

Learn Conceptual Modelling to innovate, design and engineer Digital Ecosystems!



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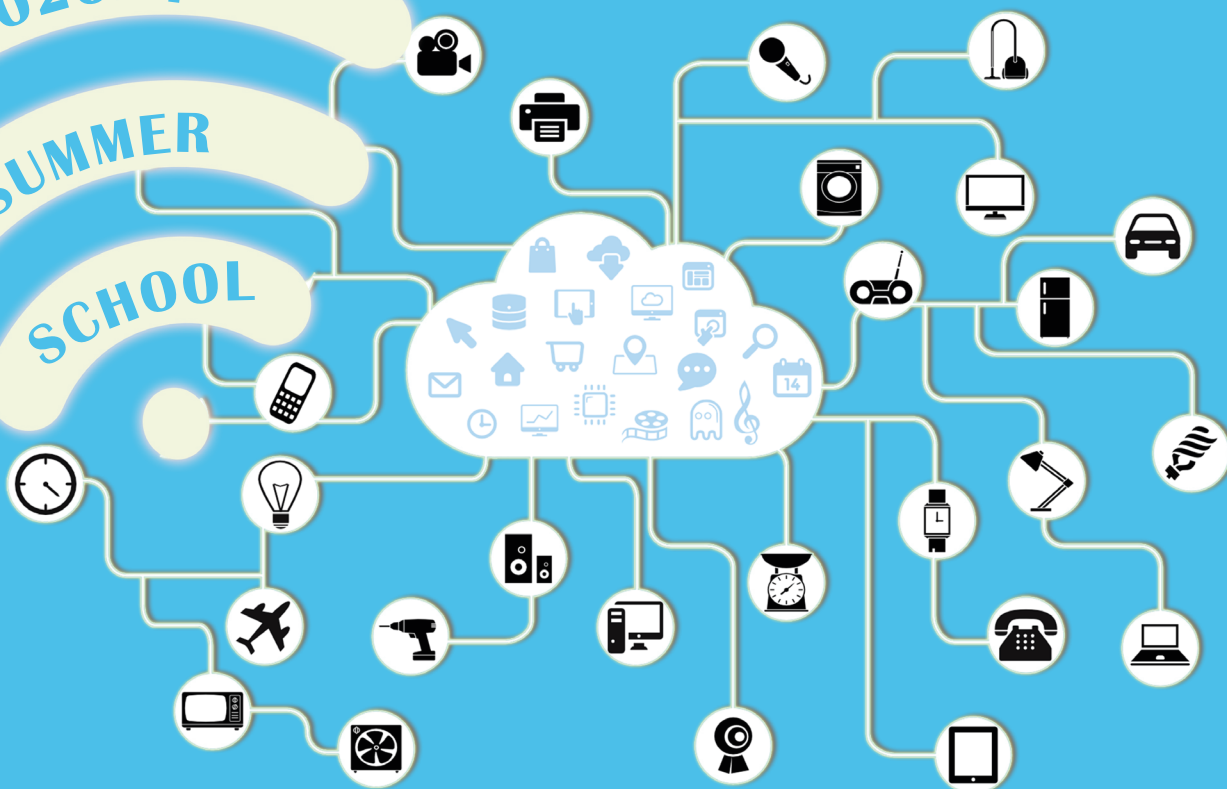
A Nonprofit Organization

PROGRAMME

NEMO2024

SUMMER

SCHOOL



General Information

Summer School Venue

OMiLAB @University of Vienna
Faculty of Computer Science
Währinger Straße 29
1090 Vienna, Austria
T +43 1 4277-78943

Public means of transport

Tram: 5, 33, 37, 38, 40, 41, 42
Tram station:
Spitalgasse/Währinger Straße
Trip planning:
<http://www.wienerlinien.at>

NEMO2024 Team



Contact

Iulia Vaidian
T +43 660 7064283
E events@omilab.org

Taxi

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

Emergency calls

Rescue 144
Police 133
Fire department 122

Organization Team

Contact: nemo2024@omilab.org



Mira Tjoa



Hannah Staffel

Technical Team

Contact: nemo2024@omilab.org



Danial Mohammadi Amlashi



Karlheinz Wachauer



Franz Staffel

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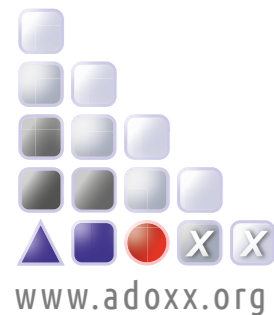
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Research & University Partners



Organizer



Welcome!

The NEMO Summer School Series welcomes you to its 10th 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 conceptual modelling. Since in today's enterprises modelling methods are widely used for numerous purposes. NEMO2024 will focus on the design and implementation of Enterprise Digital Twins and Ecosystems addressing different domains and approaches of modelling:

- Foundations of Conceptual Modelling, e.g. formal methods and tools for the creation, transformation, and application of modelling methods.
- Semantics and Technologies for Digital Ecosystems, e.g. meta-modelling platforms, model-value functionality, interaction with diverse smart devices and multi-client applications.
- Enterprise Digital Twins, e.g. Enterprise Information Systems, security frameworks, and lifecycle behaviour.
- Cross-cutting Issues, e.g. information 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 sessions 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 organizational team at the OMiLAB@UNIVIE and the support of the Faculty of Computer Science at the University of Vienna.

