | 20 July |
|---|---|---|
| **Quality Assurance for BPMN Models**<br>A. Polini | **Modelling Knowledge Work: Integrating Decision-aware Business Processes and Case Management**<br>K. Hinkelmann | **OMiLAB NPO: An Introduction**<br>D. Karagiannis, M.K. Lee, E. Miron |
| **Participatory Enterprise Modelling with the 4EM Method**<br>J. Stirna, B. Lantow | **Semantic-based Modelling for Information Systems in SeMFIS**<br>H.G. Fill | **OMiLAB@work**<br>**A Smart City Case - Design Thinking Workshop**<br>Moderation: E. Miron |
| R E A K | B R E A K | |
| **Parallel Practice Session**<br>A. Polini/ J. Stirna | **Parallel Practice Session**<br>K. Hinkelmann/ H.G. Fill | **Team 1** **OMiLAB@work**<br>**A Smart City Case - Parallel Working Groups**<br>M. Walch, M. Kunz |
| U N C H | L U N C H | |
| **Teaching Conceptual Modelling: v to Guide the Conceptual Modelling Process of Students?**<br>M. Snoeck | **A User-Centric Platform PRINTEPS to Develop Integrated Intelligent Applications**<br>T. Yamaguchi | **Team 2** **OMiLAB@work**<br>**A Smart City Case - Parallel Working Groups**<br>V. Döller, D. Götzinger |
| **A Model Driven Approach to Specification and Generation of Information Systems and Databases**<br>I. Lukovic | **Collaborative and Well-Behaved Outdoor Robots in Harsh Environment**<br>J. Röning | **Team 3** **OMiLAB@work**<br>**A Smart City Case - Parallel Working Groups**<br>V. Kunnummel, A. Sumereder |
| R E A K | B R E A K | |
| **panese Creative Service as a Next Generation Enterprise Modelling**<br>H. Masuda, Y. Hara | **Integrated Decision and Process Modelling**<br>J. Vanthienen | **Team 4** **OMiLAB@work**<br>**A Smart City Case - Parallel Working Groups**<br>C. Muck, P. Burzynski |

| 25 July | 26 July | 27 July |
|---|---|---|
| **Business Processes for Business Communities**<br>A. Oberweis, A. Koschmider | **Process Modelling and Business Intelligence**<br>W. Grossmann, C. Moser | **STUDENT PRESENTATIONS** |
| **Semantic Queries and Reasoning on Domain-Specific Conceptual Models**<br>R. Buchmann, A.M. Ghiran | **Next-Generation Modelling for Enterprise Architecture Management**<br>A. Gerber, S. Eybers | **STUDENT PRESENTATIONS** |
| R E A K | B R E A K | |
| **Parallel Practice Session**<br>A. Oberweis/ R. Buchmann | **Parallel Practice Session**<br>W. Grossmann/ A. Gerber | **STUDENT PRESENTATIONS** |
| U N C H | L U N C H | |
| **Process Algebra to Model Distributed Mobile Real-Time IoT**<br>M.K. Lee | **Conceptualizing and Designing Value Co-Creation – an IS Perspective**<br>R. Winter | **STUDENT PRESENTATIONS** |
| **Practice Session**<br>M.K. Lee | **Grounded Enterprise Modelling**<br>E. Proper | **STUDENT PRESENTATIONS** |
| R E A K | B R E A K | |
| **ATOS ctors, Beverage Vending Machines and Rat Traps How to create Internet of Things Use Cases?**<br>G. Singer | **Enterprise Modelling and Information Security**<br>M. Kirikova | **Closing Ceremony** |

# JAPANESE CREATIVE SERVICE AS A NEXT GENERATION ENTERPRISE MODELLING

**Dr. Hisashi Masuda, Kyoto University, Japan**
**Prof. Dr. Yoshinori Hara, Kyoto University, Japan**

## ABSTRACT

We define Japanese creative services and discuss how they have been sustained successfully and its application to global service enhancement. There are many ``Shinise" (shops of long standing) service companies in Japan that are quite unique compared to the companies located in any other geographical region. They typically have anecdotal values based on nature and seasons, various types of culture, histories, and/or lifestyles. Several Japanese creative services are expanding their activities toward global markets. We explain the mechanisms of the sustainability and scalability of advanced cases of Japanese Creative Services. A key aspect of the mechanism is a communication between service providers and consumers based on sharing/interpreting/utilizing of tacit context in a community. For analyzing the key aspect, we propose the combined approach of sociology/anthropology, psychology, engineering and design thinking. We developed a meta-modelling platform for handling the combined analysis of the Japanese Creative Services. We believe that this kind of approach will contribute to creating new values within the field of service science and for value-added global services.

## BIO

Dr. Hisashi Masuda serves as program-specific senior lecturer, Graduate School of Management, Kyoto University. He received his Ph.D. from Kyoto University in 2013 and served as assistant professor, Japan Advanced Institute of Science and Technology in 2013-2017. His research interest is related to new business model and marketing research method to develop and sustain not only simple services but also complex ones. And also he is focusing on how to empower such business directions by using current digital technologies.

Dr. Yoshinori Hara serves as professor, Graduate School of Management, Kyoto University. His current research focus includes innovation management, service and design management, and open innovation with IT frameworks. Prior to joining Kyoto University, he held various research and key management positions at R&D organizations in NEC Corporation, for 13 years in Japan, and for 10 years in the Silicon Valley, California, USA. He was responsible for conducting research and development on advanced ubiquitous computing including Web/Hypermedia systems, mobile & embedded systems, adaptive user interfaces, advanced information retrieval technologies, system security & reliable systems, etc. From 1990 to 1991, he was a Visiting Researcher at the Department of Computer Science, Stanford University. He received his B.E. and M.E. from University of Tokyo, and his Ph.D. from Kyoto University.

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# MODELLING KNOWLEDGE WORK: INTEGRATING DECISION-AWARE BUSINESS PROCESSES AND CASE MANAGEMENT

**Prof. Dr. Knut Hinkelmann, FHNW, Switzerland**

## BIO

Prof. Dr. Knut Hinkelmann is Head of the Master of Science in Business Information Systems at the FHNW University of Applied Sciences and Arts Northwestern Switzerland. He also is adjunct professor at the University of Camerino, Italy, and research associate at the University of Pretoria, South Africa. In 1988 he obtained a diploma in Computer Science and in 1995 a PhD from the University of Kaiserslautern. After the study he worked for the Research Institute for Applied Knowledge Processing (FAW). Then he was researcher and head of the Knowledge Management research group at the German Research Center for Artificial Intelligence (DFKI). After having worked as product manager for Insiders Information Management GmbH, he joined FHNW in August 2000 as a professor for Information Systems.

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## ABSTRACT

Modelling Knowledge Work is based on two principles: (1) the separation of business logic and process logic and (2) the support of both structured and unstructured knowledge. Case management is the management of long-lived, non-structured collaborative processes that require knowledge and information. The path of case execution cannot be predefined but depends on human skills and judgment. The OMG recently developed the Case Management Modelling and Notation (CMMN). For real processes, however, there is no strict separation between structured processes and cases. The lecture will show how case modelling can be integrated with business process modelling in BPMN. Decision-aware business processes separate business logic from process flow, making process models simpler and easier to modify. This can be achieved by combining process modelling with decision modelling (e.g. using DMN) and having decision data available in structured format. The modelling of knowledge work will be demonstrated with the Knowledge Work Designer.

