

**NEMO 2016  
PROGRAMME**

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



# General Information

## Summer School Venue

University of Vienna  
Faculty of Computer Science  
Währinger Straße 29  
1090 Vienna, Austria  
T +43 1 4277-78901

## Public means of transport

Tram: 37, 38, 40, 41, 42  
Tram station:  
Spitalgasse/Währinger Straße  
Trip planning:  
<http://www.wienerlinien.at>



### Contact

Elena-Teodora Miron  
T +43 699 14035497  
E [events@omilab.org](mailto:events@omilab.org)

### Taxi

Taxi 31300: +43 1 31300  
Taxi 40100: +43 1 40100

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Police 133  
Fire department 122

## Organisation Team



**Iulia Vaidian**  
University of Vienna



**Verena Kleinschmid**  
University of Vienna

**David Götzinger**  
University of Vienna

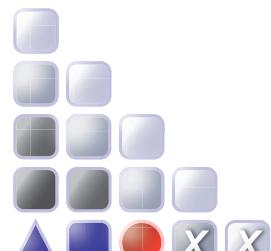


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# Welcome

The “Next Generation Enterprise Modelling” (NEMO) Summer School welcomes you to its 3<sup>rd</sup> 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 2016 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 management 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.

And last but not least we would like to thank Erasmus+ and the Austrian National Agency for Lifelong Learning, who supported our endeavor with European Commission funds. Our special thanks go to Mr. Gerhard Volz and Mr. Lucas Petri, who provided us with guidance and support during the project implementation.

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



Vienna and Klagenfurt, June 2016

# Open Models Laboratory

**University of Vienna**

**OMLAB®**

The Open Models Laboratory (OMiLAB) is a dedicated research and experimentation space for modelling method engineering. Both a physical and virtual place, it is equipped with tools to explore method creation and design, experiment with method engineering and deploy software tools for modelling.

Open to all those interested, the laboratory is a platform where all participants can bring in ideas related to modelling and engage in the exploration process.

The lab follows a user-driven approach in its understanding of the term „model“. Experts and novices are equally invited to contribute and extract knowledge. The lab's idea is to act as a facilitator to the development and application of scientific methods to communities who value models, and implicitly modelling methods. Users are not limited to certain domains or functional areas 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 or engineering.



**The lab promotes openness of community projects and encourages communities to share their projects to the extent feasible.**

As the construction of modelling methods is a complex task, the OMiLAB introduces the OMiLAB Lifecycle which uses the “Conceptualization Process” as a framework for developing modelling methods. Starting with the “Creation” step and ranging until the “Deployment” of the modelling method as an IT-tool, the laboratory provides the conceptual steps, the collaborative environment and the necessary working resources. For the “Design”, “Formalization” and “Development” steps the OMiLAB makes an open use of the ADOxx meta-modelling plat-

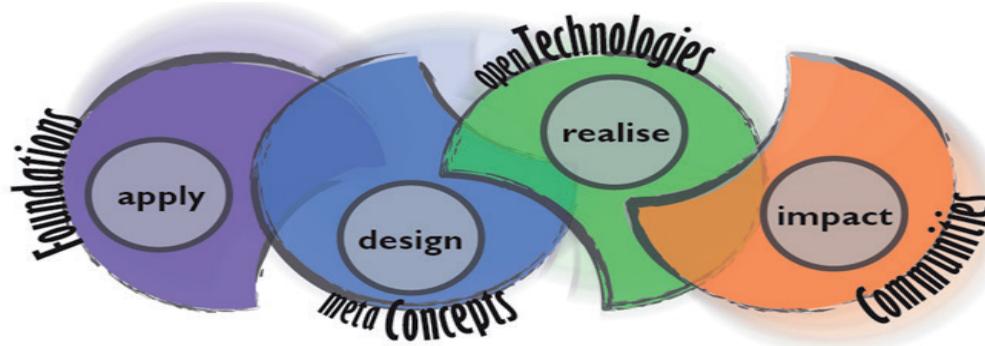
form. Such a platform allows the use of concepts that support the modelling method engineering process (e.g. patterns, DSML) and formalisms which favour the re-use/evolution/variants of modelling methods. It also grants openness to other tools and open source add-ons.

The main vision carrying the idea of the OMiLAB is: Models for Everyone!

Visit us at [www.omilab.org](http://www.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 Process Management". Within this core area the work accomplished by the group provides novel research results in the areas of Meta-Modelling, Meta-Data and Ontologies, Hybrid Method Engineering and Business Intelligence.

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 ([www.omilab.org](http://www.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.

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## Contact

**Verena Kleinschmid**

University of Vienna, Research Group Knowledge Engineering

Währinger Straße 29, 1090 Vienna, Austria

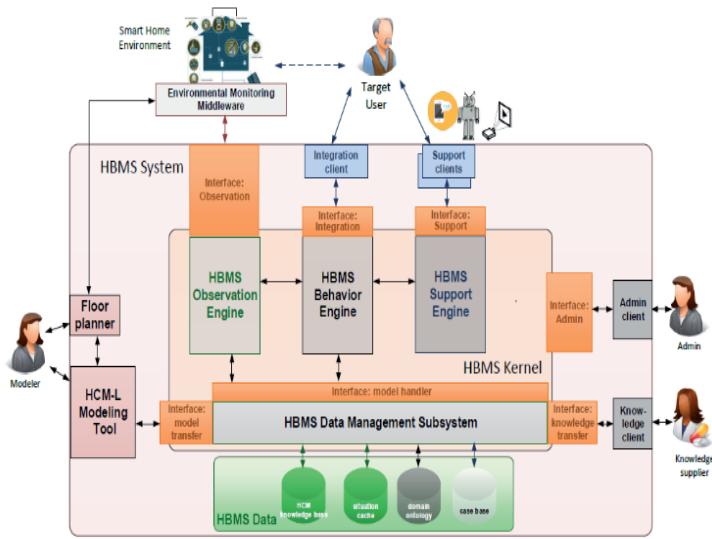
T: 0043 1 4277 78903

E: [verena@dke.univie.ac.at](mailto:verena@dke.univie.ac.at)

# The Application Engineering Institute

**Alpen-Adria-Universität Klagenfurt**

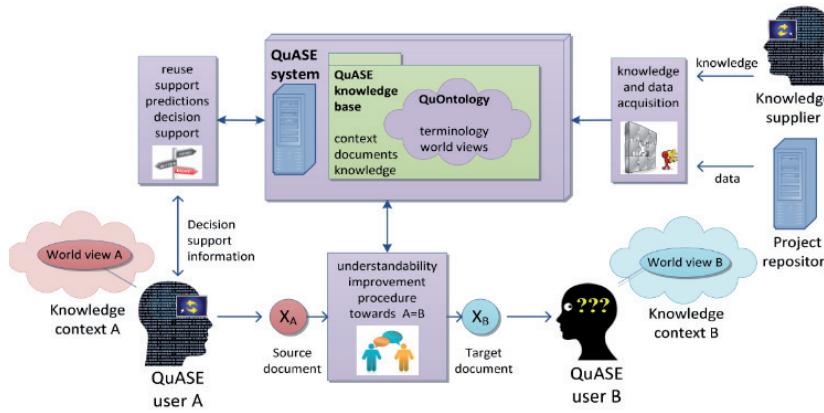
We are committed to human-centred informatics: our research and teaching activities address the design, architecture, implementation and quality of human-centred application systems. We conduct both, fundamental as well as applied/experimental research with an emphasis on modelling, computational linguistics, and software quality. Currently, we are working at research projects in the areas of Active and Assisted Living (AAL), Text Understanding, and Quality Management in Software Development Processes.



AAL research aims at IT methods that enable people to live as autonomously and for long as possible in their domestic environment. In our project HBMS (Human Behavior Monitoring and Support) we use conceptual modelling and computational linguistics for deriving an individual cognitive model from the observed behaviour of a particular person. For that purpose, the Human Co-

gnitive Modelling Language HCM-L has been developed, and underpinned by a tool using the meta-modelling platform ADOxx®. In the productive support phase, reasoning procedures exploit a person's HCM-L model for deriving the best-suited ambient support when needed. Thus, HBMS is to support persons based on their own prior episodic knowledge.

Effective Quality-Related Communication is crucial for the success of software development processes. Consequently, the different parties involved have to be supported by properly managed quality-related information throughout a software development process. In particular, it is necessary to ensure that all parties have a consistent understanding



of the communicated information. In the QuASE (Quality Aware Software Engineering) project, we aim at establishing means for this, based on acquired and formalized domain knowledge about quality issues in software processes. Moreover, we work on supporting decision making in the software process as well as on the reuse of quality-related experience.

## Contact

**Daniela Werdnig**

Institute of Applied Informatics, Alpen-Adria-Universität Klagenfurt

Universitätsstraße 65-67, 9020 Klagenfurt am Wörthersee, Austria

T: +(43)463 2700 3703

E: [daniela.werdnig@aau.at](mailto:daniela.werdnig@aau.at)

## 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.



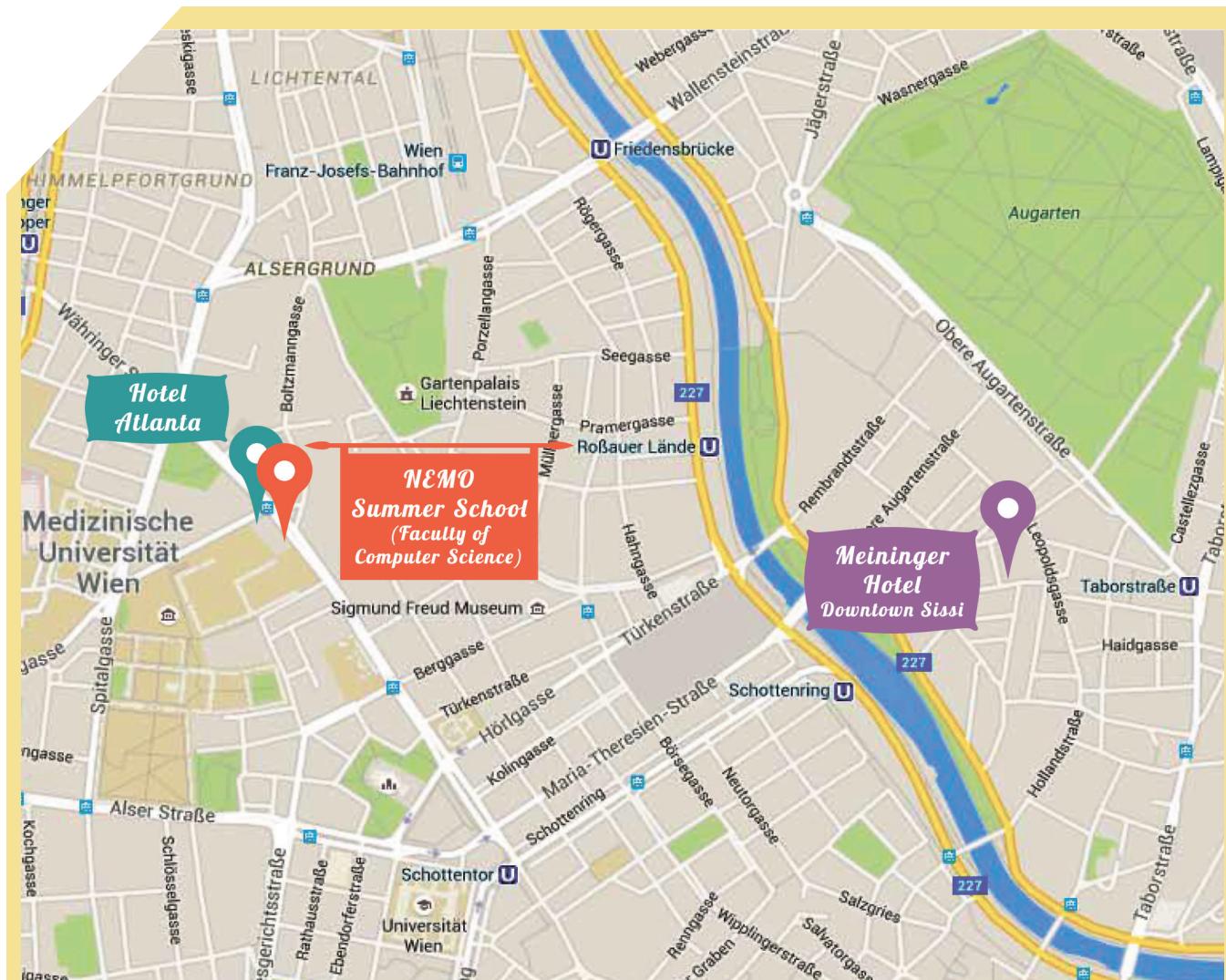
A couple of social events and excursions will be offered, for example:

- a guided tour of the University of Vienna, a 650 years old university with remarkable history and architecture
- an exciting and challenging day in Prater, the oldest amusement park in the world with lunch at Schweizerhaus, a renowned beer garden and restaurant offering delicious traditional specialties
- a farewell party on Friday, July 31<sup>st</sup>.

Detailed information will be provided at the summer school.



## HOTEL CONTACTS



### Faculty of Computer Science

Währinger Straße 29, 1090 Vienna  
Tel.: +43 (1) 4277-78901

### Hotel Atlanta \*\*\*\*

Währinger Straße 33, 1090 Vienna  
Tel.: +43 (1) 405 12 30

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Schiffamtsgasse 15, 1020 Vienna  
Tel.: +43 (0) 720 8820 66

# Vienna



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of all Austria



- capital City of  
- largest city in  
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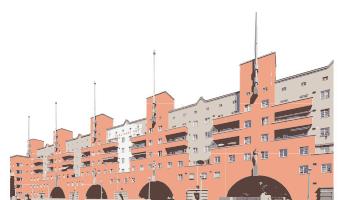


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SCHUBERT &  
J. STRAUSS



# Floor Plan

**Address:**

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

**Basement:**

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

**1<sup>st</sup> Floor & 2<sup>nd</sup> Floor:**

Working-Groups in:  
PC2, PC3, PC5, PC6

**Ground Floor:**

Registration

**4<sup>th</sup> Floor:**

Organisation Team  
OMiLAB



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# FOUNDATIONS OF CONCEPTUAL MODELLING

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

## 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. This includes the validation, verification, evaluation, transformation etc. of models. 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. We study a number of fundamentally different, yet successful modelling- and analysis methods and discuss the trade off between expressiveness and analysis techniques.



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 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“.



### Contact:

**Prof. Dr. Wolfgang Reisig**  
Humboldt University Berlin  
[reisig@informatik.hu-berlin.de](mailto:reisig@informatik.hu-berlin.de)

# AGILE MODELLING METHOD ENGINEERING – AMME

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

## 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 steering committee of the Austrian Computer Society and its Special Interest Group on IT Governance. He is the founder of the Open Models Laboratory, [www.omilab.org](http://www.omilab.org).



### Contact:

**Prof. Dr. Dimitris Karagiannis**

University of Vienna  
[dk@dke.univie.ac.at](mailto:dk@dke.univie.ac.at)

## ABSTRACT

**A**s the paradigm of enterprise modelling originally envisioned, a hybridization of modelling approaches is needed in order to cover the multiple facets of a business view, its context and requirements for different types of resources - including IT services and infrastructure. The "modelling method framework" [Karagiannis/Kühn, 2002] establishes key building blocks - i.e. the modelling language, the modelling procedure and mechanisms/algorithms - to enable the required hybrid modelling and to increase the value of models beyond their traditional functions. As the importance of Next Generation Enterprise Modelling in the age of the Internet of Things, Industry 4.0, Industrial 3-D printing etc. increases, new modelling capabilities, semantically enriched design concepts and adapted operational functionality must satisfy evolving needs, in order to successfully manage not only the transformation in the digital enterprise stage, but also the adaptation and extension of existing services. In this context, the foundations of a „conceptual-model“-awareness approach for next generation enterprise information systems will be presented. This novel approach makes use of semantic networks to extend model-awareness towards arbitrary types of models that are developed for specialized communities aiming for domain-specificity (or even case-specificity) in their modelling language, therefore favoring productivity at the expense of reusability across domains. The technological space for capturing and bridging knowledge through model semantics is primarily based on diagrammatic models. Two categories of models are employed in this context: (1) Models of Concepts for describing a common understanding of a domain through its concepts and relations; (2) Models that use Concepts are typically domain-specific models based on some already established understanding of the domain. The hereby introduced life cycle of Agile Modelling Method Engineering - AMME [PCI2015] aims to apply the principle of agility established in Software Engineering (e.g., evolutionary development, flexible response to change) to the practice of Modelling Method Engineering. The main assumption is that a modelling method may evolve iteratively based on changing modelling requirements and feedback loops. Within the context of AMME, a full methodological approach is established by the OMILAB, with a life cycle encompassing five phases: (1) create, (2) design, (3) formalize, (4), develop and (5) deploy/validate. The approach is supported, in its fast prototyping stage, by the metamodeling domain-specific language MM-DSL and the meta-modelling platform ADOxx.

# FOUNDATIONS OF MODELS, TO MODEL AND MODELLING

**Prof. Dr. Bernhard Thalheim,**  
**Christian-Albrechts-Universität zu Kiel, Germany**

## ABSTRACT

Models are a mainstay of every scientific and engineering discipline. Models are typically more accessible to study than the systems, data or theories that are considered. Models are instruments that are effectively functioning within a utilisation scenario. The effectiveness is based on an associated set of methods and satisfies requirements of utilisation of the model. In the tutorial we introduce a notion of the model that generalises notions of models used in Computer Science, in engineering, in social and natural sciences, in mathematics and other disciplines. We explain that models must be considered within the utilisation scenarios and that the modelling activities for development or utilisation can be systematically developed. We develop foundations of a discipline of modelling. The approach is illustrated by models developed on the basis of enhanced entity relationship models and business process models.

**Prof. Dr. rer. nat. habil. Bernhard Thalheim** (Director, Department of Computer Science, Faculty of Engineering at Christian-Albrechts University Kiel, Germany) (MSc, PhD, DSc) is full professor at Christian Albrechts University in Germany. His major research interests are database theory, logic in databases, and systems development methodologies, in particular for web information systems. He has published more than 300 refereed publications, edited more than 30 conference volumes, co-founded three international conferences, and has been programme committee chair for almost three dozen international conferences such as MFDBS, ER, FoIKS, ASM, SDKB, NLDB and ADBIS. He got several international awards, e.g. the Kolmogorov professorship at Lomonossov University Moscow and the P.P. Chen award of Elsevier. He has been an associated professor at Dresden University of Technology, a visiting professor at Kuwait University, Alpen-Adria University Klagenfurt and others, and a full professor at Rostock University and Brandenburg University of Technology at Cottbus.



### Contact:

**Prof. Dr. Bernhard Thalheim**  
 Christian-Albrechts-Universität zu Kiel  
 thalheim@is.informatik.uni-kiel.de

# SEMANTIC TECHNOLOGIES FOR INDUSTRIAL APPLICATIONS

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

## BIO

Prof. Dr. Dimitris Kirsitsis 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. He served also as Guest Professor at the Intelligent Maintenance Systems 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. Kirsitsis 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 180 publications. He is founding fellow member of the International Society for Engineering Asset Management (ISEAM) and of various international scientific communities in his area of interests including EFFRA. Since September 2013 Dimitris is Chair of IFIP WG5.7 – Advanced Production Management Systems and member of the Advisory Group of the European Council on Leadership on Enabling Industrial Technologies – AG LEIT-NMBP.

## ABSTRACT

The use of semantic technologies and ontologies is becoming more and more popular in engineering applications and particularly in product modelling. Still, the use is limited in academia and applications are of a small scale. In this lecture we will present the research work done by the ICT for Sustainable Manufacturing group of EPFL, Switzerland, on the use of ontology-based technologies for the life cycle management of products and engineering assets. It aims at providing both a wider understanding of the benefits of applying such technologies in the complex environment of product and asset life cycle management and at providing a platform for implementing ontology models in industrial environments.

### Contact:

**Prof. Dr. Dimitris Kirsitsis**

EPFL

dimitris.kirsitsis@epfl.ch



# CAPABILITY ORIENTED ENTERPRISE KNOWLEDGE MODELLING: THE CODEK APPROACH

**Prof. Dr. Evangelia Kavakli, University of the Aegean, Greece**  
**Prof. Dr. Pericles Loucopoulos, University of Manchester, UK**

## ABSTRACT

In order to address dynamic requirements of today's business environments, Enterprise Modeling has shifted focus on more agile approaches that can offer designers the opportunity to dynamically configure enterprises depending on the requirements that arise as a result of changes in the enterprise domain and its ecosystem. This lecture will outline the key ideas and the main concepts of an approach known as CODEK (Capability Oriented Designs with Enterprise Knowledge). CODEK uses 'business capabilities' as a conceptual conduit that can integrate the contextual, service, operational and teleological viewpoints of organizations and enable integrated reasoning on enterprise requirements and evolutionary decisions. Further to introducing to the notion of capability in Enterprise Modelling the objective of this lecture is to demonstrate how a capability oriented approach can guide the design and evaluation of alternative enterprise models that meet the challenges of alignment and agility and define a number of challenges for researchers and practitioners alike.

## BIO

**Prof. Dr. Evangelia Kavakli** is an Associate Professor at the Department of Cultural Technology and Communication of the University of the Aegean. She obtained her PhD in Computation from the University of Manchester, Institute of Science and Technology in 1999. She is in charge of the Cultural Informatics Laboratory of the University of the Aegean. Her research work supported in the context of national and EU funded projects, focuses on the topics of goal oriented requirements engineering, enterprise knowledge modelling, information systems privacy and cultural informatics. She is a member of the working group for the International Committee for Documentation Conceptual Reference Model (CIDOC/CRM) of the International Council of Museums. She can be virtually reached at <http://cilab.ct.aegean.gr>.

**Prof. Dr. Pericles Loucopoulos** holds appointments at the Manchester Business School of the University of Manchester (UK) and at Harokopio University of Athens (Greece). His research has been supported by numerous research grants supporting over 20 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. He has been awarded the Edelman Laureate medal and the President's Medal of the UK OR Society, two of the top distinctions in the field of Operations Research and Management.