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

Dimitris Karagiannis

Heinrich C. Mayr

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

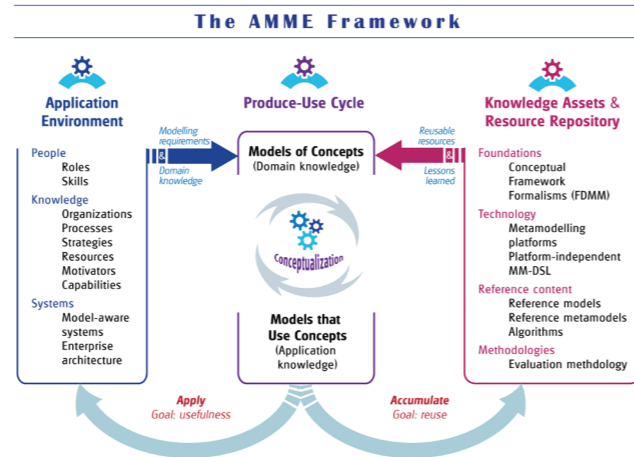
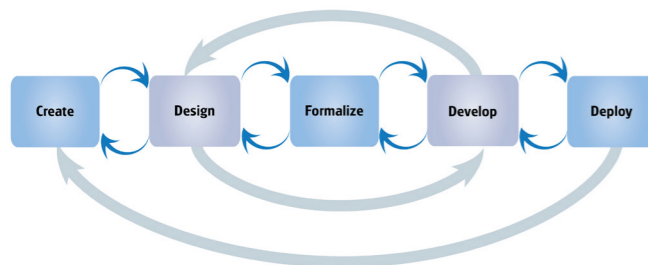
Community of Practice: supported by a non-profit organisation (NPO) headquartered in Berlin, Germany and governed by a Scientific Advisory Board (SAB).

Digital Innovation Environment (DiEn): dedicated research and experimentation space for modelling method engineering equipped with tools to explore method creation and design, experiment with method engineering and deploy open-source software tools and services for modelling. OMiLAB acts as facilitator to the development and application of methods to communities who value models.

Network of Nodes: each node focuses on their own core topic and expertise supported by the collaborative, innovative and explorative space driven by DiEn. Individual engineers, researchers and different stakeholders can work together and contribute to modelling method creation, implementation and model-driven value creation.

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

the AMME Lifecycle



OMiLAB Community of Practice Benefits:

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

Digital Innovation Environment Resources:

- **Knowledge and procedures:** the Agile Modelling Method Engineering Framework (AMME), the Conceptualization Lifecycle, trainings, methodologies.
- **Technology:** open source platforms (e.g. ADOxx, OLIVE) and open source software tools (e.g. Bee-Up, Scene2Model).
- **Community of Practice:** events, publications, exploitation opportunities in third-party funded projects, the NEMO Summer School Series, the ADOxx Crash Courses, Digital Design Thinking Workshops and Bee-Up Tutorials.