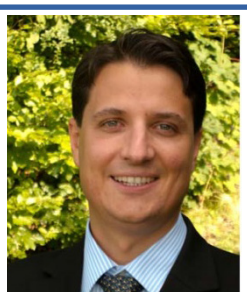
# SEMANTIC-BASED MODELLING FOR INFORMATION SYSTEMS IN SEMFIS

**Prof. Dr. Hans-Georg Fill, University of Bamberg, Germany**

## ABSTRACT

In this talk an introduction to semantic-based modelling and the SeMFIS platform will be given. At its core, semantic-based modelling characterizes the use of semi-formal conceptual models together with formal semantic schemata such as ontologies, thesauri or controlled vocabularies. The talk will enable participants to understand the theoretical and practical foundations for applying semantic-based modelling to the design and analysis of information systems. In particular it will be reverted to the ADOxx-based SeMFIS platform that constitutes a flexible engineering platform for realizing semantic annotations of conceptual models and that is provided for free via OMiLAB (http://semfis-platform.org/). The approach will be illustrated with applications in semantic business process management, semantic-based simulation and semantic visualization of enterprise models.

Dr. Hans-Georg Fill is currently substituting a full professor position for business informatics and development of information systems at the University of Bamberg, Germany. He holds a habilitation and a PhD in business informatics and a master in international business administration from University of Vienna. His research interests are in the areas of meta modelling, enterprise modelling, semantic information systems and visualization. From 2010-2011 he has led an Erwin-Schrödinger research project at Stanford University, which established the foundations for the SeMFIS approach. He has developed and co-developed several modelling tools and platforms including the SeMFIS platform for the semantic annotation of conceptual models, the RUPERT modelling toolkit for business process improvement, the ADOxx Horus modelling toolkit for business process management, and the PSS Scenario Modeller for analyzing product-service systems. He is an active contributor to the OMiLAB.org open source infrastructure where he initiated the development of the GraphRep Generator, the Model Annotator and the REST-API projects.



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# A USER-CENTRIC PLATFORM PRINTEPS TO DEVELOP INTEGRATED INTELLIGENT APPLICATIONS

**Prof. Dr. Takahira Yamaguchi, Keio University, Japan**

## BIO

Prof. Dr. Takahira Yamaguchi is a professor at the Faculty of Science and Technology at Keio University. He received his B.E., M.E., and Ph.D. degrees in telecommunication engineering from Osaka University in 1979, 1981, and 1984, respectively. His research interests include Ontology Engineering, KBSE, Advanced Knowledge Systems, and Machine Learning. He is a member of IPSJ, JSAI, JSFTS, JCSS, ISSJ, AAAI, IEEE-CS, and ACM..

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## ABSTRACT

We are developing PRactical INTEligent aPplicationS (PRINTEPS), which is a user-centric platform to develop integrated intelligent applications only by combining four types of modules such as knowledge-based reasoning, speech dialog, image sensing and motion management. PRINTEPS supports end users to participate in AI applications design and to develop applications easily. This lecture introduces the architecture and applications of PRINTEPS for robot cafe and teaching assistant robot.

# COLLABORATIVE AND WELL-BEHAVED OUTDOOR ROBOTS IN HARSH ENVIRONMENT

**Prof. Dr. Juha Röning, University of Oulu, Finland**

## ABSTRACT

Collaboration between robots of different domains is necessary in many disaster scenarios, for example by utilizing unmanned aerial vehicles for coarse area mapping and using unmanned ground and surface vehicles to perform environment manipulation. In this talk I will consider challenges with robots operating on harsh environment collaborating with humans and other robots. There are numerous robotics competitions, ranging from those of mainly educational purpose, to those whose goal is to inspire and promote new cutting-edge research with significant prizes, with numerous competitions being some mixture of the these two goals. ERL Emergency is a competition of this mixed category and its participants range from university students to experienced academic and industry professionals. Amongst all the listed competitions, ERL Emergency is unique in its incorporation of all the three main robotics domains of air, land and water. In ERL Emergency, successful teams must be able to set up and use highly heterogeneous and interconnected robots to complete highly complex search-and-rescue and other emergency related tasks in varied environments. In short, ERL Emergency tests the capabilities of multi-robot systems in SAR and other disaster scenarios. In this talk, the challenges and hands-on experiences on realistic scenarios and terrains are presented. It includes a series of event arrange in European Land Robot Trial, euRathlon and now under umbrella of ERL. Also a new testing site, OuluZone, where the harsh weather conditions, unevenness on terrain and dynamic driving conditions challenge outdoor robots. Our aim is to provide reliable operation in any conditions. An ultimate goal is to provide a driving license for autonomous heavy machines.

## BIO

Prof. Dr. Juha Röning is Professor of Embedded System at the University of Oulu. He serves also as Visiting Professor of Tianjin University of Technology, P. R. China. He is principal investigator of the Biomimetics and Intelligent Systems Group (BISG). In 1985 he received Asla/Fullbright scholarship. From 1985 to 1986 he was a visiting research scientist in the Center for Robotic Research at the University of Cincinnati. From 1986 to 1989 he held a Young Researcher Position in the Finnish Academy. In 2000 he was nominated as Fellow of SPIE. He has two patents and has published more than 300 papers in the areas of computer vision, robotics, intelligent signal analysis, and software security. He is currently serving as a Board of Director for euRobotics aisbl.

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# INTEGRATED DECISION AND PROCESS MODELLING

**Prof. Dr. Jan Vanthienen, KU Leuven, Belgium**

## BIO

Prof. Dr. Jan Vanthienen is full professor of information systems at KU Leuven (Belgium), Department of Decision Sciences and Information Management, Information Systems Group, where he is teaching and researching on business intelligence, analytics, business rules & processes, decision modelling, and business information systems. He has published numerous papers in reviewed international journals and conference proceedings. Jan is a founding member and coordinator of the Leuven Institute for Research in Information Systems (LIRIS). He received the Belgian Francqui Chair 2009 at FUNDP and an IBM Faculty Award in 2011. He is co-founder and president-elect of the Benelux Association for Information Systems (BENAIS). Jan is actively involved in the Decision Modelling & Notation standard (DMN) at OMG (Object Management Group). This standard is designed to complement the Business Process Modelling & Notation (BPMN) standard, in order to integrate and distinguish business processes and business decisions. He is also member of the IEEE task force on process mining, and co-author of the Business Process Mining Manifesto.

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## ABSTRACT

Modelling business processes is essential for business effectiveness and efficiency. But not all business processes can easily be modelled as simple arrangements of flows and activities. Business processes, and certainly knowledge-intensive processes, incorporate lots of decisions and decision knowledge, that should not be hidden in process flows or activities, because hard-coding (decision) rules in processes leads to complex and inflexible process models. In analogy with the Business Process Modelling & Notation Standard (BPMN), a Decision Model & Notation standard (DMN) was developed, that allows to model the decisions separately, thereby simplifying the process model. A decision model describes business decisions, with their interrelationships and requirements, together with the detailed decision logic used to make the decision. This session is about the basics of decision modelling, but mainly about how decision models and process models should be combined (and separated) into an integrated model of processes and decisions.

# DOMAIN STORYTELLING: A MODELLING APPROACH FOR BUSINESS PROCESSES

**Prof. Dr. Heinz Züllighoven, University of Hamburg & WPS, Germany**
**Dr. Stefan Hofer, WPS - Workplace Solutions GmbH, Germany**

## ABSTRACT

Understanding and describing requirements is probably the greatest challenge in a software development project. Only well-known and well-understood requirements can be successfully implemented. Requirements engineering is a learning and communication process for us. The domain experts need to validate the requirements documentation so that it is possible to detect mistakes and misunderstandings. With Domain Storytelling we use the principles of learning a new human language. Let experts tell their domain stories. While listening, we record the domain stories using a pictographic language. The domain experts can see immediately whether we have understood their story correctly. After very few stories, we will be able to talk about people, tasks, tools, work items, and events in a domain. Domain Storytelling is an example-based approach for modelling selected business processes and their IT support. The models are easy to understand for people in different departments, business organizations and their specialists alike. The method aims at common understanding and communication about the processes which are modelled. Characteristics of Domain Storytelling are: cooperative business processes, simple pictograms make models easy to comprehend, processes are structured along the lines of "who makes what with whom". The initial lecture will present the conceptual basis of Domain Storytelling, putting business process modelling into the context of application-oriented software development. It will characterize software development as a learning and communication process with a strong need for feedback among all parties concerned. The basic principles and concepts of Domain Storytelling will be explained. The tutorial will provide hands-on experience.