### Contact:

**Prof. Dr. Evangelia Kavakli**  
 University of the Aegean  
[kavakli@ct.aegean.gr](mailto:kavakli@ct.aegean.gr)



### Contact:

**Prof. Dr. Pericles Loucopoulos**  
 University of Manchester  
[pericles.loucopoulos@manchester.ac.uk](mailto:pericles.loucopoulos@manchester.ac.uk)

# MODELLING THE ADAPTIVE ENTERPRISE

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

## BIO

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 is an associate editor for the Int. Journal of Information Systems Modelling and Design, and serves on the editorial boards of the Int. J. of Agent Oriented Software Engineering, IET Software, and the Journal of Data Semantics. He was Program Co-chair for the 27th and 33rd Int. Conference on Conceptual Modelling (ER'08, ER'14).

## ABSTRACT

The Internet of Things, together with big data analytics, social, mobile, and cloud, are creating a perfect storm for today's enterprise to advance to the next level of agility and continuous innovation. Current enterprise modelling frameworks and techniques, conceived and developed for a more stable environment, will need to be extended to support analysis and design of the complex dynamics of today's increasingly fast-paced world. I will outline requirements for next-generation enterprise modelling in light of the digital transformations taking place across almost every sector, and will suggest possible paths ahead.

---

### Contact:

**Prof. Dr. Eric Yu**

University of Toronto  
eric.yu@utoronto.ca



# MODELLING AND ANALYSING SECURITY REQUIREMENTS

**Prof. Dr. Haralambos Mouratidis, University of Brighton, UK**

## ABSTRACT

The increasing demand of modern information systems to process and manage sensitive information and the introduction of relevant technological paradigms (e.g. Big Data, Cloud Computing, Internet of Things) has led researchers and industrialists to rethink the way that security (and its related issues such as trust, privacy and risk) is treated during the information systems development process. In the first part of this lecture, I will discuss the security modelling challenges, which are introduced in such complex systems, and I will outline the requirements that security modelling frameworks should fulfil. In the second part, I will present the foundations of a security modelling methodology, called Secure Tropos. From a theoretical perspective, I will describe its concepts, processes, and reasoning capabilities, while from a practical perspective I will present an ADOxx-based tool and some examples of how it can be used in practice.

## BIO

**Haris Mouratidis** is Professor of Software Systems Engineering at the School of Computing, Engineering and Mathematics, at the University of Brighton, U.K and Director of the Secure and Dependable Software Systems Research Cluster. He is Fellow of the Higher Education Academy (HEA) and Professional Member of the British Computer Society (BCS). His research interests lie in the area of secure software systems engineering, requirements engineering, and information systems development. He is interested in developing methodologies, modelling languages, ontologies, tools and platforms to support the analysis, design, monitoring of security, privacy, risk and trust for large-scale complex software systems. He has published more than 140 papers (h-index 24) and he has secured funding as Principal Investigator from national (Engineering and Physical Sciences Research Council (EPSRC), Royal Academy of Engineering, Technology Strategy Board (TSB)) and international (EU, NII) funding bodies as well as industrial funding (British Telecom, ELC, Powerchex, FORD) towards his research. He is currently leading the UoB team on projects EVOSEC, SESAME, VisiOn and MITIGATE. His "Powerchex KTP" project was finalist for the best 2012 UK National Knowledge Transfer Partnership TSB award. He has acted as evaluator for national and international funding bodies (e.g. EPSRC, HEA, and EU) and invited subject expert for organisations (e.g. TSB, NATO). He is on the editorial boards of the Requirements Engineering Journal and the International Journal of Information System Modelling and Design and he has been involved in the organization of various events related to his research interests. He was the General co-Chair of CAiSE'14 and he will be general chair of RCIS'17.



### Contact:

**Prof. Dr. Haris Mouratidis**  
University of Brighton  
[H.Mouratidis@brighton.ac.uk](mailto:H.Mouratidis@brighton.ac.uk)

# A META-MODELLING METHOD FOR IoT USING PROCESS ALGEBRA AND BEHAVIOUR ONTOLOGY

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

## BIO

Currently, Prof. in Division of Computer Science and Engineering in Chonbuk National University, Republic of Korea. Received Bachelor degree in Computer Science, Pennsylvania State University, USA; Master and PhD 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 from NSWC of 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  $\delta$ -Calculus and Behavior Ontology in SAVE on ADOxx.

## ABSTRACT

Things of IoT behave like living things behave in society. In order to understand the behaviour of the things systematically, it is necessary to abstract the behaviour in formal and collective patterns. In that perspective of abstracting behaviour of the things, this lecture presents a meta-modelling method to abstract the behavior in the patterns as follows. Firstly, the basic individual actions of the behaviour are represented as movement actions in process algebra, called  $\delta$ -Calculus, in a geo-temporal space, called GTS. Secondly, the actions of the things are grouped together in sequence as behaviours in ontology, called Behaviour Ontology, in an abstraction space, called n:2-lattice. In this way, the behavior of the things can be represented in mathematically structured patterns and be organized hierachically in the collective patterns of population of the things. In the method, the requirements for the secure and safe behaviours will be specified and verified using GTS Logic, and be represented as dynamic constraints in the lattice. Further the relations between the GTS space and the lattice space can be investigated. In order to show the applicability of the approach, an IoT example for Emergency Medical Systems will be used for demonstration on a tool, called SAVE. SAVE is a prototype tool to specify, analyze, verify and evaluate distributed mobile real-time systems. It has been developed on the ADOxx meta-modelling platform. At the end, the detailed architecture of the tool will be presented to show how effectively and efficiently the tool has been developed by using the basic facilities of ADOxx.

### Contact:

**Prof. Dr. Moon Kun Lee**  
Chonbuk National University  
[moonkun@jbnu.ac.kr](mailto:moonkun@jbnu.ac.kr)



# FORMAL METHODS FOR HIGH RELIABLE SYSTEMS

**Prof. Dr. Jin-Young Choi, Korea University, Korea**

## ABSTRACT

In the age of Internet of Things, business models often require high reliable requirements and specifications. In this talk, we define three important properties of software which are „reliability“, „safety“ and „security“. We then introduce several formal methods in terms of formal specification and formal verification. We show briefly how we can use formal methods to build models with high reliable/safe/secure properties.

**Prof. Dr. Jin-Young Choi** is currently the Chair of the Software security interest group at the Korea Institute of Information Security And Cryptology. He completed his PhD at the University of Pennsylvania with the dissertation title: The Decidability Problem for Rigid E-Unification: A New Proof and Extensions. He received multiple awards and honors, such as the InfoCulture Education Award from the Prime Minister's Commendation (2013), the Silver Prize from the Korean Institute of Information Scientists and Engineers (2013) and the SEOKTOP Teaching Award from the Korea University in 2013. His research interests are formal methods, software security, secure software engineering, software and supply chain assurance (SSCA) and Cyber Physical Systems.



### Contact:

**Prof. Dr. Jin-Young Choi**  
Korea University  
[choi@formal.korea.ac.kr](mailto:choi@formal.korea.ac.kr)

# DATABASE DESIGN AND MANAGEMENT OF DERIVED DATA

**Prof. Dr. Nick Roussopoulos, University of Maryland, USA**

## BIO

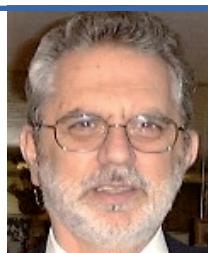
**Nick Roussopoulos** is a Professor of the Computer Science Department and a senior faculty member of the Institute of Advanced Computer Studies at the University of Maryland. He received his PhD from the University of Toronto in 1977 and taught at the University of Texas in Austin from 1977-1980, the University of Maryland from 1981 until now, and the Athens University of Economics and Business 2001-2002. He has also taught as a visiting professor at the University of Aachen, ETH of Zurich, Stanford, and the National Technical University of Athens. He was the founding director of the University of Maryland Database Systems Group in 1981. He served on an Academy of Sciences subcommittee, CODMAC from 1985 until 1988. He was the General Chairman of the ACM International Conference on Data Management (SIGMOD) in 1986. He was an elected trustee of the VLDB Endowment from 1990-1996. In 1994 he received the best paper award at the IEEE/CS international conference for a paper on updating of client-server database architectures. In 1997, he received the 10-year award for the most influential paper on Very Large Databases for spatial search and, in 1999, the ACM SIGMOD best paper award for the work on data warehousing. In 2001, he was elected Fellow of the Association for Computing Machinery. He is a member of the editorial board of the International Journals on Information Systems, Decision Support Systems, and Intelligent Cooperative Information Systems. Professor Roussopoulos research has ranged from modelling database semantics and design methodologies to database system development and datacube analytics. Lately he is focusing his efforts in data virtualization which permits virtual data integration and aggregation without data collocation. This is in the realm of Big Data and offers a metadata platform and the necessary plumbing for implementing a Virtual Metadata Network. Professor Roussopoulos has also founded a high tech software company (<http://www.act-us.com>) which specialises in data warehouse products and data dissemination software.

## ABSTRACT

A database design methodology like the one offered in the Open Model Initiative ([www.openmodels.at/web/sdbd](http://www.openmodels.at/web/sdbd)) is a necessary tool for designing a database. In the old good days of databases, database design was a process that was followed by data entry, data loading, query and application development, testing and optimisation before making the database operational. Each of these steps were distinct and time consuming. In the past decade or so, the environment has changed drastically. The majority of the data is generated by machines, scanners, sensors, cameras and a lot of it is offered by multiple external data services on the internet. The result is what we call today Big Data and is characterized by the 5Vs: Volume (very high), Variety (multiple types), Velocity (speed of change), Variability (inconsistencies), and Veracity (quality). The last two Vs require data to be curated and stored before use. This adds redundancy and lineage metadata to the database. In the Big Data context, what is the role of a database design methodology? And what are the necessary tools to deal with the challenges in these 5V dimensions? In this talk, we will cover the basic database design methodology and its extensions to make it a continuous process to handle the 5 Vs. We will also cover continuous database schema evolution and vertical data integration in-the-small necessary to deal with Velocity and derived data.

### Contact:

**Prof. Dr. Nick Roussopoulos**  
University of Maryland  
[nick@cs.umd.edu](mailto:nick@cs.umd.edu)



# BUILDING SUSTAINABLE APPLICATIONS BY INTEGRATING CAPABILITY-ORIENTED ENTERPRISE MODELLING WITH SYSTEM DEVELOPMENT

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

## ABSTRACT

A significant objective of today's enterprise Information Systems (IS) is to be sustainable, which entails producing value to their stakeholders over time. A major concern is how Information Systems can successfully adapt and support constant 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 organisational development with IS development taking into account changes in the application context of the solution. It requires a number of organisational concepts to be modelled, such as business goals, processes, resources, Key Performance Indicators (KPIs), as well as the parameters for describing business environmental contexts for organisations 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 models in several industrial cases.

Professor Jelena Zdravkovic is the head of the Information Systems unit 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 more than 80 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 Journal, as well as a regular reviewer for a number of other international journals including several of Springer, such as Requirements Engineering Journal, as well as Elsevier's Journal of Systems and Software, and Information & Software Technology Journal, also IEEE Computing Journal. She serves in the program committees of more than 10 international conferences and workshops.