Contact

OMiLAB NPO

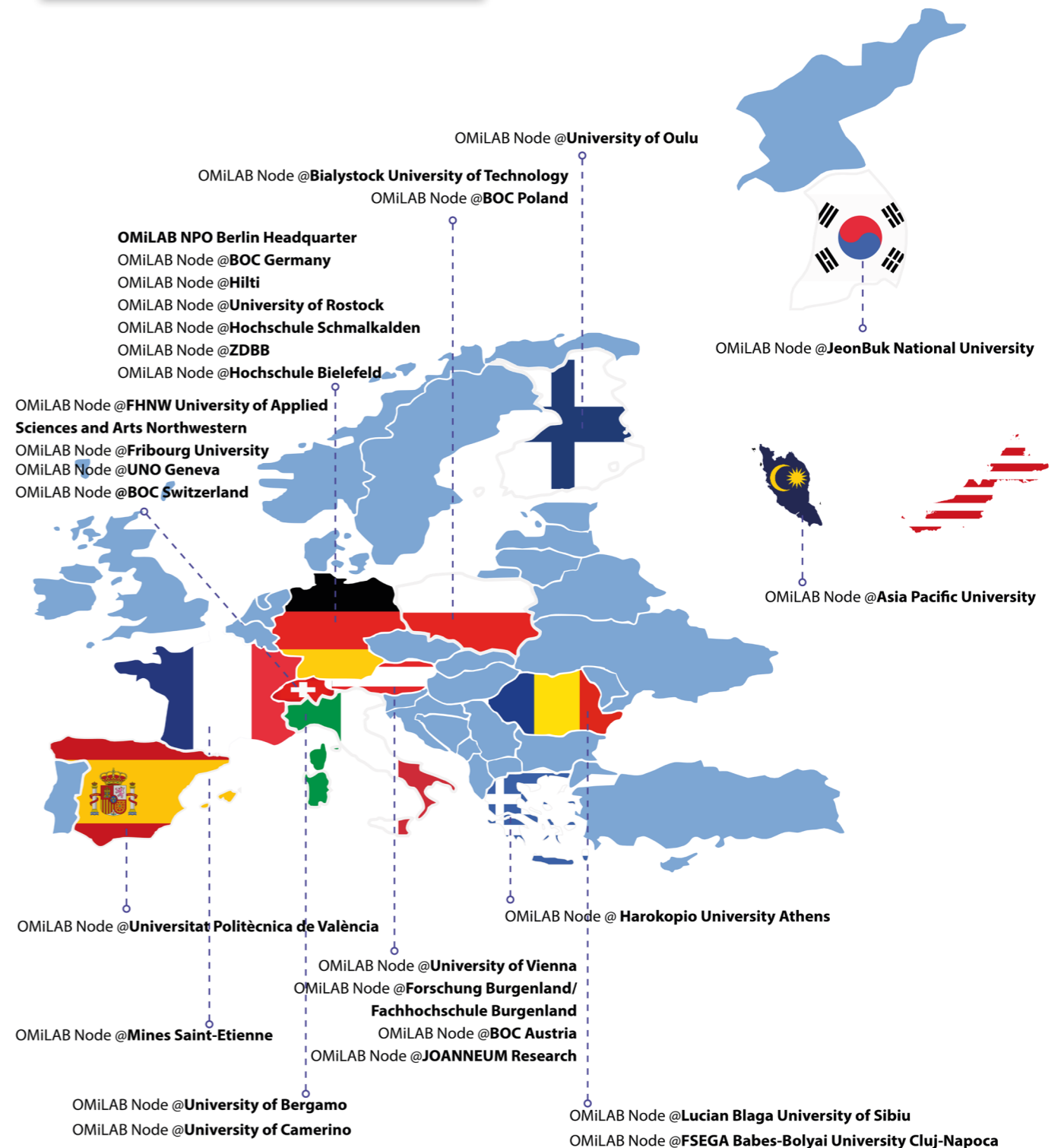
Lützowufer 1
D-10785 Berlin

T: +49 30 2636 7863

E: info@omilab.org



<https://www.omilab.org/nodes>

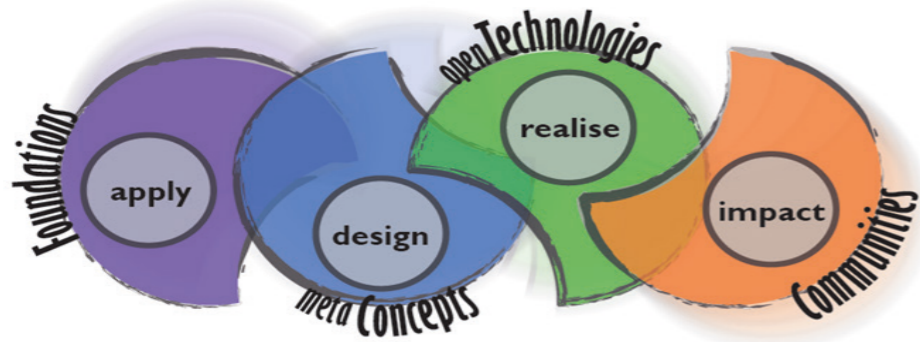


26 OMiLAB Nodes

12 Countries

2 Continents

Research Group Knowledge Engineering and the OMiLAB Vienna Node at University of Vienna



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

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

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

technologies in form of web based user and context specific applications and made available to the community.



In order to promote the exchange in regards to content and technological advancements in the method engineering community, the group has established the OMiLAB (Open Model Laboratory).

OMiLAB@UNIVIE is equipped with tools to explore method creation and design, experiment with method engineering and deploy software tools for modelling. The dissemination of established know-how, the exploitation of recent research results and their further development assure a sustainable impact on the community.

The Agile Modelling Method Engineering Framework is one of the core knowledge resources provided by the OMiLAB@UNIVIE. Design Thinking is another valuable expertise of the node, enhanced by the development of the Scene2Model tool.

Contact

Prof. Dr. Dimitris Karagiannis

OMiLAB@UNIVIE

Research Group Knowledge Engineering
Währinger Straße 29, 1090 Vienna, Austria

T: +43 1 4277 78901

E: dk@dke.univie.ac.at

SOCIAL Events



The NEMO Summer School comes with a programme full of lectures and working group sessions: the participants, students and lecturers thus will experience two intensive weeks of insights into the current 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 in the beautiful and exciting capital of Austria, Vienna.



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



HOTEL CONTACTS & NEMO VENUE

**Hotel Geblergasse*****

Geblergasse 21, 1170 Vienna
Tel.: +43 (1) 4063366

Hotel Atlanta****

Währinger Straße 33, 1090 Vienna
Tel.: +43 (1) 4051230

NEMO VENUE

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

Lunch Venue

Türkenstraße 3, 1090 Vienna
Tel.: +43 (1) 51552 5130

Vienna

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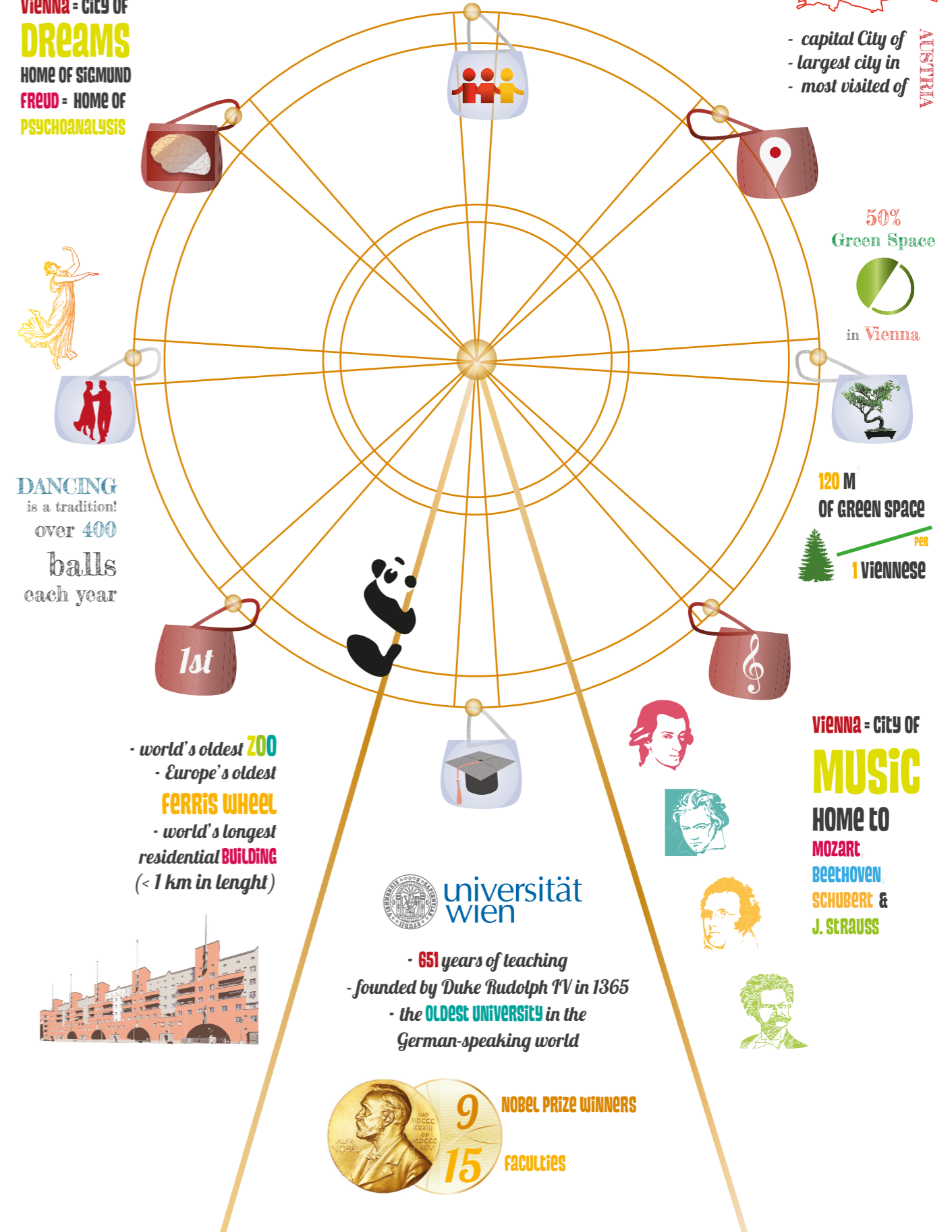
POPULATION
2.6 million