## BIO

Prof. Dr. Heinz Züllighoven, graduated in Mathematics and German Language and Literature, holds a PhD in Computer Science. From 1991 until 2015 he held a chair in software architecture at the University of Hamburg and was head of the attached Software Technology Centre. He is one of the original designers of the Tools & Materials approach to object-oriented application software and the eGPM approach which preceded Domain Storytelling. Since 2000, Heinz Züllighoven is also one of the managing directors of WPS Workplace Solutions Ltd. He has published a number of papers and books on various software engineering topics. Among his current research interests are a revision of the Tools & Materials approach in the light of new interaction means of current frontend technologies and the architecture of large industrial software systems. In addition, he an his co-researchers are further developing the tool support for Domain Storytelling.

Dr. Stefan Hofer studied Software Engineering in Austria and wrote his PhD thesis on the transformation of application landscapes. He has been working at WPS since 2005 where requirements analysis became his main interest. With Domain Storytelling, he promotes a visual approach for learning domain language.

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# MODELLING FOR AMBIENT ASSISTANCE

**Prof. Dr. Heinrich C. Mayr, Alpen Adria University Klagenfurt, Austria**
**Dr. Judith Michael, RWTH Aachen University, Germany**

## BIO

Prof. Dr. Heinrich C. Mayr has been a full professor of Informatics at Universität Klagenfurt since 1990, leading the Application Engineering Research Group. Until then he was an assistant professor at the University of Karlsruhe , visiting professor at several universities, and CEO of a German software company. His research is documented in over 220 publications and includes information system design methodologies, requirements and model engineering, and knowledge management. He was the President of Gesellschaft für Informatik. For 6 years he served as Rector of the University. Currently he is editor in chief of the "Lecture Notes in Informatics", chair of the ER steering committee, chair of the council of the Software Internet Cluster SIC, and Member of the TC "Wirtschaftsinformatik" of the German Accreditation Organisation ASIIN.

Dr. Judith Michael received her doctorate in Informatics from the Universität Klagenfurt in 2014. From 2006, she has worked as a software engineer and consultant in IT-companies, and as a University assistant and senior scientist at the Application Engineering Research Group. Currently, she is a senior scientist and project leader at the Software Engineering Department of RWTH Aachen University, head of the Supervisory Board of Lakeside Science & Technology Park GmbH, and Junior Fellow of Gesellschaft für Informatik GI.

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## ABSTRACT

Ambient Assistance is a challenging field for software engineers and computer scientists in both, research and application, with lots of ques-tions to answer and technical solutions to find. The range of applications is broad and covers everyday situations in private and business envi-ronments as well as support for people with special needs. Using smart sensor based Activity Recognition Systems, life video analysis tech-niques as well as speech recognition human cen-tred assistance becomes feasible and affordable. Dealing with the support of humans, it is an in-terdisciplinary field affecting Psychology, Neu-rology, Medicine, Law, Philosophy, and others more. Models play a key role in ambient assistance sys-tems as they act as the integral means for data and knowledge acquisition, representation, evaluation and exchange for the various system components. The lecture will start with a short overview of already existing best practice examples and then work out the key notions and concepts that form the basis for domain specific modelling in this field concerning both, the application domain as well as the interfaces of an integrated ambient assistance system. A model-centered architecture for such kind of digital ecosystems will be presented. Students will gain deeper insight in the practice session headed by Dr. Judith Michael .

# VALUE MODELLING AND UNDERSTANDING RISKS IN NETWORKS OF ENTERPRISES

**Prof. Dr. Jaap Gordijn, Vrije University, The Netherlands**

## ABSTRACT

Enterprises increasingly offer IT-intensive services in network. For example Netflix heavily relies on IT, and requires partners such as Internet access providers and hosting providers. We present a methodology, called e3value to conceptualize such a network in terms of commercial actors, and what they exchange of economic value with each other. However, most business networks are subject to risk of fraud. Therefore, we also analyse this risk using an extension of e3value, called e3fraud. After this talk, you will know the most important terminology used to express business models and their associated risks.

## BIO

Prof. Dr. Jaap Gordijn is associate professor at the Vrije Universiteit Amsterdam, Computer Science department and founding director of The Value Engineers. His research focusses on the design process of commercial electronic services (e.g. NetFlix or Spotify). He published over 120 scientific papers at international conferences, workshops, and journals. In addition to his academic career, he also has extensive experience in industry. He has worked for Bakkenist Management Consultants, Deloitte & Touche, and the Internet Business Solution Group of Cisco Systems (IBSG). This group advises the Fortune 500 companies worldwide regarding their e-business strategy. Jaap holds a PhD degree from the Vrije Universiteit Amsterdam, Computer Science, a MSc/BSc degree in Information Science, University of Tilburg, Economics Faculty, and BSc degree in Technical Computer Science. During his consultancy practice, he acted as business developer, and advised many starting companies, but also multi-nationals, and specifically networks of enterprises. His current interest is in the digital content industry and Fintech. Jaap is advisor of Intellectual Music Property Societies in The Netherlands, and works with banks to develop innovative banking services based on blockchain technology.

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# MODELLING KNOWLEDGE ACTION AND TIME: ACTION THEORIES AND THEIR APPLICATION IN DYNAMIC DOMAINS

**Prof. Dr. Dimitris Plexousakis, University of Crete & FORTH-ICS, Greece**
**Dr. Theodore Patkos, FORTH-ICS, Greece**

## BIO

Prof. Dr. Dimitris Plexousakis is a Professor of Computer Science at the Univ. of Crete and Director of the Institute of Computer Science of FORTH. He obtained a PhD in Computer Science from the Univ. of Toronto in 1996. His research interests lie in the areas of Conceptual Modelling, Knowledge Representation and Reasoning; Formal models and query languages for the Semantic Web; process and service modelling. He has extensive experience in coordinating and participating in National and European Projects and over 200 publications in peer-reviewed journals and conferences.

Dr. Theodore Patkos is a postdoctoral researcher at FORTH-ICS. He holds a PhD in Computer Science from the University of Crete since 2010 studying formal methods for commonsense reasoning in dynamic environments and their application to Ambient Intelligence domains. His research interests include knowledge representation and non-monotonic reasoning with emphasis on action languages, contextual and commonsense reasoning, multi-agent systems, argumentation and formal knowledge representation models for the Semantic Web.

## ABSTRACT

The modelling of knowledge, action and time is a topic of current research within the broader domain of knowledge representation and reasoning. The course will focus on declarative approaches for modelling and reasoning with change, paying particular attention to the integration of knowledge and action. As time is inherent in any type of activity and process, the course will also deal with the representation of temporal properties that characterize the occurrence of actions and the knowledge they generate. Practical aspects of reasoning about knowledge, action and time will be discussed in the context of solving constraint satisfaction problems for business process optimization. Students will have the ability to work with software implementing non-monotonic and event-based formalisms, and to understand the benefits of coupling such tools and methodologies with modelling tools, like the ADOxx metamodelling platform.