## BIO



### Contact:

**Prof. Dr. Jelena Zdravkovic**  
Stockholm University  
[jelenaz@dsv.su.se](mailto:jelenaz@dsv.su.se)

# MODELLING WITH THE EGPM METHOD

**Prof. Dr.-Ing. Heinz Züllighoven, Hamburg University, WPS Workplace Solutions GmbH  
Holger Breitling, WPS Workplace Solutions GmbH, Germany**

## BIO

Heinz Züllighoven graduated in Mathematics and German Language and Literature and 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. 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 and his co-researchers are further developing the tool support for the eGPM approach.

Holger Breitling graduated in Software Engineering and works as a senior software architect and managing consultant at Hamburg-based Workplace Solutions, Ltd. He is one of the designers of the eGPM method and acts as product owner (in Scrum terminology) for the eGPM modelling tool. He has frequently given talks and tutorials on example-based modelling. In his daily work, he uses the eGPM method and tooling in projects ranging from off-the-shelf-software evaluation and selection to pure software development, as well as projects that have transformative impact on the structure, processes, IT and business model of a company.

**Contact:**  
**Prof. Dr. Heinz Züllighoven**  
 Hamburg University  
[heinz.zuellighoven@informatik.uni-hamburg.de](mailto:heinz.zuellighoven@informatik.uni-hamburg.de)



**Contact:**  
**Holger Breitling**  
 WPS Workplace Solutions GmbH  
[holger.breitling@workplace-solutions.de](mailto:holger.breitling@workplace-solutions.de)



## ABSTRACT

The example-based business process modelling method (eGPM) is a visual approach to model selected business processes and their IT-support. The models are easy to understand for people in different departments, the business organisation and its specialists alike. The method aims at common understanding and communication about the processes which are modelled. Characteristics of the eGPM method are: (a) cooperative business processes are modelled as "cooperation pictures" based on selected scenarios, (b) simple pictograms make models easy to comprehend, (c) processes are structured along the lines of "who makes what with whom". The initial lecture will present the conceptual basis of the eGPM approach, 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 eGPM approach will be explained. The tutorial will provide hands-on experience with the eGPM tool. Examples from different application domains and usage contexts will show the usability of eGPM in many professional contexts.

# FROM REQUIREMENTS TO CODE: CONCEPTUAL MODEL-BASED SOFTWARE DESIGN

**Prof. Dr. Oscar Pastor, Universidad Politecnica de Valencia, Spain**

## ABSTRACT

A crucial success factor in information systems development is the alignment of the system with business goals, business semantics and business processes. Developers should be freed from programming concerns and be able to concentrate on these alignment problems. The application of sound Conceptual Modelling techniques within a Model-driven System Development (MDD) not only provides a structured and systematic approach to systems development, but also offers developers the possibility of using model transformation technologies to derive models of a lower abstraction level that can be further refined, and even generate software code automatically. From the experience got with the advanced MDD platform provided by Integranova, this presentation will show how to successfully integrate business process modelling (BPM), requirements engineering (RE) and object-oriented conceptual modelling with the objective of leveraging MDD capabilities. The current state of the art on modelling methods and code generation tools will be discussed to explore different ways to match an information system with business requirements. Concrete principles, concepts and common practices of MDD will be presented with a special focus on model-driven requirements engineering, meaning by it how business process models and requirements models can be embedded in a complete Conceptual Modelling-based software production process. As a practical application, a specific method and notations are explained, but the ultimate goal is that assistants are able to apply this knowledge to their own contexts, either in industrial practice or academic research.

Full Professor and Director of the Research Center on „Métodos de Producción de Software (PROS)” at the Universidad Politécnica de Valencia (Spain). He received his Ph.D. in 1992. He was a researcher at HP Labs, Bristol, UK. He has published more than two hundred research papers in conference proceedings, journals and books, received numerous research grants from public institutions and private industry, and been keynote speaker at several conferences and workshops. Chair of the ER Steering Committee, and member of the SC of conferences as CAiSE, ICWE, CIBSE or RCIS, his research activities focus on conceptual modelling, web engineering, requirements engineering, information systems, and model-based software production. He created the object-oriented, formal specification language OASIS and the corresponding software production method OO-METHOD. He led the research and development underlying CARE Technologies that was formed in 1996. CARE Technologies has created an advanced MDA-based Conceptual Model Compiler called OlivaNova, a tool that produces a final software product starting from a conceptual schema that represents system requirements. He is currently leading a multidisciplinary project linking Information Systems and Bioinformatics notions, oriented to designing and implementing tools for Conceptual Modelling-based interpretation of the Human Genome information.



### Contact:

**Prof. Dr. Oscar Pastor**

Universidad Politecnica de Valencia

[opastor@pros.upv.es](mailto:opastor@pros.upv.es)

# BUSINESS DECISION MODELLING

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

## BIO

**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) and 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 upcoming 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.

## ABSTRACT

**B**usiness processes incorporate lots of decisions. Business decisions are important, but are often hidden in process flows or activities. It is not considered good practice to model the detailed decision paths in the business process model, because hardcoding (decision) rules in processes leads to complex and inflexible process models. Separating rules and decisions from the process simplifies the process model (separation of concerns). In analogy with the Business Process Modelling & Notation Standard (BPMN), a Decision Model & Notation standard (DMN) has been developed. Decision modelling describes business decisions to be made, with their interrelationships and requirements, together with the detailed decision logic used to make the decision. One of the common forms of decision modelling is a structure of decision tables, describing the premises and resulting outcomes of a specific decision situation. This lecture is about the relation between business decisions and business processes and their integration. It takes you through decision methodology, including best practices, examples and experiences with different decision representations for modelling decision rules.

### Contact:

**Prof. Dr. Jan Vanthienen**  
KU Leuven  
[jan.vanthienen@kuleuven.be](mailto:jan.vanthienen@kuleuven.be)



# BUSINESS PROCESS MANAGEMENT AND ONTOLOGIES AS AN APPLICATION DOMAIN FOR META-MODELLING

**PD Dr. Hans-Georg Fill, University of Vienna, Austria**

## ABSTRACT

In this lecture it will be shown how concepts of meta-modelling can be applied in two core areas of modern information systems. For this purpose the lecture will start with a brief introduction into the theoretical foundations of meta-modelling and the corresponding realisation of modelling methods on the ADOxx meta-modelling platform. Subsequently, the application areas of business process management and ontologies will be introduced. Thereby it will be particularly focused on the challenges and opportunities of adapting existing modelling concepts in these areas to the personal needs of users, organisations, as well as technical processing functionalities in the form of algorithms. As a solution to these challenges the introduced meta-modelling concepts will be applied. Furthermore, it will be discussed how this approach permits to design and implement innovative software applications that bring together the technical opportunities of semantic technologies and established business process management methodologies. The concepts and applications will be illustrated using case studies from research and industry projects. In particular it will be reverted to concepts and implementations from the SeMFIS research project conducted at Stanford University that is hosted at [www.omilab.org](http://www.omilab.org).



PD Dr. Hans-Georg Fill holds a master degree in international business administration and a PhD in business informatics both from the University of Vienna, Austria. In 2013 he received the venia docendi (habilitation) in business informatics from the University of Vienna. In 2010 he was awarded an Erwin-Schrödinger fellowship for conducting a one year research project at Stanford University in the area of semantic based modelling for information systems. He regularly teaches courses in business informatics on the bachelor and master level at the University of Vienna and at the Ecole Nationale Supérieure des Mines St. Etienne, France. His research interests include semantic information systems, meta-modelling for enterprise information systems and visualization.



### Contact:

**PD Dr. Hans-Georg Fill**

University of Vienna

[hans-georg.fill@dke.univie.ac.at](mailto:hans-georg.fill@dke.univie.ac.at)

# CONSTRAINTS BETWEEN MODELLING PERSPECTIVES

**Dr. Manfred Jeusfeld, University of Skövde, Sweden**

## BIO

Manfred Jeusfeld studied computer science from 1980 to 1986 at the University of Technology Aachen (RWTH), Germany. In 1992 he received his Doctoral degree in Natural Sciences from the University of Passau. In 1992 he returned to the RWTH Aachen as a senior researcher of the Information Systems Institute (Informatik V). He is the principal developer of the ConceptBase system (<http://conceptbase.cc>), which is now used by more than a thousand institutes and companies world-wide for designing information systems and meta-modelling. From 1997 to 2013, he was assistant professor in the department Information Management (IM) of the Tilburg University, The Netherlands. Since 2013 he is senior lecturer at the department of information technology, University of Skövde, Sweden. His research covers cooperative conceptual modelling, data warehouse quality management, meta-modelling, method engineering, and repository systems. He is associate information director for ACM SIGMOD and the founder of CEUR Workshop Proceedings, a publication service for open-access proceedings of scientific workshops and conferences.

## ABSTRACT

Enterprise models span all levels and perspectives of objects relevant to an enterprise, such as goal models, process models, data models, product models, network structures, interfaces, and so forth. Such models must be kept consistent with each other. The lecture proposes a constraint language that allows to formulate rules at an abstraction level that facilitates their automated re-use. We also discuss the mechanism that makes the elements of heterogeneous modelling languages related to each other and how we can use this view to plan the links between such modelling languages. The technique is applied to existing enterprise modelling approaches such as 4EM and Archimate to demonstrate the required effort. Practical examples and exercises use the ConceptBase meta-modelling system.

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### Contact:

**Dr. Manfred Jeusfeld**  
University of Skövde  
[manfred.jeusfeld@acm.org](mailto:manfred.jeusfeld@acm.org)



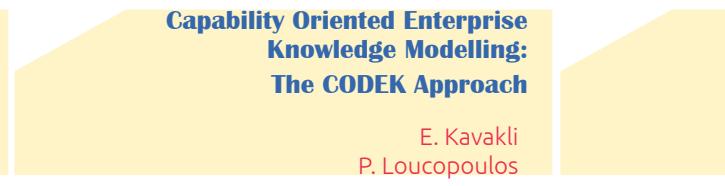
**Week 1****17 July****18 July****19 July****time**

09:00 - 10:00

PARTICIPANTS ARRIVAL



10:00 - 11:00



11:00 - 11:30

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15:30 - 17:00

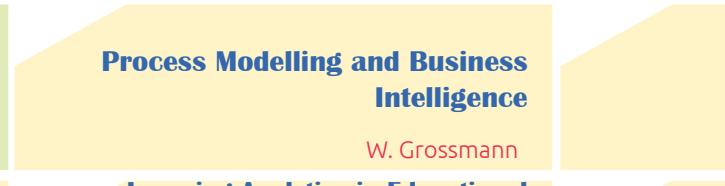
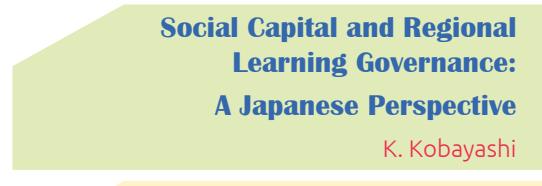


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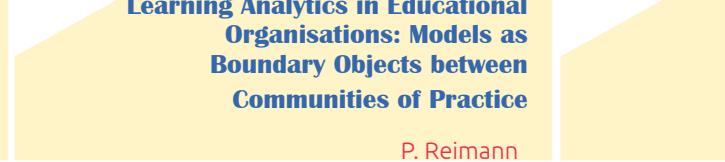
**Week 2****24 July****25 July****26 July****time**