= about 1/3
of all Austria



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



Lecture Hall and PC Labs



Address:

Faculty of Computer Science
Währinger Straße 29
1090 Vienna

Basement (UG1):

Lectures in HS 1
Coffee Break in the Basement Lobby

1st Floor & 2nd Floor (1.0G - 2.0G):

Practice Sessions in:
PC2, PC3, PC5 & PC6

Ground Floor (EG):

Registration

4th Floor (4.0G):

Organisation Team
OMiLAB@UNIVIE

LECTURE

DESCRIPTIONS

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PRACTICAL ASPECTS OF IMPLEMENTING DIGITALIZATION

John Martin Coyne, IAEA - International Atomic Energy Agency

ABSTRACT

The Safeguards Department of the International Atomic Energy Agency (IAEA) ensures the peaceful use of nuclear material and activities in accordance with legal agreements between the IAEA and member states. In order to verify compliance with the agreements, Safeguards staff verify the consistency between member states declarations with observations in the field (often at nuclear facilities) along with observations from other Safeguards relevant information collected in headquarters. The Department has developed and continues to develop a suite of custom designed software to enable the department's work. The digitalization of work processes is key to increase the efficiency and effectiveness of the workforce. Some important considerations in this regard are: It is vital to know your users, the business of your users, and your user's capabilities. Knowledge gaps in any of these areas increases risks, and increases the likelihood of project failure. Well designed digital workflows can bring a range of benefits which may not be immediately evident. While digitizing a workflow can help stakeholders understand what needs to be done now, over time the output could be used to identify patterns of past behavior, and can form the basis of future predictions. Analog processes may allow for free text input, which may contain inconsistencies which lead to impediments for evaluating the process. It is beneficial to digitize the whole process as early in the lifecycle as possible, which may require changing stakeholders' existing processes.

BIO

John Martin COYNE, United States of America, has been appointed as Director, Office of Information and Communication Systems, Department of Safeguards, as of 1 July 2018. Prior to Mr Coyne's appointment, he was Acting Director, Office of Information and Communication Systems, Department of Safeguards, since 1 February 2015. Since joining the Department of Safeguards in 2012, Mr Coyne has served as Section Head, Section OC4, Division of Operations C and Section Head, Coordination and Support Section, Division of Operations C, Department of Safeguards. Before joining the Agency, Mr Coyne held several positions in CTBTO (Programme and Project Coordinator, Section Chief, Unit Head and Software Engineer) and in Science Applications International Corporation in Arlington, VA, United States. Mr Coyne has a Master's Degree in Geophysics from Cornell University and a Bachelor's Degree in Geological Sciences from the Pennsylvania State University.



Contact:

John Martin Coyne
J.COYNE@iaea.org

CONCEPTUAL MODELS: INSTRUMENTS FOR DIGITAL ECOSYSTEM DEVELOPMENT

Em. o. Univ.-Prof. Dr. Dr.H.C. Heinrich C. Mayr, Alpen-Adria-Universität Klagenfurt, Austria

BIO

Heinrich C. Mayr has been Full Professor of Informatics at the Universität Klagenfurt since 1990. Until then he was assistant professor at the Universität Karlsruhe (today: KIT), visiting professor at several universities and managing director of a German software company. His research is documented in more than 250 publications and includes methods of information system design, domain specific modeling languages, requirements modeling as well as knowledge management. Among other things, he held the position of President of the Gesellschaft für Informatik (GI) and Vice-President of the Council of European Professional Informatics Societies (CEPIS). He was rector of his university for 6 years. For 20 years he was editor-in-chief of the „Lecture Notes in Informatics“ and chairman of the council of the Software Internet Cluster SIC. Currently, he is a board member of the „Kärntner Beteiligungsverwaltung.“



Contact:

Em. Prof. Dr. Heinrich C. Mayr
Heinrich.Mayr@aau.at

ABSTRACT

Dealing with modeling, i.e., defining modeling languages and using them consistently is not everyone's cup of tea. While in engineering, especially for life-critical systems, modeling is a matter of course, in the practice of the software business one often encounters the opinion that the effort for systematic modeling does not pay off. Often also, the object under development is estimated so complex that it cannot be described with a modeling language but must be programmed right away. This is of course a contradiction in terms. For, programs are (representations of) models of processes, that are to be executed by a computer. In short: programming is modeling! Accordingly, requirements engineering also consists to a large extent of modeling. For practitioners, it would be desirable to be able to use requirements models as building templates, i.e., prescriptive models (specifications) that evolve in parallel with the system and become descriptive models of the final product. It is the task of Informatics to provide suitable methods for this! Consequently, Informatics has for long systematized the field of modeling, for example by introducing model hierarchies, by ontological foundations, by developing universal modeling languages such as UML, or by specifying domain-specific modeling methods (DSSMs) for areas of application where universal approaches fail. For the design and implementation of reliable and resilient Enterprise Digital Twins and Digital Ecosystems, Conceptual Modeling is the key method. In this talk we aim at a better understanding of what this method is about. We will address the „anatomy“ of conceptual models and show how they can be characterized by a signature. We combine this with a transparent explanation of the nature of conceptual models as the link between the dimension of language representation and the dimension of fixing a unique model semantics: Figuratively this leads to the triptych of conceptual modeling. Building on this, we show how digital ecosystems can be designed and developed in a rigorous model-centered approach. This is illustrated by the results of projects we have carried out in the areas of assistance systems and the development of mechatronic systems.

SAPNET: A SECURITY ASSESSMENT PLATFORM FOR SPN IN THE IOT ECOSYSTEM

Prof. Dr. Christous Douligeris, University of Piraeus, Greece

Dr. Zacharenia Garofalaki, University of Piraeus, Greece

ABSTRACT

SAPnet is an ADOxx-based modelling tool that includes the ontology toolkit for stochastic Petri net (SPN) modeling enriched with the tools that enable the security evaluation of the model. SAPnet provides (a) a modeler-friendly interface for the composition and the updating of the security vulnerabilities list that affect the model, and (b) fast and accurate results regarding the security metric of the model, at any point of the designing phase. The SAPnet is presented and used for the evaluation of the security of an Internet of Things (IoT)-based transport service in real-life scenarios.

Christos Douligeris, currently a professor at the department of Informatics, University of Piraeus, Greece held positions with the Department of Electrical and Computer Engineering at the University of Miami. He was an associate member of the Hellenic Authority for Information and Communication Assurance and Privacy and the President and CEO Hellenic Electronic Governance for Social Security SA. He has published in the networking scientific literature and he has participated in many research and development projects. He is the co-editor of a book on "Network Security" published by IEEE Press/ John Wiley, a co-editor of a special issue of IEEE Communications Magazine on Medical Informatics and he is on the editorial boards of several scientific journals as well as on the technical program committees of major international conferences.

Zacharenia Garofalaki is a Teaching Fellow of the Dpt. of Informatics and Computer Engineering of the University of West Attica, Greece. During the years 1999-2016 she worked as a Network Engineer for the Network Operational Centre of the former Piraeus University of Applied Sciences, Greece. Since 2016, she has collaborated with the University of Piraeus Research Center as a doctorate researcher and quality control specialist in research/development projects. She is a lecturer in the Postgraduate Programs of the University of West Attica and the University of Piraeus. Her research interests include privacy and data protection, network security and the Internet of Things ecosystem. Her published work is in repositories of international scientific firms (IEEE, ACM, Elsevier, Springer).



Contact:

Prof. Dr. Christos Douligeris
cdoulig@unipi.gr



Contact:

Dr. Zacharenia Garofalaki
z.garofalaki@uniwa.gr

TRACING THE ESSENCE OF METAMODELLING

Mag. Victoria Döller, University of Vienna, Austria

ABSTRACT

Victoria Döller is a PhD student at the Research Group for Knowledge Engineering of the University of Vienna. With a masters degree in mathematics and a profound background in psychology she is strongly interested in artificial intelligence and cognitive modeling as well as in conceptual modeling and metamodeling, especially in examining and formalizing common requirements of metamodels. Prior to her PhD position she worked as a software developer in the insurance sector and gained experience in the non-academic application of Knowledge Engineering and Modeling.

Metamodeling concepts comprise not only the selection of appropriate methods but also the syntactic and semantic specification of modeling techniques. Moreover, these techniques need to be accompanied by a proper notation as well as mechanisms and algorithms that enable the processing of created models. Lastly, the actual way of applying a certain modeling technique by means of a modeling procedure needs to be specified.



Contact:

Mag. Victoria Döller
victoria.doeller@univie.ac.at

CONCEPTUAL MODELLING: THE ABSTRACTION PERSPECTIVE

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

ABSTRACT

Conceptual Modeling is about the use of abstraction to reduce complexity in a domain for a specific purpose. The design of modeling methods thus requires meta-conceptual capabilities in order to manage multiple abstraction layers, a skill usually associated with human intelligence. Nowadays, the question arises if upcoming technologies, like Large Language Models, will be capable of imitating this ability in a sufficient manner. Considering this perspective of abstraction, insights that were gathered over several decades of applying conceptual modeling in research, teaching, and as the common foundation within the OMiLAB Community of Practice. It will be shown that abstraction plays a fundamental role in realizing the syntactical, notational, and semantic perspective of the Generic Modeling Method Framework (GMMF), thereby forming the foundation for the development of (Domain-Specific) Modeling Methods.

Dimitris Karagiannis holds a full professor position at the University of Vienna since 1993, leading the Research Group Knowledge Engineering. His main research interests include modelling methods, meta-modelling, knowledge engineering, business process management, enterprise architecture management and artificial intelligence. 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, and Knowledge Management. He is the initiator and coordinator of the OMiLAB Book Series on "Domain-Specific Conceptual Modelling: Concepts, Methods and ADOxx Tools". He serves as an expert in various international conferences and is on the editorial board of several international journals. The industrial application of his meta-modelling research was demonstrated within the BOC Group (<https://www.boc-group.com/>), a European software- and consulting company, founded in 1995. The scientific applications of his research are applied in the OMiLAB (Open Models Initiative Laboratory) <http://www.omilab.org>, an open collaborative environment for modelling method engineering, which he is the founder of and the scientific lead of its international educational platform, the NEMO Summer School Series, <https://nemo.omilab.org>.