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# CHAMPION OF DISRUPTION: THE BLOCKCHAIN

**Dr. Ljuba Kerschhofer-Wallner, Deloitte, Germany**

## ABSTRACT

While many people have not even heard about it and others think that it is just another buzz word from the Silicon Valley, the blockchain - in fact - has the potential to disrupt many if not all industries. This is because the blockchain fundamentally changes the way, how (financial) transactions are taking place. The concept of blockchain arouse from the need for a trusted ledger to authenticate transactions without a central authority. It's concept and technology bears many advantages, such as near-instantaneous transactions, greater operational efficiency and reduced transaction costs, transaction verification without a central authority and protection against single points of failure. Although the blockchain gained interest in the financial industry first, meanwhile more and more industries are about to discover the potential of the blockchain. Countless start-ups are inspired by the blockchain to build their business idea on it and improve its concept and technology. As such, we can most certainly expect the emergence of a diverse eco-system built on the blockchain.

## BIO

Dr. Ljuba Kerschhofer-Wallner is a Senior Manager at Deloitte specialized in software license compliance, data privacy and contract management. Her client focus is on the automotive industry. Before joining Deloitte, Ljuba was the head of the contract, claim and change managements in the BWI, Europe's biggest public-private-partnership and joint venture of Siemens, IBM and the German Federal Army. Ljuba started her career in the IT outsourcing division of Siemens. She has a degree in natural sciences.

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# SUPPORTING BUSINESS PROCESS IMPROVEMENT THROUGH A MODELLING TOOL

**Prof. Dr. Florian Johannsen, University of Bremen, Germany**

## BIO

Prof. Dr. Florian Johannsen currently holds the position of a locum professor for Industrial Services in the "Department of Economics" at the University of Bremen. He successfully completed his postdoctoral thesis in October 2017 and was appointed private lecturer (Privatdozent) at the University of Regensburg. He received his doctoral degree at the University of Regensburg in March 2011, where he worked as a research assistant and postdoctoral researcher from 2006 to 2017. During that time, he led several projects with partners from industry and published his research at highly regarded conferences and in reputable journals.

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## ABSTRACT

Business Process Improvement (BPI) ranks among the topics of highest priority in modern organizations. However, considering the rapidly changing customer requirements in times of high market transparency and the increasing collaboration between organizations, the conduction of BPI projects has become very challenging. Implicit process knowledge from diverse process participants needs to be elicited and transformed into improvement opportunities. In this context, the results achieved need to be properly documented, communicated and processed throughout a company. The purpose of the lecture is to present a conceptual solution (called "BPI roadmap"), which is a means for systematically performing BPI initiatives based on a set of easy-to-use and proven BPI techniques. In the in the tool "RUPERT" (Regensburg University Process Excellence and Reengineering Toolkit), the BPI techniques are realized in form of corresponding model types. The lecture gives insights into the development of the "BPI roadmap" and "RUPERT" and demonstrates the tool's functionality by referring to a use case stemming from a cooperation project.

# THE INDUSTRIAL TRANSITION TOWARDS PRODUCT-SERVICE-SYSTEMS: ARTICULATING ENTERPRISE MODELLING AND ECONOMIC MODEL BALANCING

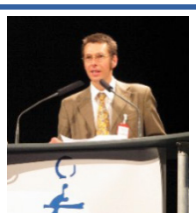
**Prof. Dr. Xavier Boucher, Ecole des Mines de Saint Etienne, France**

## ABSTRACT

The current industrial transition towards Factories of the Future (FoF) implies strong transformation of enterprise Business Models within the manufacturing sector. Product Service Systems are a key component of this transition, and contribute to renovate both the underlying enterprise models and the needs of enterprise engineering tools. The objective of the lecture is to articulate the overall needs of transition towards FoF with the requirements for innovative conceptual modelling approaches and new enterprise engineering methods and tools. The lecture will first give a synthetic insight on PSS within the context of FoF, to make possible for the audience to understand the key concepts of PSS and key industrial needs for developing innovative enterprise modelling and engineering solutions. The second part of the lecture articulate two dimensions of Enterprise engineering: an advanced modelling method dedicated to support PSS design and engineering (based on a PSS-oriented meta-model) and a decision-making approach for PSS economic-model balancing.

## BIO

Prof. Dr. Xavier Boucher is Professor in Industrial Management at the Ecole des Mines de Saint Etienne (France). He is Research Director at FAYOL Institute, a research Center focusing on Sustainable Industrial performance and Organisations. His current research focuses on Product Service Systems (PSS), Service oriented production systems, collaborative-agile networks and decision models to manage the supply chain agility. Prof. X. Boucher is currently leading several collaborative research projects in the field of design and management of PSS with an economic and manufacturing point of view.



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# CAPABILITY ORIENTED REQUIREMENTS ENGINEERING

**Prof. Dr. Pericles Loucopoulos, University of Manchester, UK**

## BIO

Prof. Dr. Pericles Loucopoulos holds appointments at the School of Computer Science of the University of Manchester (UK) and at the Department of Informatics of Harokopio University of Athens (Greece). His research has been supported by numerous research grants supporting over 25 research projects, most of them in collaboration with industry. He is the editor-in-chief of the Journal of Requirements Engineering and also serves as Associate Editor on 15 other journals. His research focus is on the use of conceptual modelling for achieving alignment between enterprise and information technology systems with particular focus on requirements specification and analysis. He has developed the Enterprise Knowledge Development (EKD) and more recently the Capability Oriented Requirements Engineering (CORE) methods, both of which are part of the Open Models Initiative (OMI) platform. He is a member of a number of international professional bodies, has served as General Chair or Programme Chair of many international conferences and has served on over 300 conference programme committees. He has been awarded the Edelman Laureate medal and the President's Medal of the UK OR Society. He has authored 9 books, edited 23 books and conference proceedings and has published over 200 papers in journals and international conferences.

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## ABSTRACT

The NEMO 2018 lecture and associated exercise concerns an approach to the application of conceptual modelling known as the Capability Oriented Requirements Engineering (CORE) approach. The conceptual modelling framework applied in CORE employs a set of complimentary and intertwined modelling paradigms based on enterprise capabilities, goals, actors, and information objects. The lecture will define the foundational concepts of CORE as well as the way of working from capturing textual descriptions from stakeholders, progressing to formally defining models of early requirements, based on the CORE meta-model, and in a stepwise refinement define functional and non-functional requirements of desired systems. The theory will be supplemented by examples from a real application of CORE on a Cyber Physical Production System.

# ADVANCES IN MODEL LANGUAGE ENGINEERING

**Prof. Dr. Bernhard Rumpe, RWTH Aachen University, Germany**

## ABSTRACT

Modelling is key for any engineering discipline to design a system and to early understand its quality. Effective modelling needs appropriate modelling languages, because as already Wittgenstein said: „The borders of my language are the borders of my world." General consensus of model-driven engineering is, that domain-specific modelling languages help to reduce the "conceptual gap" between problem domains and software implementation. In this talk, we examine advances in how the concepts for language definition have evolved, and how the tool implementation are assisted by modern language workbenches. We examine concepts like language reuse, composition, refinement, extension, management of language variants and how to migrate models between versions.

## BIO

Prof. Dr. Bernhard Rumpe is heading the Software Engineering department at the RWTH Aachen University, Germany (one of the top three universities in CS as well as Mechanical Engineering). Earlier he had positions at INRIA/IRISA, Rennes, Colorado State University, TU Braunschweig, Vanderbilt University, Nashville, and TU Munich. His main interests are rigorous and practical software and system development methods based on adequate modelling techniques. This includes agile development methods like XP and SCRUM as well as model-engineering based on UML-like notations and domain specific languages. He has to many modelling techniques, including the UML standardization. He also applies modelling, e.g. to autonomous cars, human brain simulation, BIM energy management, juristical contract digitalization, production automation, cloud, and many more. In his projects he intensively collaborates with all large German car manufacturers, energy companies, insurance and banking companies, a major aircraft company, a space company as well as innovative start-ups in the IT-related domains. He is author and editor of ten books and Editor-in-Chief of the Springer International Journal on Software and Systems Modelling (www.sosym.org). His newest books „Agile Modelling with the UML" and „Engineering Modelling Languages: Turning Domain Knowledge into Tools" were published in 2016 and 2017.