09:00 - 10:00

LEISURE DAY



10:00 - 11:00



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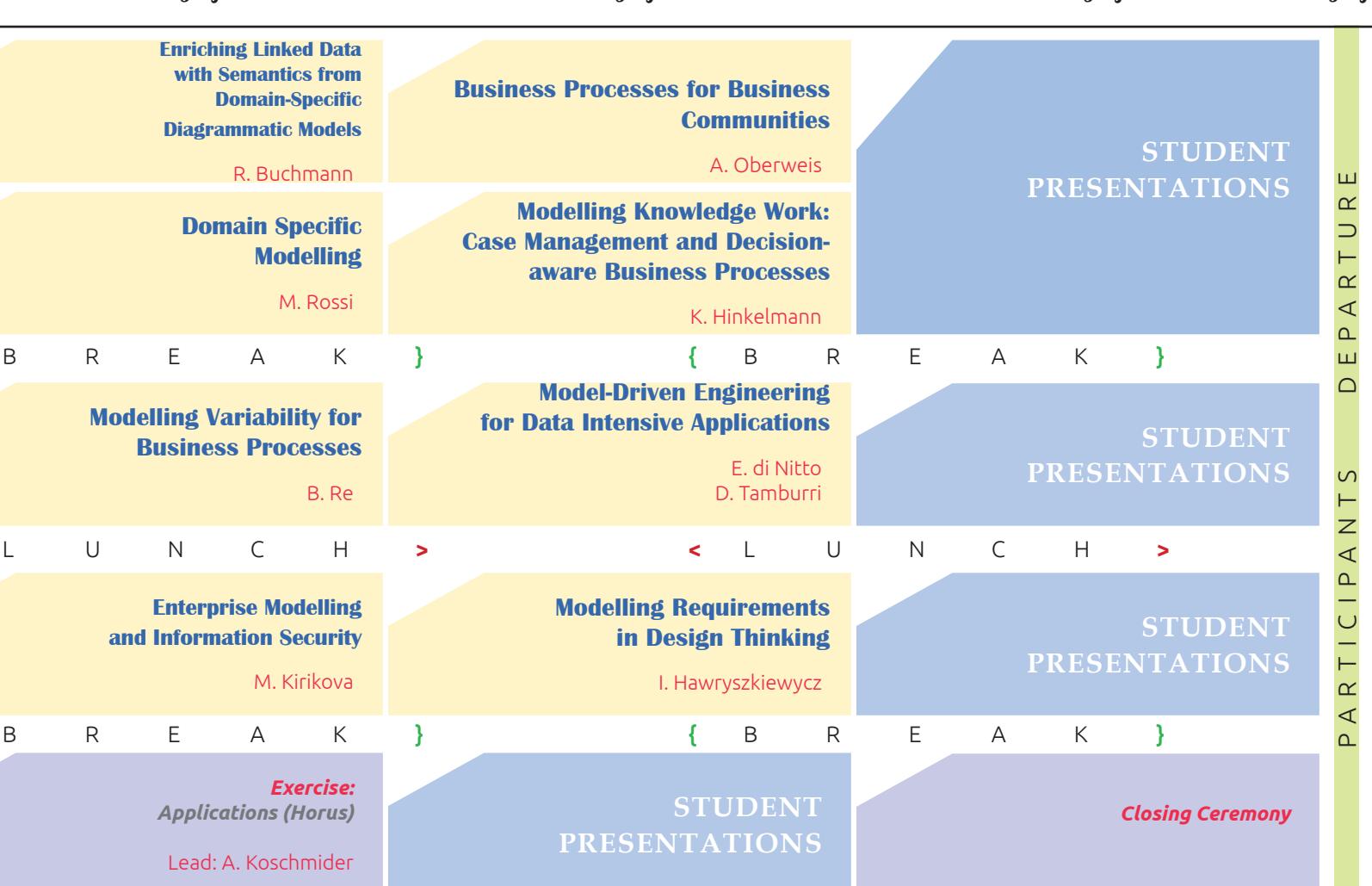
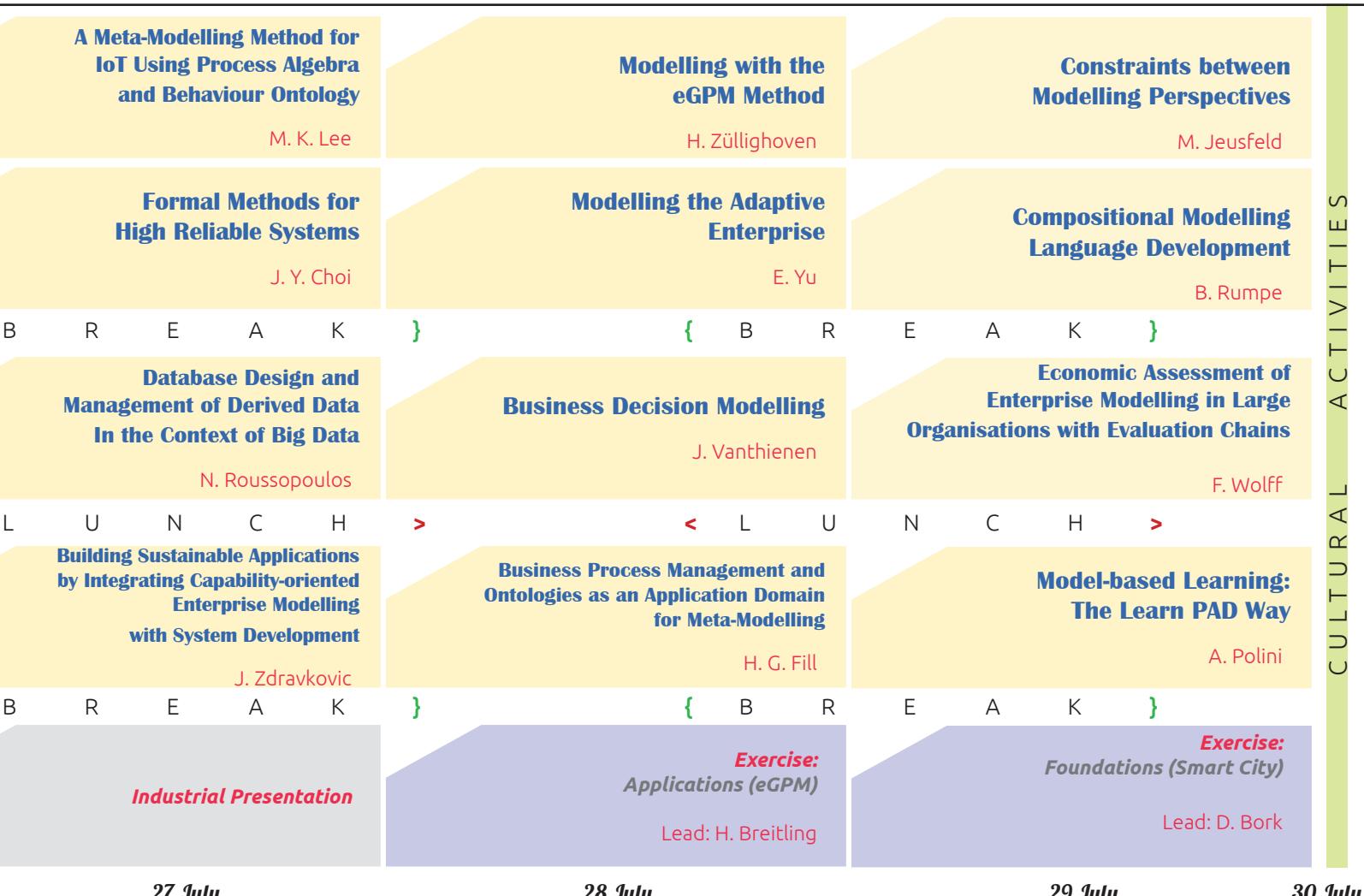
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20 July

21 July

22 July

23 July



# COMPOSITIONAL MODELLING LANGUAGE DEVELOPMENT

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

## ABSTRACT

We examine the current state and problems of modelling enterprises as well as software systems and discuss a number of approaches to tackle those. In particular, we discuss how to make use of models in large development projects, where a set of heterogeneous models of different languages needs is developed and needs to fit together, e.g. describing high-level structures of the organisation, business processes, data structures, automatically executable functions, constraints and so on. A model based development process (both with UML as well as a domain specific modelling language (DSML)) heavily relies on modelling core parts individually and composing those through generators to early and repeatedly cut code and tests from these models. We discuss in detail compositionality on models and heterogeneous modelling languages and how it supports agile evolution of such infrastructures.

Bernhard Rumpe is teaching Software Engineering at the RWTH Aachen University. Earlier he had positions at INRIA/IRISA, Rennes, Colorado State University, Fort Collins, TU Braunschweig, Vanderbilt University, Nashville, and TU Munich. His main interests are rigorous and practical software and system development methods. This includes model-engineering based on UML-like notations and domain specific languages, evolution, model-based testing, software architecture and especially the methodical and technical implications of their use in industry. He has contributed to formal methods as well as the UML standardisation. He is author and editor of nine books and Editor-in-Chief of the Springer International Journal on Software and Systems Modelling ([www.sosym.org](http://www.sosym.org)).



### Contact:

**Prof. Dr. Bernhard Rumpe**  
RWTH Aachen University  
[rumpe@se-rwth.de](mailto:rumpe@se-rwth.de)

## BIO

# ECONOMIC ASSESSMENT OF ENTERPRISE MODELLING IN LARGE ORGANISATIONS WITH EVALUATION CHAINS

**Prof. Dr. Frank Wolff, Baden-Württemberg Cooperative State University Mannheim, Germany**

## BIO

Prof. Dr. Frank Wolff is a professor of Information Systems at the Baden-Württemberg Cooperative State University Mannheim since August 2009. He focuses on Management of large scale organisational and IT Modelling. He completed his PhD studies in 2008 at the University of Duisburg-Essen. Before that he studied Economics and Business Administration at the University of Witten/Herdecke. He holds seminars and lectures at the University of Duisburg-Essen and at the University of Vienna.

## ABSTRACT

To support management with essential information enterprise models are reckoned almost indispensable. However, the creation and maintenance of an encompassing enterprise model has proven to be a challenging task. Fundamental are the diversity of influential factors and the long time period of its creation and usage. Therefore, a dedicated framework to control enterprise modelling has been developed based on the concept of evaluation chains. The lecture will present the foundations of the framework, the technical support with an ADOxx implementation and some example cases.

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### Contact:

**Prof. Dr. Frank Wolff**  
Baden-Württemberg University  
[frank.wolff@dhbw-mannheim.de](mailto:frank.wolff@dhbw-mannheim.de)



# MODEL-BASED LEARNING: THE LEARN PAD WAY

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

## ABSTRACT

The talk will illustrate a model-based and collaborative approach to learning in complex organisations. In organisations for which the activities are driven by complex process models workers are nowadays challenged to learn their daily activities in short time frames. Traditional approaches to learning requires then to be complemented with innovative solutions. In the talk the solution foreseen and developed by the EU project Learn PAd will be presented. The solution required the definition of seven model kinds including weavings permitting to relate concepts residing on different model kinds. The models are then used to automatically derive a knowledge based and collaborative infrastructure that will permit to organise knowledge according to the models themselves.