Contact:

Prof. Dr. Dimitris Karagiannis
dk@dke.univie.ac.at

IMPROVING AGILITY IN THE POST-MASS CUSTOMIZATION ERA

Prof. Dr. Khaled Medini, École des Mines de Saint-Étienne, France

ABSTRACT

Khaled Medini is currently an Associate Professor at the Mines Saint-Etienne; he holds a PhD and a Research Habilitation (HDR) in Industrial Engineering. He is Certified Project Management Professional (PMP®). His current research interests include agile and sustainable manufacturing and digitalisation. He is an associate editor of the Engineering Management Speciality Section of Frontiers in Industrial Engineering, editorial board member of Systems and of the International Journal of Supply Chain and Inventory Management. He is a member of the scientific committees of several international conferences, most of which are sponsored by International Federation for Information Processing (IFIP) or CIRP (International Academy for Production Engineering). He is a member of International Federation of Information Control (IFAC T5.3). He served as an external member of PhD and MSc committees. He has been involved as principal investigator or project manager in several research projects.

Agile manufacturing has been around for a while as a means to address changing customer requirements and turbulent markets. Among the critical challenges ahead of decision makers in the business sector, is how to deploy agility concepts at operational level. This lecture introduces agility concept with a focus on manufacturing domain and outlines solutions approaches to enable agile manufacturing. The lecture also highlights the role of business process management in fostering the deployment of agile manufacturing.



Contact:

Prof. Dr. Khaled Medini
khaled.medini@emse.fr

MODELLING THE THREE RS OF DIGITAL BUSINESS ECOSYSTEMS: ROLES, RESPONSIBILITIES, RESILIENCE

Prof. Dr. Jelena Zdravkovic, Stockholm University, Sweden

ABSTRACT

Digital Business Ecosystem implies several distinctive features including the heterogeneity of involved actors, their interdependence in the exchange of resources, the dynamic nature of their relationships, and the need for self-organization. To successfully design and develop such ecosystems, it is essential to clearly define the business scope, delineate the roles and responsibilities of each participating organization and individual, map out their interactions and dependencies, and leverage a range of underlying technologies and data. Furthermore, this process must include an assessment of the ecosystem's resilience, gauging its ability to achieve its objectives in the face of challenges. This involves identifying and analyzing resilience indicators to ensure the ecosystem's capacity to adapt and thrive under changing conditions.

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



Contact:

Prof. Dr. Jelena Zdravkovic
jelenaz@dsv.su.se

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

Prof. Dr. Martin Glinz, University of Zurich, Switzerland

ABSTRACT

Martin Glinz is a full professor emeritus and head of the Requirements Engineering Research Group at the Department of Informatics, University of Zurich. He received a diploma in Mathematics and a Dr. rer. nat. in Computer Science, both from RWTH Aachen University, Germany, in 1977 and 1983, respectively. From 1983 to 1993, he was with BBC/ABB in Baden, Switzerland where he was active in research, development, training, and consulting in the field of software engineering. His research interests include requirements and software engineering, in particular modeling, validation, and quality -- and software engineering education. He was vice-dean of the Faculty of Business, Economics and Informatics and director of academic studies in Informatics from 2000-2006 and department head of the Department of Informatics from December 2007 to January 2016.

ABSTRACT

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



Contact:

Prof. Dr. Martin Glinz
glinz@ifi.uzh.ch

CAPABILITY ORIENTED REQUIREMENTS ENGINEERING

Prof. Dr. Evangelhia Kavakli, University of the Aegean, Greece

ABSTRACT

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

Evangelhia 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 on the topics of goal oriented requirements engineering, enterprise knowledge modelling, information systems privacy and cultural informatics, has been supported in the context of national and EU funded projects. Her current research focuses on requirements engineering for Big Data applications and the design of socio-cyber-physical systems. She has published over 60 peer-reviewed papers in reputed international journals and conferences and edited books. She is member of the editorial board of the Requirements Engineering Journal and has served in the program committee of a substantial number of international conferences in the field of information systems.



Contact:

Prof. Dr. Evangelhia Kavakli
kavakli@ct.aegean.gr

NEW EDUCATION PERSPECTIVES: HOW TO PROFILE EXPERTS FOR A DIGITAL ECONOMY ERA

Prof. Dr. Ivan Lukovic, University of Belgrade, Serbia

BIO

Ivan Luković received his diploma degree (5 years) in Informatics from the Faculty of Military and Technical Sciences in Zagreb in 1990. He completed his M.Sc. (former Mr, 2 years) degree at the University of Belgrade, School of Electrical Engineering in 1993, and his Ph.D. at the University of Novi Sad, Faculty of Technical Sciences in 1996. Currently, he works as a Full Professor at the Faculty of Organizational Sciences of the University of Belgrade, where he lectures in several Computer Science and Informatics courses. His research interests are related to Database Systems, Business Intelligence Systems, and Software Engineering. He is the author or co-author of over 200 papers, 4 books, and 30 industry projects and software solutions in the area. He supervised 12 completed Ph.D. theses. He created a new set of B.Sc. and M.Sc. study programs in Information Engineering, i.e. Data Science, at the Faculty of Technical Sciences. The programs were accredited the first time in 2015. Currently, he is a chair of Managing Board of the Computer Science and Information Systems (ComSIS) journal, and a chair of M.Sc. study program in Information Engineering at Faculty of Organizational Sciences. He is also a member of Serbian AI Society.