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# DOMAIN SPECIFIC MODELLING OF ENTERPRISE ARCHITECTURE

**Prof. Dr. Matti Rossi, Aalto University, Finland**

## BIO

Prof. Dr. Matti Rossi is a professor of information systems at Aalto University School of Business. He is currently a visiting scholar at NYU Stern School of Business. He is the current president of the Association for Information Systems. He has been the principal investigator in several major research projects funded by the technological development center of Finland and Academy of Finland. He was the winner of the 2013 Millennium Distinction Award of Technology Academy of Finland for open source and data research. His research papers have appeared in journals such as MIS Quarterly, Journal of AIS, Information and Management and Information Systems. He has been a senior editor of JAIS and Database, and an associate editor for MIS Quarterly, and he is the past editor in chief of Communications of the Association for Information Systems. He is a member of IEEE, ACM and AIS.

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## ABSTRACT

The lecture introduces students to developing new modelling languages through Domain Specific Modelling approach with MetaEdit+ platform. During this lecture the students will get an overview of working with MetaEdit+ when developing DSM's and they can develop a support environment for their own modelling language through an exercise. The tool allows language developers to rapidly build and evolve their methods and then try them out on the fly. As an example of a developed language I use an enterprise architecture language for strategic architecture in the health care domain.

# BUSINESS PROCESSES FOR BUSINESS COMMUNITIES

**Prof. Dr. Andreas Oberweis, Karlsruhe Institute of Technology, Germany**
**Dr. Agnes Koschmider, Karlsruhe Institute of Technology, Germany**

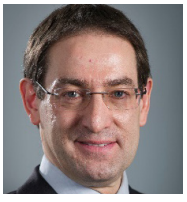
## ABSTRACT

Business processes in the age of the internet are typically not restricted to single organizations but cross organizational borders to customers, suppliers and other organizations. The design of business processes for these business communities is a complex collaborative task, which requires special methodological support. This course introduces Horus, which includes a set of modelling methods and languages to support the whole life cycle of business processes within business communities. Horus is based on high-level Petri Nets for procedure modelling and provides additional modelling support for objects, resources, organizational structures, business goals and business rules. Simulation based concepts are provided to evaluate models. Besides describing the basic concepts of Horus, the course also gives an overview about ongoing research work.

BIO

Prof. Dr. Andreas Oberweis is professor at the Karlsruhe Institute of Technology (KIT), Institute of Applied Informatics and Formal Description Methods. He is Research Director and Member of the Board of FZI Research Center for Information Technology Karlsruhe. He is co-founder of several companies in the field of Business Process and Software Engineering.

Dr. Agnes Koschmider is a senior researcher at the Karlsruhe Institute of Technology (KIT), Institute of Applied Informatics and Formal Description Methods. Her current research focuses on predictive behavior analysis and the extraction of process models from sensor logs in order to support decision-making processes.



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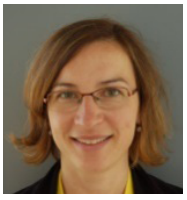

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# SEMANTIC QUERIES AND REASONING ON DOMAIN-SPECIFIC CONCEPTUAL MODELS

**Prof. Dr. Robert Buchmann, Babes Bolyai University, Romania**
**Dr. Ana-Maria Ghiran, Babes Bolyai University, Romania**

## BIO

Prof. Dr. Robert Buchmann received his doctoral degree in the field of E-commerce application models from Babeş-Bolyai University of Cluj Napoca, Romania, in 2005. Since then, he has been specializing in Semantic Technology and Conceptual Modelling, as enablers for Knowledge Management Systems and Enterprise Architecture Management. During 2012-2015 he occupied a postdoctoral research position at University of Vienna, specializing in Agile Modelling Method Engineering, while managing metamodelling and requirements engineering tasks for the ComVantage FP7 project. Currently, he occupies a Professor position at UBB and is a Scientific Director of the University's Business Informatics Research Center, where his team is investigating opportunities of interplay between the paradigms of Semantic Web, Enterprise Modelling and Requirements Engineering.

Dr. Ana-Maria Ghiran is experienced with the Semantic Web technological space, as she had applied it in her own doctoral research developed at Babeş-Bolyai University of Cluj Napoca, in the field of IT Infrastructure Auditing. She has been involved in teaching and developing the „Information Systems Security" and „Semantic Web" disciplines for the Business Information Systems Department at the same university. Currently she is investigating the Conceptual Modelling paradigm and applications of semantic technology in model-driven software engineering.

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## ABSTRACT

The interplay between ontologies and domain-specific conceptual modelling languages was traditionally concerned with the challenge of „ontological commitment" - i.e., the language is expected to have some ontological qualities, in order to enforce coherence and consistency in model contents. An alternative approach to coupling the two worlds will be promoted by this lecture, motivated by pragmatic semantic interoperability and knowledge externalisation requirements: agile modelling languages are treated here as means of knowledge representation that are amenable to reasoning, linking and publishing through techniques that have been established by the Semantic Web paradigm - i.e., RDF graph databases, OWL axioms, SPARQL queries and endpoints. The presentation highlights the benefits of combining the Agile Modelling Method Engineering Framework with the Resource Description Framework in order to build novel knowledge acquisition methods. The lecture will present results originally proposed in the context of the ComVantage FP7 research project and further developed in follow-up projects.

# PROCESS ALGEBRA TO MODEL DISTRIBUTED MOBILE REAL-TIME IOT

**Prof. Dr. Moon Kun Lee, Chonbuk National University, Korea**

## ABSTRACT

In general, process algebra can be the most suitable formal method to specify IoT systems due to the equivalent notion of processes as things. However there are some limitations for distributed mobile real-time IoT systems. For example, Timed pi-Calculus has capability of specifying time property, but is lack of direct specifying both execution time of action and mobility of process at the same time. And d-Calculus has capability of specifying mobility of process itself, but is lack of specifying various time properties of both action and process, such as, ready time, timeout, execution time, deadline, as well as priority and repetition. In order to overcome the limitations, this lecture presents a process algebra, called, dT-Calculus, extended from d-Calculus, by providing with capability of specifying the set of time properties, as well as priority and repetition. Further the method is implemented as a tool, called SAVE, on the ADOxx meta-modelling platform. It can be considered one of the most practical and innovative approaches to model distributed mobile real-time IoT systems.

## BIO

Prof. Dr. Moonkun Lee is professor in the Division of Computer Science and Engineering at Chonbuk National University, Republic of Korea. Received Bachelor degree in Computer Science, Pennsylvania State University, USA; Master and Ph.D. degrees in Computer & Information Science, The University of Pennsylvania, USA. Worked at CCCC, USA, as Computer Scientist; Developed SRE (SW Re/reverse-engineering Environment); Applied to modernization of legacy OS and SW of NSWC in US Navy to Ada. Main research interests are SW round-trip engineering, distributed real-time systems, formal methods, ontology, behaviour engineering, etc. Currently focused on collective behaviour engineering for distributed mobile systems with δ-Calculus and Behavior Ontology in SAVE and PRISM on ADOXX.

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# TRACTORS, BEVERAGE VENDING MACHINES AND RAT TRAPS - HOW TO CREATE INTERNET OF THINGS USE CASES

**Dr. Georg Singer, Atos, Austria**

## BIO

Dr. Georg Singer is currently working as Business Development Manager for Business and Platform Solutions at Atos in Vienna, Austria. Prior to joining Atos he worked as a Senior Innovation Manager building a smart home system for OSRAM in Munich and has held a number of additional innovation- and business development related roles in Austria and Estonia. He has studied physics, business administration and computer science.