**Andrea Polini** (M) got his PhD from Scuola Superiore „Sant’Anna“ in Pisa - Italy. His research interests are mainly in the area of Software Engineering, in particular Software Testing, and in Business Process Modelling and verification. Andrea has got a quite strong experience in research within EU projects. He currently is Scientific Leader of the Learn PAd EU project, and he participated as research member to the FP6 STREP Telcert project, to the FP6 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. Andrea regularly reviews papers for IEEE-TSE, ACM-TOSEM, SOSYM, STVR. He has been reviewer for ICSE 2015, AST11-16, PESOS12-15, ViDaS10, EGOVIS12-13-14-15-16, ICST10-12, WebTest09, A-MOST08, TAP08, SOQUA07, ICSEA06, CD2005 and he organised events associated to relevant conferences in the Software Engineering domain, such as QASBA11-13, ARAMIS08, IW-SOSwE07, IW-SOSwE06, and WS-MaTe 06.



### Contact:

**Prof. Dr. Andrea Polini**  
University of Camerino  
andrea.polini@unicam.it

# SOCIAL CAPITAL AND REGIONAL LEARNING GOVERNANCE: A JAPANESE PERSPECTIVE

**Prof. Dr. Kiyoshi Kobayashi, Kyoto University, Japan**

## BIO

Kiyoshi Kobayashi is Professor of Infrastructure Economics, Graduate School of Management and the Director of the Research Center of Business Administration, Kyoto University. He is also Professor of Planning and Management Theory of Graduate School of Engineering, Kyoto University. He was Dean of Graduate School of Management for the period of 2010-2012. He is a world renowned researcher in the fields of Urban and Infrastructure Management and Economics and a recipient of several awards including the Distinguished Research Awards by Japan Society of Civil Engineers, Fellow Awards by RSA International, and Education Awards by the Danish Ministry of Environment as well as by the Vietnamese Minister of Education. He was experienced the Vice President of Japan Society of Civil Engineers, the President of the Applied Regional Science Conference, Global Business Society and serves on the editorial boards of international journals including the American Society of Civil Engineers, Annals of Regional Science, the series editor-in-chief of the Journals of Japan Society of Civil Engineers and the Journal of Applied Regional Science. Currently, he is a member of National Land Development Council of Japan, a committee expert on Transport Policy Council of Japan, and a coalition member of Science Council of Japan. He was an adjunct professor of 10 oversea universities and a visiting fellow of international organizations of OECD, WHO, and World Bank, etc. He is the author and co-editor of 65 books and over 430 academic reviewed papers.

**Contact:**  
**Prof. Dr. Kiyoshi Kobayashi**  
 Kyoto University  
[kobayashi.kiyoshi.6n@kyoto-u.ac.jp](mailto:kobayashi.kiyoshi.6n@kyoto-u.ac.jp)



## ABSTRACT

Recently the use of a participatory approach encouraging various regional actors to engage in the process of developing regional projects has been institutionalised and promoted in the context of Japanese regional development. An interactive process among regional actors with various views and interests, however, could result in counterproductive conflicts preventing those actors from cooperating with each other towards regional growth. This lecture highlights the role of legitimacy capital, as a part of social capital in a business context, to effectively manage conflicts over regional development by promoting an alignment of various interests and opinions of regional agents with a socially legitimate ideal. Legitimacy capital, which involves rules, norms, reciprocal rights and obligations, is developed through a series of discourses among various actors in society. The lecture presents normative principles and conditions to sustain discourse system for developing legitimacy capital on the basis of discourse theories and investigates the role of legitimacy capital to sustain and promote regional learning among multiple stakeholders for local development from the perspective of discourse theory. Introducing the concept of discourse systems, it is pointed out that regional learning practices consist of micro discourses focusing on specific regional debate and macro discourses focusing on the whole discourse system, and that social capital plays important roles both for strengthening the bond of each discourse initiative (bonding social capital) and for bridging network connections between different discourse spheres (bridging social capital).

# JAPANESE CREATIVE SERVICES AS A NEXT GENERATION ENTERPRISE MODELLING

**Prof. Dr. Yoshinori Hara, Kyoto University, Japan**  
**Dr. Hisashi Masuda, Japan Advanced Institute of Science and Technology, Japan**

## ABSTRACT

We define Japanese creative services and discuss how they have been sustained successfully and their 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/utilising of tacit context in a community. For analysing 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.

**Dr. Yoshinori Hara** serves as professor, Graduate School of Management, Kyoto University, since April 2006, when the graduate school was established. 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.

**Dr. Hisashi Masuda** serves as assistant professor, School of Knowledge Science, Japan Advanced Institute of Science and Technology. He received his B.S. from Chiba University in 2008, and received his MBA and his Ph.D. from Kyoto University in 2010 and in 2013, respectively. His research focuses on service engineering, service marketing, applied microeconomics, and knowledge engineering. Some of his publications are: (1) Hisashi Masuda and Wilfrid Utz, "The Development of Web Questionnaire with Business Process Modelling for Service Evaluation", The Second Asian Conference on Information Systems (ACIS), 2013, (2) Hisashi Masuda and Yoshinori Hara, "Using Value-in-Use: A Dynamic Model for Value-in-Exchange and Value-in-Use", 1st International Conference on Human Side of Service Engineering (HSSE) pp. 5972-5980, 2012.



### Contact:

**Prof. Dr. Yoshinori Hara**  
 Kyoto University  
[hara@gsm.kyoto-u.ac.jp](mailto:hara@gsm.kyoto-u.ac.jp)



### Contact:

**Dr. Hisashi Masuda**  
 Japan Advanced Institute of  
 Science and Technology  
[masuda@jaist.ac.jp](mailto:masuda@jaist.ac.jp)

# A METHOD FOR DESIGNING DOMAIN-SPECIFIC MODELLING LANGUAGES

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

## BIO

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. Further areas of research include research methods, method engineering, models at run time and methods for IT management. He is on the editorial boards of the journals Information Systems Architectures, Business & Information Systems Engineering, Journal of Information System Modelling and Design, Software and Systems Modelling and Information Systems and E-Business Management. He has been actively involved in numerous conferences and various major research projects. He had assignments as visiting researcher/professor in various countries. Ulrich Frank is the founding director of the international student exchange network IS:link.

## ABSTRACT

In recent years, the development of domain-specific modelling languages (DSML) has gained remarkable attention. This is for good reasons: A DSML incorporates concepts that represent domain-level knowledge. Hence, systems analysts are not forced to reconstruct these concepts from scratch. At the same time, DSML contribute to model integrity, because they include already constraints that would otherwise have to be added manually. Even though there has been a considerable amount of research on developing and using domain-specific modelling languages, there is still a lack of comprehensive methods to guide the design of these languages. In this course the participants will learn to use a method for designing DSML. It includes heuristics to analyse requirements and meta-modelling guidelines that support frequent design decisions. The use of the method will be illustrated by the development of an example DSML.

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### Contact:

**Prof. Dr. Ulrich Frank**

University of Duisburg-Essen  
[ulrich.frank@uni-duisburg-essen.de](mailto:ulrich.frank@uni-duisburg-essen.de)



# ENTERPRISE ENGINEERING NEEDS FOR PRODUCT SERVICE SYSTEMS

**Prof. Dr. Xavier Boucher, Dr. Khaled Medini,**  
**Ecole Nationale Supérieure des Mines de Saint Etienne, France**

## ABSTRACT

This contribution to NEMO 2016 is not oriented on innovations or research works concerning the theory and implementation of enterprise modeling tools and methodology. Complementary, it is focusing on an application area, which induces specific requirements and needs for such methodologies. Industrial Product Service Systems (PSS) are a recent industrial concept offering strong opportunities both for business innovation and sustainability improvement. Coupling or even integrating industrial production and service delivering poses many innovative challenges for the manufacturing industry at the technological, organisational and even human level. In the recent years, many international projects have contributed to important scientific advances in the field. The lecture will first give a synthetic insight on PSS, to make possible for the audience to understand the key concepts of PSS and key industrial needs to manage an economical transition towards this new form of industrial economy. Then, the lecture will underline specific research orientations directly linked to the needs of developing enterprise modelling and engineering solutions, to support the configuration, deployment, and life cycle management of PSS and value creation chains. The practical part of the lecture will offer the audience the opportunity to experiment a customized modelling tool implemented using the ADOxx platform, named 'PSS Scenarios Modeler'. PSS Scenarios Modeler is designed to support PSS engineering through a progressive capitalization of the designers' ideas and knowledge throughout the engineering process. The audience will go through a stepwise modelling process to define PSS organisational scenario in a specific context.



**Prof. Dr. Xavier Boucher** is currently Professor in Industrial Management at the Ecole Nationale Supérieure des Mines de Saint Etienne. His current research focuses on Product Service Systems, service oriented production systems, collaborative-agile networks and decision models to manage the supply chain agility. Prof. Boucher is currently European co-chair of the working group WG 5.5 of IFIP (International Federation for Information Processing) and has been involved in SOCOLNET community (Society for Collaborative Networks) for many years, and co-leader of a French CNRS research group on Model Driven Enterprise and Information Systems Engineering. Prof. X. Boucher is currently leading several collaborative research projects in the field of design and management of Product Service Systems with an economic and manufacturing point of view.

**Dr. Khaled Medini** is currently an Assistant Professor of Industrial Engineering at Ecole des Mines de Saint-Etienne, Fayol Institute. He received his PhD from Ecole Centrale de Nantes in 2013. He holds a MSc of Industrial Engineering from Ecole Centrale de Lille, 2010 and an Engineer Diploma from Ecole Nationale d'Ingénieurs de Tunis, 2009, in Industrial Engineering. His research interests relate to decision making support by use of performance evaluation, enterprise modelling and simulation, in the contexts of mass customization, product-service systems (PSS) and sustainable development. Khaled Medini has been involved in European (FP7 and Erasmus+), national and regional research projects about PSS and mass customization.



### Contact:

**Prof. Dr. Xavier Boucher, EMSE**  
**boucher@emse.fr**



### Contact:

**Dr. Khaled Medini, EMSE**  
**khaled.medini@emse.fr**

# PROCESS MODELLING AND BUSINESS INTELLIGENCE

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

## BIO

**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 a PhD student at the University Vienna.

## ABSTRACT

**B**usiness 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 organisational 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 realised 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.

### Contact:

**Prof. Dr. Wilfried Grossmann**

University of Vienna

wilfried.grossmann@univie.ac.at



# LEARNING ANALYTICS IN EDUCATIONAL ORGANISATIONS: MODELS AS BOUNDARY OBJECTS BETWEEN COMMUNITIES OF PRACTICE

**Prof. Dr. Peter Reimann, University of Sydney, Australia**

## ABSTRACT

The widespread availability of learner-related data has the potential to empower students, teachers, parents and school leaders by providing critical insights into the learning process. However, fostering a widespread organisational culture of data-informed learning and teaching practice remains a significant challenge. This is in part due to the need for multidisciplinary experts collaborating with practitioners to develop processes that can readily facilitate the translation of data into pedagogical action. The presentation focuses on the question of how to accelerate and deepen the uptake of new data-supported practices in schools and universities. I will introduce a theory of integrated individual and organisational learning that suggests that practices of data-intensive decision making can be expanded in educational organisations by engaging these in joint data practices with experts from two fields where innovating data practices are continuously developed: Educational Data Mining [1] including Learning Analytics [2] and the Learning Sciences [3]. The approach focuses on knowledge objects, in particular in their role as boundary objects, that is in their function to facilitate work across different kinds of boundaries, in particular disciplinary boundaries and organisational boundaries [4, 5]. The creative frictions that generate from discussions surrounding these boundary objects can facilitate the broader adoption and dissemination of innovations within and across schools. I will discuss the suitability of a number of formats for knowledge objects to serve as boundary objects, including formats that are grounded in methods of meta-modelling.