Contact:

Prof. Dr. Ivan Lukovic
ivan.lukovic@fon.bg.ac.rs

ABSTRACT

Nowadays, modern business includes acquisition and storing enormous data volumes, larger than ever before. Such data represent a significant value that an organization or a society can utilize to reach created goals and provide sustainable development. Unfortunately, a daily practice still intensively points out to the problem of a serious gap between the identified needs for knowledge, on one hand, and inability of the disciplines of Computer Science, Software Engineering, and Artificial Intelligence (CS & SE & AI, for short), combined with the modern software technologies, to address such needs in an effective way, on the other hand. One of the important causes of such phenomenon is in a lack of strongly educated and interdisciplinary oriented experts showing an appropriate level of knowledge both in CS & SE & AI, as well as in the disciplines of Management and Economics, for a specific problem domain. In this presentation, we will address issues on how to come to more flexible and interdisciplinary oriented study models capable of producing various forms of digital managers, as a new profile of experts, ready to cope with digital economy and digital transformation in a modern society. Massive deployment of such experts is a way to significantly raise the level of organization maturity regarding capabilities for: information management, quality management, business processes, and big data analytics.

PROCESS ALGEBRA TO MODEL PROBABILISTIC BEHAVIOR OF SMART IOT

Prof. Dr. Moonkun Lee, Chonbuk National University, South Korea

ABSTRACT

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

Moonkun Lee is professor in the 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 Ph.D. degrees in Computer & Information Science, The University of Pennsylvania, USA. Worked at CCCC, USA, as Computer Scientist; Developed SRE (SW Re/reverseengineering Environment); Applied to modernization of legacy OS and SW of NSWC in US Navy to Ada. Main research interests are SW round-trip engineering, distributed real-time systems, formal methods, ontology, behaviour engineering, etc. Currently focusing on Smart City and Factory in order to implement CPS (Cyber-Physical Systems) with dTp-Calculus in SAVE on ADOXX and Web Server.



Contact:

Prof. Dr. Moonkun Lee
moonkun@jbnu.ac.kr

CAPABILITY MODELLING IN SUPPORT OF BUSINESS ECOSYSTEM DESIGN

Prof. Dr. Janis Stirna, University of Stockholm, Sweden

ABSTRACT

Janis Stirna has received a degree of Doctor of Philosophy in Computer and Systems Sciences from the Royal Institute of Technology, Sweden in 2001 and Associate Professor (docent) from Jönköping University, Sweden in 2008. In 2015 he was promoted to full professor at Department of Computer and Systems Science (DSV), Stockholm University. Stirna's current research interests include enterprise modelling and requirements engineering methods and tools, organisational patterns, knowledge management and transfer of best practices. Stirna is an author or co-author of some 70 research reports and publications as well as two text books on Enterprise Modelling.

Key aspects of business ecosystems are (i) the capabilities that the actors in the ecosystem have and offer to other participants in the ecosystem, as well as (ii) the needed capabilities of the ecosystem. Capability is the ability and capacity that enable an enterprise to achieve a business goal in a certain context. Over the years there have been a number of contributions in terms of methods and frameworks for capability analysis and management. Taking a brief look at the state of the art, this presentation will elaborate how capabilities can be modelled for an enterprise, how to analyze the context dependence of capabilities, as well as how to model the needed and offered capabilities in a ecosystem. Examples of several business ecosystems from the health-care and maritime sectors will be discussed.



Contact:

Prof. Dr. Janis Stirna
js@dsv.su.se

DECISION MODELS FOR PROCESSES AND CHATBOTS

Prof. Dr. Jan Vanthienen, KU Leuven, Belgium

ABSTRACT

Decisions are everywhere. Modelling decisions is important in processes, information systems, service applications, AI and analytics, and so many other areas. So modelling decisions in the correct way is imperative. This session is about decision modelling, and about how decision models and process models can be combined into an integrated model. It is also about how decision models can be made explainable using a generic chatbot interface. In analogy with the Business Process Modelling & Notation Standard (BPMN), a Decision Model & Notation standard (DMN) was developed, that allows to model decisions and processes separately. Modelling business processes is essential for business effectiveness and efficiency, but knowledge-intensive processes incorporate lots of decisions and decision knowledge, that should not be hidden in complex and inflexible process flows. Decision models are also an excellent medium for advice and explanation, creating intelligent assistance for various decision related service questions.

Jan Vanthienen is full professor of information systems at KU Leuven (Belgium), Department of Decision Sciences and Information Management, where he is teaching and researching on business intelligence, analytics, business rules, processes & decisions. He has published numerous papers in reviewed international journals and conference proceedings. and received the Belgian Francqui Chair 2009 at FUNDP and an IBM Faculty Award in 2011. Jan is actively involved in the Decision Modeling & Notation standard (DMN) at OMG (Object Management Group). He is also member of the IEEE task force on process mining, co-author of the Business Process Mining Manifesto and member of Leuven.AI – KU Leuven Institute for Artificial Intelligence.



Contact:

Prof. Dr. Jan Vanthienen
jan.vanthienen@kuleuven.be

VALUE MODELING FOR ECOSYSTEM DESIGN: AN E3VALUE PRIMER, APPLICATION SCENARIOS, AND LESSONS LEARNED

Prof. Dr. Sybren de Kinderen, Eindhoven University of Technology, The Netherlands

ABSTRACT

Sybren de Kinderen is an Assistant Professor in the Information Systems group at Eindhoven University of Technology. His research interests include enterprise (architecture) modeling, (future) energy systems, and cognitive linguistics for discourse analysis in the field of information systems. Sybren holds a PhD in computer science from the Free University in Amsterdam (2010). In a previous capacity he has acted as a postdoctoral researcher at the Luxembourg Institute of Science and Technology, the University of Luxembourg, and the University of Duisburg-Essen.