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## ABSTRACT

Three customer use cases demonstrate how the internet of things can be used in practice. Because regardless of being an agricultural manufacturer, drink producer or a pharmaceutical company IoT can make your life easier. With IoT we can transform digital visions and strategies via technology into business value and (innovative) Business Models and can create specifically tailored solutions for our customers.

# PROCESS MODELLING AND BUSINESS INTELLIGENCE

**Prof. Dr. Wilfried Grossmann, University of Vienna, Austria**
**Christoph Moser, University of Vienna, Austria**

## ABSTRACT

Business Process Modelling (BPM) and Business Intelligence (BI) are two important areas in business informatics, which are treated, often rather separated from each other. Looking at the literature and the activities in the two areas shows that process modelling takes a look at the business from a more production and organizational oriented view, whereas business intelligence activities emphasize more the role of the customer in the business process.In this lecture we want to take a unified view onto these two approaches and show how BPM and BI support each other. For demonstration we use the activities of data understanding and data provisioning which are at the beginning of any BI activity. Due to the abundance of data on the Internet integration of traditional data sources and big data is a challenging task. We present a process model for data integration and show how this model can be realized using the ADOxx platform. The basic idea of the model is simultaneous processing of the data workflow and the associated workflow of the metadata which describe the data processing activities. Such a model supports better understanding of the data and extends traditional methods for accessing data quality.

## BIO

Prof. Dr. Wilfried Grossmann is retired professor at the Faculty of Computer Science at the University Vienna. He got his PhD at the University Vienna in Mathematics and has worked and published in the areas Information Management, Mathematical Statistics, Applied Statistics, Statistical Computing, Operations Research, and Metadata. In connection with his research he has participated in European research programs in Official Statistics (Eurostat) as project coordinator and as work group leader. From 2005-2010 he was chair of the Quality Board of Statistics Austria and vice chair of the Austrian Statistics Council. At the moment his main interests are Business Analytics, Applied Statistics and Information Management.

Christoph Moser is PhD student at the University Vienna.

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# NEXT-GENERATION MODELLING FOR ENTERPRISE ARCHITECTURE MANAGEMENT

**Prof. Dr. Aurona Gerber, Universoty of Pretoria, South Africa**
**Dr. Sunet Eybers, University of Pretoria, South Africa**

## BIO

Prof. Dr. Aurona Gerber is an Associate Professor in the Department of Informatics and Information Systems at the University of Pretoria in South Africa. She worked as a bursar at Council for Scientific and Industrial Research. For her masters degree she investigated developing switching algorithms and programs for a massively parallel computer with up to 246 processors. She worked in industry, developing software for various systems such as radar control and multiplexer switches. As consultant she was involved in the development of one of the first internet database applications (in South Africa). She completed a PhD on Semantic Web technologies and worked as researcher in ontology engineering and enterprise architecture, as well as the establishmnt of a research group in applied Artificial Intelligence. She published more than 40 accredited publications and supervised more than 10 postgraduate masters and doctoral students to completion of their degrees.

Dr. Sunet Eybers is currently working as a Senior Lecturer in the Department of Informatics and the University of Pretoria. Her main duties include teaching and learning, research, curriculum development and post-graduate supervision. She s an accomplished Project Manager with over 10 years management experience through the full Information Systems spectrum, including Business Intelligence, Software Development, Training and Operations Management

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## ABSTRACT

Changing customer needs and technology disruption, as well as a highly competitive market setting and the emergence of platform business models are only a few challenges today's enterprises must face. In addition to these external factors, enterprises are experienced increasing complexity internally, for instance consisting of several components that need to be integrated and aligned. In order to survive, enterprises or businesses need to be agile enough to swiftly adapt to changing operating environments.Enterprise Architecture Management (EAM) is a research field that focuses on assisting modern enterprises to deal with an increasing complex internal and external operating environment. One mechanism used to deal with complexity is enterprise architecture (EA) modelling and EAM uses such modelling to capture and reason about the fundamental aspects of an enterprise as well as communicate with all stakeholders. Modelling methods simplifies a complex reality by focusing only on relevant aspects such as the IT landscape and its alignment with business processes and business strategy. Enterprise modelling is time and resource consuming and requires highly skilled enterprise architects that understand all aspects of a business. Given the demands of enterprise agility, it is crucial that the enterprise modelling tasks are executed timeously and the use and reuse of suitable EA models and meta-models, as well as suitable modelling platforms are essential. In this presentation the audience will be introduced to EAM and the essential role EAM fulfill to assist businesses to survive change through the use of modelling and modelling platforms.

# CONCEPTUALIZING AND DESIGNING VALUE CO-CREATION - AN IS PERSPECTIVE

**Prof. Dr. Robert Winter, University of St. Gallen, Switzerland**

## ABSTRACT

Service-dominant (S-D) logic reconceptualizes the notion of economic exchange. The cornerstone of this reorientation is the concept of value co-creation a collaborative process of reciprocal value creation among various actors. Owing to S-D logic's significance, information systems (IS) research discusses its implications on understanding, designing and managing IS. However, an equivocal understanding of value co-creation's foundations, semantics, and use emphasizes its underlying conceptual ambiguity in IS and marketing research. We discuss the phenomenon of value co-creation, how value co-creation can be conceptualized and how IS development for supporting value co-creation can be supported by designing a suitable ontology, derive a taxonomy, and propose design principles.

## BIO

Prof. Dr. Robert Winter is full Professor of Business & Information Systems Engineering at the University of St. Gallen (HSG) and Director of HSG's Institute of Information Management. He was founding Academic Director of HSG's Executive Master of Business Engineering programme and Academic Director of HSG's Ph.D. in Management programme. He received Master degrees in business administration and business education as well as a doctorate in social sciences from Goethe University, Frankfurt, Germany. After eleven years as a researcher and deputy chair in information systems in Germany, he joined HSG in 1996. He was vice Editor-in-chief of the „Business & Information Systems Engineering" journal and currently serves as Senior Associate Editor of European Journal of Information Systems and member of the editorial boards of several other journals including MIS Quarterly Executive. His research interests include design science research methodology, enterprise architecture management and the governance of very large IT projects/programmes.

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# GROUNDED ENTERPRISE MODELLING

**Prof. Dr. Erik Proper, LIST, Luxembourg**

## BIO

Prof. Dr. Henderik A. Proper is Head of Academic Affairs of at the Luxembourg Institute of Science and Technology in Luxembourg, and senior research manager for Innovative Services department. He also holds a chair in Information Systems at the Radboud University Nijmegen. Furthermore, he chairs the Enterprise Engineering research network involving researchers from these two institutions. He is interested in the further development of the field of enterprise engineering, and enterprise modelling in particular. He has co-authored several journal papers, conference publications and books. His main research interests include enterprise architecture, systems theory, business/IT alignment and conceptual modelling. Erik received his Master's degree from the University of Nijmegen, The Netherlands in May 1990, and received his PhD (with distinction) from the same University in April 1994. In his Doctoral thesis he developed a theory for conceptual modelling of evolving application domains, yielding a formal specification of evolving information systems.

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## ABSTRACT

Enterprise models are ussed to represent different aspects of /related-to an organisation / enterprise. Such enterprise models typically take the form of conceptual models expressed in terms of a more specialised, purpose specific, modelling language. In general, such modelling languages, force modellers to "reduce" the models to mere boxes-and-lines diagrams, where it is left to the names in / on the boxes to provide a linkage to semantically richness, and nuances, of the domain being modelled. In this lecture, we discuss the strategy to ground enterprise models in purpose / domain specific languages on top of a conceptual model expressed in a more generic domain modelling language, where the latter allows modellers to include richer verbalisations of the concepts and their relationships. This will be illustrated in terms of example models in the ArchiMate language, while grounding these on models expressed in the well known fact-based modelling language ORM.