Peter has a PhD in psychology from the University of Freiburg, Germany. Since 2002, he has been holding a position as Professor in the Faculty of Education and Social Work, University of Sydney. Before that, he was Professor of Educational Psychology at the University of Heidelberg. His primary research areas are cognitive learning research with a focus on educational computing, multimedia-based and knowledge-based learning environments, e-learning, and the development of evaluation and assessment methods. Peter has helped to organize various conferences over the years, recently the International Conference of the Learning Sciences, and is on the editorial board of numerous journals, among the the Journal of the Learning Sciences and Educational Psychologist. He just completed a four year project in the European Commission's research program on technology enhanced learning called Next-Tell ([www.next-tell.eu](http://www.next-tell.eu)) that also dealt with issues of learning design modelling.



### Contact:

**Prof. Dr. Peter Reimann**  
University of Sydney  
[peter.reimann@sydney.edu.au](mailto:peter.reimann@sydney.edu.au)

# MODELLING FOR AMBIENT ASSISTANCE

**Prof. Dr. Dr. h. c. Heinrich C. Mayr, Alpen-Adria Universität Klagenfurt, Austria**

## BIO

**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 (today: KIT), visiting professor at several universities, and CEO of a German software company. His research is documented in over 200 publications and includes information system design methodologies, requirements and model engineering, and knowledge management. He has held, amongst other functions, that of President of the Gesellschaft für Informatik (GI). For 6 years he served as Rector of the University. Currently he is editor in chief of the "Lecture Notes in Informatics", vice-chair of the ER steering committee, chairperson of the council of the Software Internet Cluster SIC, and Member of the TC "Wirtschaftsinformatik" of the German Accreditation Organisation ASIIN.

**Judith Michael** received her doctorate in Informatics from the Universität Klagenfurt in 2014. From 2006 on, she has worked as a software engineer and consultant in IT-companies. Currently she is senior scientist at the Application Engineering Research Group, and member of the Supervisory Board of Carinthian Tech Research AG (CTR, Austria). Her research focuses on Conceptual Modelling, Knowledge Management, Model Driven Architecture, Human Centred Computing, and Active and Ambient Living.

**Fadi Al Machot** received his diploma from the University of Potsdam in 2010, and his doctorate in Informatics from the Universität Klagenfurt in 2013. He has worked in different European research projects. In 2011, his SRSnet project was awarded as one of the best practice projects in the Interreg IV program. He has developed different algorithms for complex event detection, driver assistance and human cognitive reasoning. His work has been patented, and published in peer-reviewed publication media. Currently, he is a lecturer and a senior researcher at the Application Engineering Research Group.



## ABSTRACT

Ambient Assistance is a growing field in ICT: Based on smart sensors, life video analysis techniques as well as speech recognition human centred assistance becomes feasible and affordable. The range of applications is broad and covers everyday situations in private and business environments as well as support for people with special needs. Consequently, Ambient Assistance is a challenging and promising field for computer scientists, software engineers and information technicians in both, research and application, with lots of questions to answer and technical solutions to find. Since dealing with the support of humans, it is an interdisciplinary field affecting Psychology, Neurology, Medicine, Law, Philosophy, Domotics and others more. Models play a key role in ambient assistance systems as they act as the integral means for data and knowledge acquisition, representation, evaluation and exchange for the various system components. We will start our lecture with a short overview of already existing best practice examples and then work out the key notions and concepts that form the basis of modelling endeavours in that field. Based here on, we will discuss the objectives, concepts and elements of the "Human Cognitive Modelling Language" HCM-L, which was developed in the "Human Behavior Monitoring and Support" project HBMS. Deeper insight will be gained in the afternoon Parallel Working Groups that are headed by members of the Application Engineering Research Group: Dr Judith Michael and Dr. Fadi Al Machot.

### Contact:

**Prof. Dr. H. C. Mayr, Dr. Judith Michael, Dr. Fadi Al Machot,**  
Alpen-Adria University Klagenfurt  
[Firstname.Lastname@aau.at](mailto:Firstname.Lastname@aau.at)

# TRANSFERRING MODEL-DRIVEN VISUALIZATIONS CONCEPTS TO INTERNET OF THINGS

**Prof. Dr. Kelly Johany Garces Pernett, Universidad de Los Andes, Colombia**

## ABSTRACT

Software is constantly evolving; this evolution is motivated by different reasons such as the obsolescence of a technology, the pressure of users, or the need to build a single coherent information system when merging companies. My research lies in the field of software modernization, a kind of evolution that refers to understand and evolve existing software assets to maintain a large part of their business value. In my talk, I present a Model-Driven Engineering approach to leverage modernization. The approach consists of two phases: i) Knowledge discovery of the existing system, ii) Transformative steps that move the as-is state to the to-be state. The first phase involves reverse engineering the existing software and presenting several different views to the users. The views help users to understand the legacy in an agnostic way and to take decisions that guide the transformative steps. I present results of the approach application into two projects that involves Colombian academic and industrial partners. This work has helped us to gain experience on Model-Driven visualizations that can be transferred to the Internet Of Things field where there are data understanding challenges. One can think about Model-Driven tools that produce metric-centered visualizations that helps one to discover aspects on the data emitted by devices. The reasons to use modelling in this field are: the power of models to unify inputs from different origins (i.e., devices) and the facility of building graphical editors on top of models. The talk ends with a practical work where participants will build a graphical editor based on a model.

**Prof. Kelly Garces Pernett** currently teaches at the University of Los Andes to undergraduates and master students from the Department of Systems and Computing Engineering. In particular, the lectures are about Software Architecture and Model-Driven Engineering. Her research interests include Software Modernization, Domain Specific Languages, and Cloud Computing. She completed her PhD at the University of Nantes with the title "Adaptation and evaluation of generic model matching strategies".

## BIO



### Contact:

**Prof. Dr. Kelly Johany Garces Pernett**  
 Universidad de Los Andes  
 kj.garces971@uniandes.edu.co

# ENRICHING LINKED DATA WITH SEMANTICS FROM DOMAIN-SPECIFIC DIAGRAMMATIC MODELS

**Dr. Robert Buchmann, Babes-Bolyai University Cluj, Romania**

## BIO

Dr. Robert Buchmann received his PhD from „Babeş-Bolyai” University Cluj, Romania, in 2005, in the field of Business Information Systems. As a lecturer in the same university, he further specialised in semantic information systems design. He worked between 2011 and 2014 at the University of Vienna, Research Group Knowledge Engineering, as a team leader in the ComVantage FP7 research project, investigating the interplay between modelling methods and semantic information systems.

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**Contact:**  
**Dr. Robert Buchmann**  
 Babes-Bolyai University Cluj  
[robert.buchmann@econ.ubbcluj.ro](mailto:robert.buchmann@econ.ubbcluj.ro)



## ABSTRACT

A key driver of the Linked Data paradigm is the ability to lift data graphs from legacy systems, by employing various adapters and RDFizers (e.g., D2RQ for relational databases, XLWrap for spreadsheets). Such approaches aim towards removing boundaries of enterprise data silos by having them open to cross-organisational linking within a „Web of Data”. An insufficiently tapped source of machine-readable semantics is the underlying graph nature of diagrammatic conceptual models - a kind of information that is richer compared to what is typically lifted from table schemata, especially when a domain-specific modelling language is employed. The lecture advocates an approach to Linked Data enrichment based on a diagrammatic model RDFizer originally developed in the context of the ComVantage FP7 research project. The presentation will provide a minimal but illustrative example from which arguments will be generalized beyond the originating project context, leading towards a proposed vision of „conceptual model”-aware information systems.

# DOMAIN SPECIFIC MODELLING

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

## ABSTRACT

The course introduces students to developing new modelling languages through Domain Specific Modelling approach with MetaEdit+ platform. During this course the students will get an overview of working with MetaEdit+ when developing DSM's and then develop support environment for their own modelling language. The tool allows language developers to rapidly build and evolve their methods and then try them out on the fly.

Matti Rossi is a professor of information systems at Aalto University School of Business. He has worked as research fellow at Erasmus University Rotterdam, visiting assistant professor at Georgia State University, Atlanta and visiting researcher at Claremont Graduate University. 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 he is the past editor in chief of Communications of the Association for Information Systems.

Matti Rossi is a member of IEEE, ACM and AIS.

## BIO



### Contact:

**Prof. Dr. Matti Rossi**

Aalto University

[matti.rossi@aalto.fi](mailto:matti.rossi@aalto.fi)

# MODELLING VARIABILITY FOR BUSINESS PROCESSES

**Prof. Dr. Barbara Re, University of Camerino, Italy**

## BIO

Dr. Barbara Re is an Assistant Professor at UNICAM. She received her PhD in Information Science and Complex System from UNICAM in 2010. Her research interests refer to the area of Software Engineering and Business Process Management from modelling to analysis. She exploits her research results in the area of Smart City and, in particular, Smart Government development and related services delivery. She was involved in multidisciplinary research projects in collaboration with national and international research institutes and companies. Currently she is involved in the EU FP7 ICT project LEarnPAD. In LEarnPAD she is work-package leader with the responsibility for the detailed coordination, planning, monitoring and reporting of demonstrators activities.

## ABSTRACT

In order to support organisations in providing similar services without the need to structure each of them separately variability management is needed. Variability is the ability of deriving different process variants from a configurable model at design-time. Several notations and approaches are available in the literature to support such issues. They will be introduced in the presentation. In particular, in the presentation a novel notation and a related approach to variability modelling is introduced. The approach and the notation are inspired by feature modelling, where features are here used to represent activities of processes. A tool has been designed and developed to support the proposed notation and approach. It will also be introduced in the presentation.

### Contact:

**Prof. Dr. Barbara Re**  
University of Camerino  
[barbara.re@unicam.it](mailto:barbara.re@unicam.it)



# ENTERPRISE MODELLING AND INFORMATION SECURITY

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

## ABSTRACT

Current business process modelling approaches are well suited for showing the sequence of activities. They are less appropriate for reflecting information flows. However, in the context of information security, the reflection of information flows is an essential instrument for analysing the way how information shall be organized with respect to the activity flow and enterprise architecture. Taking into consideration that security concerns not only technical devices and access rights in databases, the enterprise models that reflect organisational structure (including particular individuals), technical architecture, information architecture, and relationships between aforementioned models are useful to identify and use different patterns that reflect the need for caring for security. The usage of the enterprise models also helps to identify methods for establishing the requested level of security. To illustrate how enterprise models can be used in caring for information security, several security requirements patterns, represented in BPMN, will be discussed focusing on the relationship between the information flow in the pattern and the corresponding enterprise architecture elements.

**Dr. sc. ing. 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 150 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. Marīte 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.



### Contact:

**Prof. Dr. Marite Kirikova**  
Riga Technical University  
[marite.kirikova@cs.rtu.lv](mailto:marite.kirikova@cs.rtu.lv)

## BIO

# BUSINESS PROCESSES FOR BUSINESS COMMUNITIES

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

## BIO

[Andreas Oberweis](#) is Professor for Applied Informatics at the Karlsruhe Institute of Technology (KIT) since 2003. Since 2004 he is also Director at the Research Center for Information Technology (FZI) Karlsruhe in the Research Group Software Engineering. He received a Doctoral Degree in Informatics from Universität Mannheim in 1990 and a Habilitation Degree in Applied Informatics from Universität Karlsruhe in 1995. From 1995 to 2003 he was Professor for Information Systems Development at Goethe-Universität Frankfurt/Main. His research and teaching interests are in the field of business process engineering and information systems development. He is co-founder of PROMATIS software GmbH (1994) and HORUS software GmbH (2009) in Ettlingen. Since 2004 he is Program Director of the Master Program Service Management and Engineering at the Hector School of Engineering and Management. Since 2014 he is Vice President of the Gesellschaft für Informatik (GI).

[Agnes Koschmider](#) is a Locum Professor for Information Systems at the University of Cologne. In 2007 Agnes received a doctoral Degree in Applied Informatics from University Karlsruhe and finished her Habilitation in Applied Informatics in 2015 at the Karlsruhe Institute of Technology (KIT). She studied from 1998-2003 and, received her Diploma degree 2003 in Business Administration from the Goethe University Frankfurt/Main. Her current research concentrates on conceptual modelling, modelling support techniques, behaviour modelling and interdisciplinary modelling. In September 2013 she was named a junior fellow of the German Informatics Society (Gesellschaft für Informatik).

## ABSTRACT

Several languages have been suggested for modelling business processes. Practice shows, however, that a powerful modelling language alone is not enough. Users require guidance and assistance in the preparation of models, that is, during application of the language. In this course the students will learn the Horus Method. This method defines various stages of modelling and is a recipe-like guideline that has been proven in practice. In practical exercises to this lecture students will collaborate in a Web 2.0-based social network, to define business objectives, strategies and business processes together and will elaborate a common understanding of an organisation.

### Contact:

**Prof. Dr. Andreas Oberweis**  
 Karlsruhe Institute of Technology  
[andreas.oberweis@kit.edu](mailto:andreas.oberweis@kit.edu)



### Contact:

**PD Dr. Agnes Koschmider**  
 University of Cologne  
[agnes.koschmider@kit.edu](mailto:agnes.koschmider@kit.edu)



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

**Prof. Dr. Knut Hinkelmann,**  
**FHNW University of Applied Sciences and Arts Northwestern, Switzerland**

## 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 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 give an introduction into this modelling language and shows, how it can be integrated with Business Process Model and Notation (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 the Decision Model and Notation (DMN).

**Knut Hinkelmann** is head of the Master of Science in Business Information Systems at the University of Applied Sciences and Arts Northwestern Switzerland FHNW and research associate at the University of Pretoria. At the University of Camerino he is permanent member of the PhD Committee. In 1988 he obtained a diploma in Computer Science from the University of Kaiserslautern and in 1995a PhD from the same university. From 1990 until 1998 he was researcher and head of the Knowledge Management research group at the German Research Center for Artificial Intelligence (DFKI). From 1998 until 2000 he worked as product manager for Insiders Information Management GmbH. He joined FHNW in August 2000 as a professor for Information Systems. From 2002 to 2008 he was head of the Bachelor of Science in Business Information Technology. His research topics include modelling of knowledge-intensive processes, knowledge management and knowledge technologies. He has been supervisor and external examiner of many PhD theses and guest lecturer at the University of Vienna and University of Camerino.

## BIO



### Contact:

**Prof. Dr. Knut Hinkelmann**  
**FHNW**  
**[knut.hinkelmann@fhnw.ch](mailto:knut.hinkelmann@fhnw.ch)**

# MODEL-DRIVEN ENGINEERING FOR DATA INTENSIVE APPLICATIONS

**Dr. Damian Andrew Tamburri, Politecnico di Milano, Italy**  
**Prof. Dr. Elisabetta di Nitto, Politecnico di Milano, Italy**

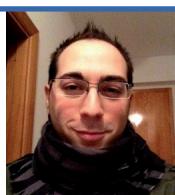
## BIO

During his Post-Doc at Politecnico di Milano, **Dr. Damian Tamburri** assumed the role of deputy WP leader of the DICE project, requiring him to manage various activities, such as coordination of EU partners, structuring, coordinating and editing deliverables, coordination and conduction of solid research work in contribution to EU projects. Dr. Tamburri is currently writing a handbook on Qualitative Empirical Software Engineering and plans to expand his knowledge on quantitative methods. His research aims are to understand and support the social and organisational side of software engineering through empirical research, predicated on the equilibrium between qualitative and quantitative research in pursuit of causality.

**Elisabetta Di Nitto** is an Associate Professor at DEIB at Politecnico di Milano, where she also earned her Ph.D. in Computer Science. She is teaching Software Engineering for graduate students and Foundations of computer science for undergraduate students. Her current research interests are mainly on software engineering, and in particular, on process support systems, service-centric applications, dynamic software architectures, and self-adaptive systems. She was researcher at CEFRIEL (a research consortium among technical universities and industry in the Milan area) and visiting professor at University of California, Irvine (USA). She has published and presented various papers on the most important international journals and conferences and is regularly serving in the program committee of various international conferences such as ICSE and ASE. She has been member of the editorial board of the IEEE Trans. on Software Engineering, of the SOCA journal, of the Journal of Software: Evolution and Process and of PeerJ Computer Science. She has been general chair of the 10th Joint Meeting of the European Software Engineering Conference and the ACM SIGSOFT Symposium on the Foundations of Software Engineering (ESEC/FSE 2015), co-chair of the 25th Conference on Automated Software Engineering (ASE 2010), workshops co-chair of ICSE 2010 and PC-chair of ServiceWave 2010. She has been also program co-chair of the workshops at ICSOC 2006 and of the demo track at ICSE 2007. She has been responsible for various EU projects. In particular, she has been the coordinator of the MODAClouds IP project, is the scientific director of the H2020 project DICE and has been the Scientific Director of the FP6 IP project SeCSE and principal investigator for PMI of CASCADAS. She has been working in S-Cube SLA@SOI, SOA4All and has been providing support for the coordination of the national FIRB 2005 project ARTDECO.

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**Contact:**  
**Dr. Damian Andrew Tamburri**  
 Politecnico di Milano  
 damianandrew.tamburri@polimi.it




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**Contact:**  
**Prof. Dr. Elisabetta Di Nitto**  
 Politecnico di Milano  
 elisabetta.dinitto@polimi.it



## ABSTRACT

**B**ig Data technologies have rapidly achieved widespread adoption for many reasons, e.g., thanks to the versatility with which they foster innovative products by direct analysis of various user contents (e.g., tweets, blogposts, likes, pictures, etc.). However, designing and developing Big Data applications is still a considerable problem since: (a) it involves many side-costs the time spent on learning about and designing with the many big data frameworks; (b) it requires to balance out infrastructural and corporate governance costs with (non-trivial) development and deployment costs; (c) it most likely requires additional costs for the various trial-and-error experiments needed to match desired performance. We argue that a relevant part of said costs can be saved by tackling the design, development and deployment of Data Intensive Applications (DIAs) with Model-Driven Engineering (MDE) framed into a DevOps process. The purpose of this course/presentation is to show how MDE and DevOps have been applied to the design of Data Intensive Applications and to identify new research areas and issues.

# MODELLING REQUIREMENTS IN DESIGN THINKING

**Prof. Dr. Igor Hawryszkiewycz,**  
**University of Technology Sydney, Australia**

## ABSTRACT

Design thinking is increasingly used to design systems in complex environments. Briefly, design thinking is a social process where stakeholders work in interdisciplinary teams to create innovative solutions. The focus here is on brainstorming rather than analytical design. Visualizations are almost natural here as stakeholders look at visual representations of solutions, identify issues and discuss alternatives. The important aspect of design thinking is that it leads to creativity outcomes followed by innovative solutions. The lecture will define modelling requirements to support design thinking. It will do so by briefly introducing design thinking and by presenting creativity tools used to develop a solution. The approaches of (a) creativity focused modeling and (b) solution modelling will be presented in more detail. The first approach deals with the modeling tools and techniques that teams use to arrive at a solution. In the second approach designers choose the constructs that naturally reflect the desired solution space, whereas the solution space can be seen from a number of different perspectives. The practical application of these is shown in an ADOxx tool, where we have now developed four perspectives for representing solutions.

Prof. Hawryszkiewycz completed BE and ME degrees in Electrical Engineering at the University of Adelaide, and a PhD degree at the Massachusetts Institute of Technology. He has developed methods for the design of systems which over time covered database design, information systems design and currently focuses on developing requirements for collaborative systems and supporting them with technology that integrates collaboration into the community and business processes and now extending to design thinking. His work has included both research as well as industrial applications and has been reported in over 250 publications and 5 text books.

## BIO



### Contact:

**Prof. Dr. Igor Hawryszkiewycz**  
**University of Technology**  
*igor.hawryszkiewycz@uts.edu.au*



# **EXERCISE DESCRIPTIONS**

# Foundation Exercises: Modelling Scenarios for a Smart City

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 2016 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	<b>How to model concepts of a Smart City?</b>  Basic metamodeling concepts required to realize a modeling 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.
	III: Queries, e.g., Analysis	<b>How to analyze Smart City models using query techniques?</b>  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 illustrative scenarios, queries will be executed on Smart City models to determine e.g., the healthiest running tracks or the fastest route for an emergency car in case of an accident.
	V: Processing, e.g., Simulation	<b>How to process Smart City models using simulation?</b>  Introduction to simulation algorithms and how they can be applied to process the knowledge codified 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. Finally, further model processing possibilities will be showcased and discussed, e.g., stepwise car navigation in a Smart City model using AdoScript, Expressions, and event handling.

In three sessions, an introduction to the foundations of meta-modelling, model analysis & querying, and model processing through simulation & algorithms is given. Every session comprises theoretical background, a demonstration using the Smart City scenario, and hands-on parts by means of practical implementation using the ADOxx meta-modelling platform. The goal of the exercises is to show the power of meta-modelling and conceptual modelling in answering the requirements of upcoming domains that cannot be addressed with general-purpose modelling languages.

[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.

## CONTACT

### EXERCISE LECTURES:



Dr. Dominik  
Bork



Nikolaos  
Tantouris

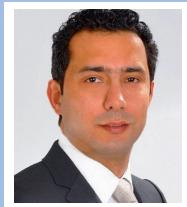


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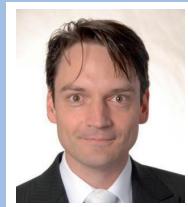


Michael  
Walch

### ADOXX TRAINING:



Mehmet  
Albayrak

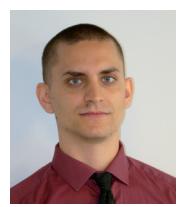


Dr. Robert  
Woitsch



Wilfrid  
Utz

### TECHNICAL SUPPORT:



Simon  
Doppler



Franz  
Staffel

University of Vienna  
Email: {firstname.lastname}@univie.ac.at

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