# ENTERPRISE MODELLING AND INFORMATION SECURITY

**Prof. Dr. Marite Kirikova, Riga Technical University, Latvia**

## ABSTRACT

Regarding information security, the role of enterprise models is two-fold: (1) the enterprise models can reflect information about security solutions in enterprise information systems and (2) the enterprise models, at the meta-level, is information that has to be properly managed from the point of view of security, i.e., it has to be clear how availability, confidentiality and other security related factors are handled with respect to particular models. To illustrate how enterprise models can be used in caring for security in information systems, several security requirements patterns will be discussed focusing on the relationships between the information flow in the patterns and the corresponding enterprise model elements. The issues of enterprise model security, at the meta-level, will be explained using the FREEDOM framework, which has been developed for continuous requirements engineering. The framework concerns As-Is and To-Be enterprise models that are used in such functions as requirements engineering, fulfillment engineering, design and development, operations, and management.

## BIO

Prof. Dr. Mārīte Kirikova is a Professor in Information Systems Design at the Department of Artificial Intelligence and Systems Engineering, Faculty of Computer Science and Information Technology, Riga Technical University, Latvia. She has more than 200 publications on the topics of requirements engineering, business process modelling, knowledge management, systems development and educational informatics. She is also a co-editor of several scientific proceedings in the area of databases, information systems, information systems engineering, enterprise modelling, systems and business, and business informatics. Marite Kirikova has participated in university research and teaching teams in Sweden, Denmark, Austria, and USA. In her research currently she focuses on continuous information systems engineering in the context of agile and viable systems paradigms.

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# OMILAB

# DAY

# Conceptualization of Modelling Methods with ADOxx

Dr. Dominik Bork

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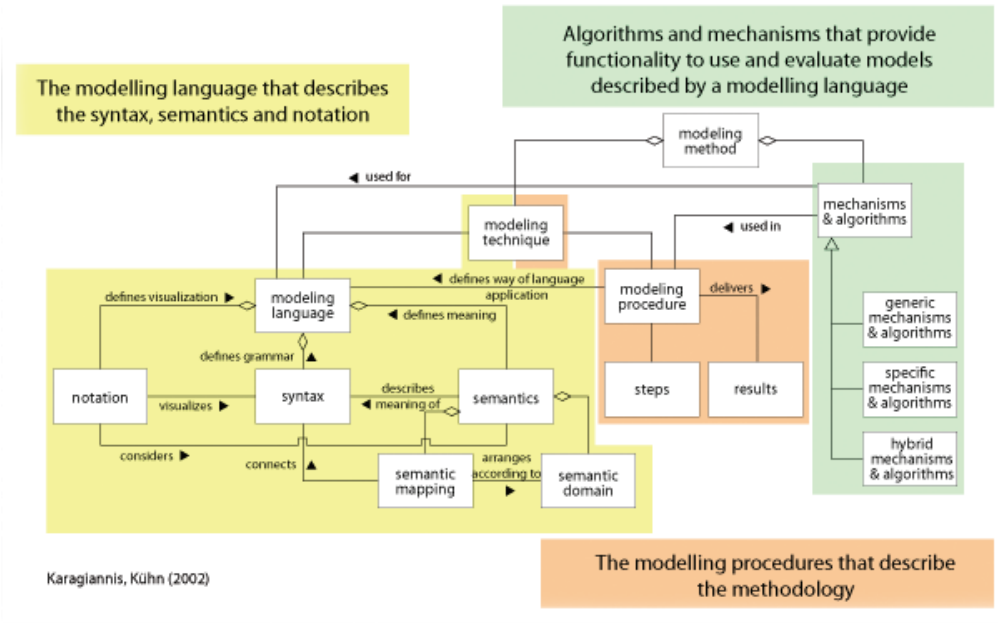
The benefits of domain-specific modelling methods – as a complement to general purpose and de-factor standard modelling methods like UML BPMN are doubtless. The process from an idea over the design up to the deployment of new modelling methods is referred to as the modelling method conceptualization. A vital part in this conceptualisation is the design of the meta model. Meta models formally specify the syntactic backbone of a modelling language by introducing the relevant modelling language concepts and by constraining the meaningful relationships between them. Meta model design decisions determine not only syntactic expressiveness of modelling languages but dictate also how their usage by modellers.

While lots of research can be found focussing on the effect of notational aspects on modelling language's usability and intuitiveness, guidelines and best practices for meta model design are still scarce. This talk will contribute bridging that research gap by reporting on the results of analysing 40 meta models of the Open Models Laboratory (OMiLAB). All meta models have been developed with the ADOxx metamodelling platform. The goal of this talk is to provide a set of generic meta model design patterns that can be employed in any modelling method conceptualization. For practical feasibility, a Smart City meta model will be utilized, thereby building a bridge between the this lecture and the OMiLAB@work practical sessions at the end of the first Summer School week.




OMiLAB Modelling Method Engineering Framework

# OMiLAB@work
# A Smart City Case - Design Thinking Workshop

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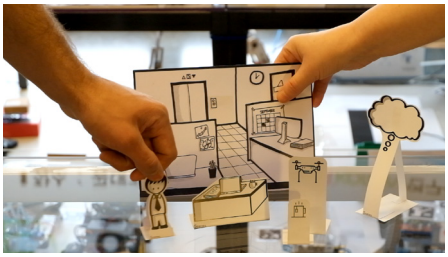
Elena-Teodora Miron

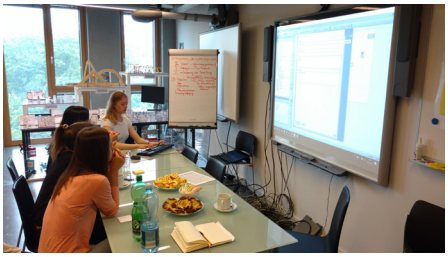
By 2050 two-thirds of the world's population is expected to live in cities (United Nations, 2014). One of UN's explicit development goals is to ensure that urban agglomerations provide sustainable cities and communities.

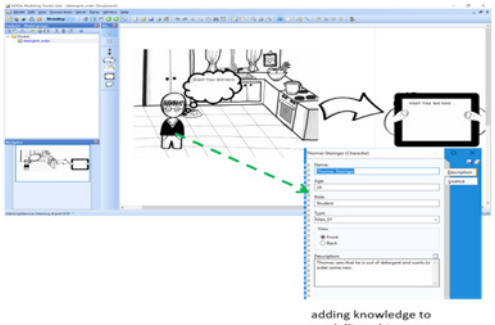
As cities become more and more complex planning bodies around the world consider digitization as one possible solution to their pressing issues. Initiatives in which technologies play a key role, like smart mobility, smart housing, and smart environment have been implemented all over the world. The ultimate goal is to use technology in such a way, that it is less perceptible to the end user yet it increases the life quality, comfort and safety of the city's citizens. This requires an integrated, interdisciplinary approach, which allows identifying, analyzing, and supporting humans and their context in a predominantly digital environment [1]. Such an approach is facilitated by Design Thinking which applies designer problem solving techniques for agile, ideation, prototyping and testing in innovative processes. It enables early exploration and validation of design(s) of new services, smart products and disruptive business models.

The workshop will introduce storyboards as a Design Thinking tool. We will use haptic paper objects to depict scenes, the key moments in a storyboard, in the context of a given Smart City problem. Subsequently we will use an automated transformation process supported by the Scene2Model tool to transform these scenes into diagrammatic models while simultaneously semantically enriching them.

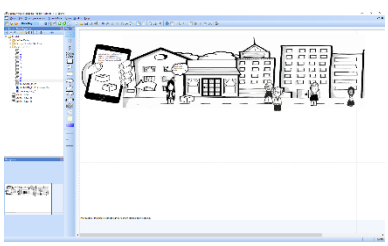
The result of this workshop is intended as inspiration for the following Smart City exercises.







adding knowledge to modelling objects



[1] Richter A., Heinrich P., Stocker, Schwabe G., „Digital Work Design", in Business Information Systems Engineering Journal, 60(3): 259-264, 2018

# OMiLAB@work
## A Smart City Case

**EXERCISE**

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The upcoming of technologies in the context of Internet of Things (IoT) such as ubiquitous sensors, mobile devices, and permanent online interaction has recently also been adopted for the area of urban development. Thereby, the transition towards user-driven digital ecosystems in the form of Smart Cities becomes apparent on three levels: a.) innovation economy, b.) city infrastructure and utilities, and c.) governance (Schaffers et al., 2011). In the foundation exercises of NEMO 2018 we will primarily focus on the aspects of the city infrastructure and the utilities. This will be a key element in realizing services such as smart parking, mobility, or the monitoring of the environment in terms of real-time alerts and safety management.

In particular, the increasing usage of IoT technology in smart vehicles, smart infrastructure and smart phones allows developing new business models and services. Based on the tremendous amount of information that is generated every second by sensors in a smart environment, innovative applications such as services for environmental and energy monitoring, services for the prediction of mobility requirements, smart meters for measuring resource consumption, or medical surveillance and assistance for elderly peoples can be realized (Hernández-Muñoz et al., 2011) .

In this context three foundation exercises have been designed to familiarize the students with modelling concepts, model querying and model processing in an independent application domain.

| | | |
|---|---|---|
| Foundation Exercises | I: Modelling Concepts | **How to model concepts of a Smart City?**<br>Basic metamodelling concepts required to realize a modelling language for a Smart City are taught. Tools of the OMiLAB, e.g., the GraphRep generator will be introduced and utilized to create graphical visualizations for the Smart City concepts. |
| | II: Queries, e.g., Analysis | **How to analyze Smart City models using query techniques?**<br>Basic model analysis techniques will be discussed, enabling the modeller to use the information captured in the models in order to e.g., answer non-trivial questions, or support decision makers. As an illustrative scenario, queries will be executed on Smart City models. |
| | III: Processing, e.g., Simulation | **How to process Smart City models using simulation?**<br>Introduction to simulation algorithms and how they can be applied to process the information captured in conceptual models. Afterwards, hands-on experience will be achieved by realizing and executing several simulation algorithms using the built-in functionality of the ADOxx platform and the Smart City models. |

[1] Schaffers et al. (2011): Smart Cities and the Future Internet: Towards Cooperation Frameworks for Open Innovation, in: J. Domingue et al. (Eds.): Future Internet Assembly, pp. 431–446, Springer.

[2] Hernández-Muñoz, J.M. et al. (2011): Smart Cities at the Forefront of the Future Internet, in: J. Domingue et al. (Eds.): Future Internet Assembly, pp. 447–462, Springer.

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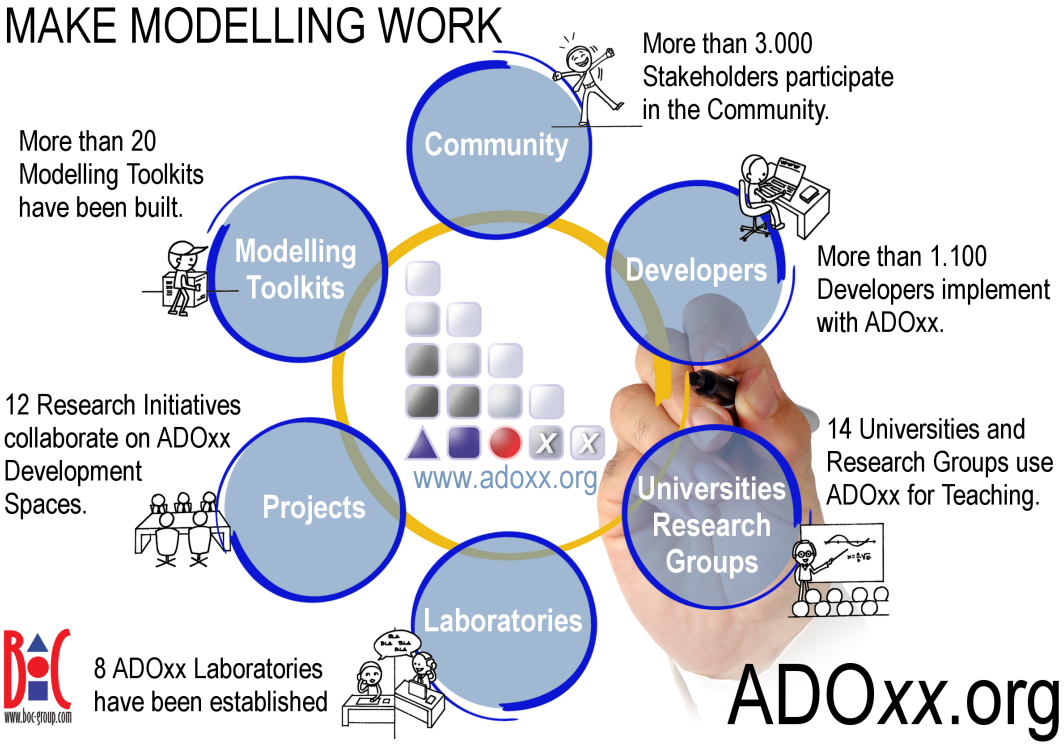
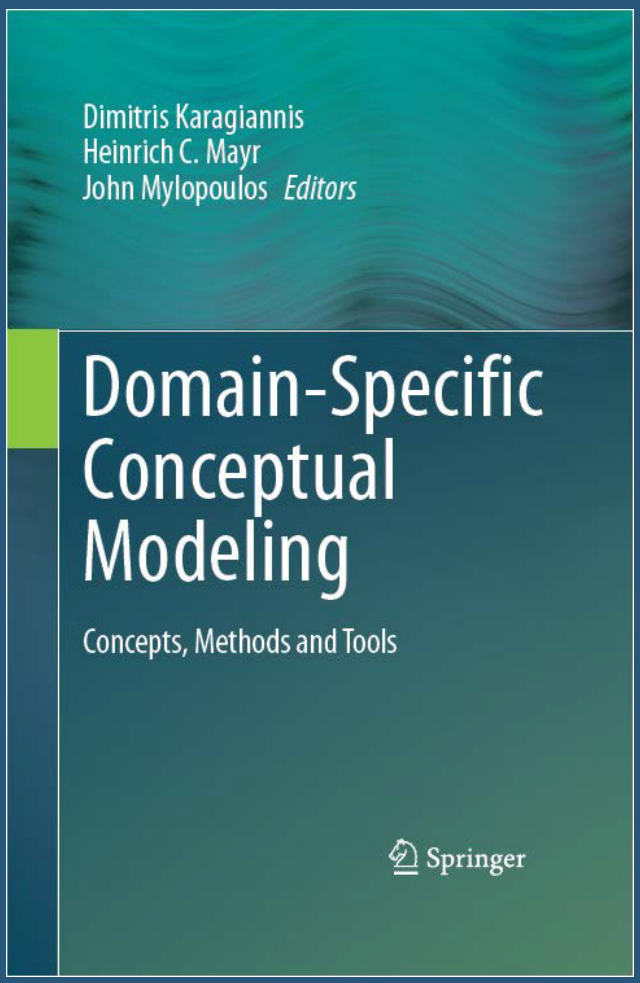


# NOTES

OMILAB BOOK

VOLUME 1




**Volume 2 currently in preparation.**

**If you are interested in contributing please contact Prof. Karagiannis at**

**dk@dke.univie.ac.at.**

NEMO 2018 PROGRAMME


# NEMO 2019

# CALL FOR PARTICIPATION

6th Edition of the NEMO Summer School

## NEXT GENERATION ENTERPRISE MODELLING IN THE AGE OF INTERNET OF THINGS

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