Value modeling has been a staple of the enterprise modeling discipline for the design of value networks. E3value is historically a prominent technique for value modeling. For a given scenario it focuses on modeling the involved actors and what they exchange of value with each other. In this talk, I will introduce e3value, and reflect upon lessons learned from its application to domains as diverse as the electricity sector and the healthcare sector. Lessons learned include situational adaptation of e3value, as well as the need to embed the language in a larger suite of modeling languages such as ArchiMate to increase the potential of analyses that involve cross-cutting different organizational perspectives, which characterizes enterprise modeling.



Contact:

Prof. Dr. Sybren de Kinderen
s.d.kinderen@tue.nl

HOW TO MODEL FAIR ECOSYSTEMS?

Prof. Dr. Jaap Gordijn, Vrije Universiteit Amsterdam, The Netherlands

ABSTRACT

Many ecosystems such as Facebook, Google, Amazon, Uber, and many more are not considered as fair. This is amongst other demonstrated by the European Commission, who fines the dominant parties of these ecosystems regularly. We explain, in a model-based way why such ecosystems are unfair, and how the model can tell this. We also give some guidelines how to design fair ecosystems and the required decentralized information technology to accomplish these. We also give some examples of ecosystems that are from a structural point fairer than the well-known platform-oriented ecosystems.

Jaap Gordijn is founder and director of The Value Engineers, a company delivering a methodology and associated software tooling for the design and analysis of complex digital ecosystems. Also, he is the UNESCO chair of the Decentralized Information Society Engineering (DISE) research group at VU Amsterdam, The Netherlands. Also, Jaap is visiting professor at the University of Malaysia, UNIMAS. He is the key developer of, and has internationally published on, the e3-value methodology, which comprises a graphical technique to design and evaluate networked business models (www.e3value.com). Earlier, he was a member of Cisco's International Internet Business Solution Group. As such, he was active as an e-business strategy consultant in the banking, insurance, and digital content industries.



Contact:

Prof. Dr. Jaap Gordijn
j.gordijn@vu.nl

INFORMATION MODELLING FRAMEWORK FOR ADDRESSING INFORMATION FRAGMENTATION IN SYSTEMS ENGINEERING

Prof. Dr. Dimitrios Kiritsis, Ecole polytechnique fédérale de Lausanne, Switzerland
Prof. Dr. Baifan Zhou, University of Oslo, Norway

ABSTRACT

Dimitris Kyritsis is Professor Emeritus of ICT for Sustainable Manufacturing at EPFL (<https://people.epfl.ch/dimitris.kiritsis?lang=en>) and Senior Adviser at SIRIUS labs of the Department of Informatics of the University of Oslo. His research interests are Closed-Loop Lifecycle Management, Sustainable Manufacturing, Cognitive Digital Twins and Industrial Ontologies. He has more than 250 publications. Dimitris is co-founder of the Industrial Ontologies Foundry (<https://www.industrialontologies.org/>) and the Knowledge Graph Alliance (<https://www.kg-alliance.org/>) and since 2019 he is actively involved in the WEF Platform on Advanced Manufacturing and Supply Chains.

Baifan Zhou is Associate Professor at Department of Computer Science, Oslo Metropolitan University, and Senior Researcher at Department of Informatics, University of Oslo, Norway. Prior to that, Baifan was a postdoctoral researcher at University of Oslo. Baifan received his Bachelor (Beijing, China, 2013) and Master's degree (Karlsruhe, Germany, 2017) in Mechanical Engineering. His PhD was an industrial PhD program (Karlsruhe, 2021) with the topic of data science for industry 4.0, jointly at Bosch Corporate Research and Karlsruhe Institute of Technology, Germany. Baifan's research interests include machine learning, language models, knowledge representation, and information modelling for industry. Baifan has been always active in cross-disciplinary research in industry or with close industrial collaboration, featuring in papers on prestigious venues such as ESWC, ISWC, CIKM, SIGIR, JoWS, JIM, etc.



Contact:

Dimitrios Kiritsis
dimitris.kiritsis@epfl.ch



Contact:

Baifan Zhou
baifanz@ifi.uio.no

ABSTRACT

Business processes in a broad range of industries along the value-chain and product life-cycle suffer from significant challenges pertaining to information fragmentation. These challenges include inconsistent information presentation, business units and datasets, heavy and chaotic manual information exchange, unknown data validity and tolerance ranges, loss of information provenance, data incompleteness, etc. To address these challenges, we need model-based standardised product data exchange between different business units along the value-chain and product life-cycle. Existing modelling languages such as OWL are expressive, but not sufficiently usable for non-semantic experts, while typically these experts (e.g., engineers) possess the essential knowledge for creating the data models. To this end, we develop an approach named as Information Modelling Framework (IMF) that aims at user-oriented and user-friendly information modelling for engineers, facilitating and allowing for a reliable and efficient use of AI and Digital Twin technologies in industrial applications. This talk presents our research of the IMF approach and exemplify its usage with real business cases towards digitalisation of industrial processes.

ONTOLOGY-BASED MODELLING FOR HUMAN AND MACHINE INTERPRETATION AND MODEL-DRIVEN ARCHITECTURE

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

ABSTRACT

The continuous alignment of business and IT in a rapidly changing environment is a grand challenge for today's enterprises. Decision-makers use models to understand and analyze a situation, to compare alternatives, and to find solutions. While humans prefer graphical or textual models, semantic annotation makes the knowledge in models machine-interpretable. This presentation describes a meta-modelling approach, which combines human-interpretable graphical enterprise architecture models with machine-interpretable enterprise ontologies. A metamodel which is represented as a formal ontology determines the semantics of the metamodel. Every time a new modelling element is created during modelling, an instance for the corresponding class is created in the ontology. It can be enhanced with an ontology representing the domain of discourse. Thus, models for humans and machines are based on the same internal representation. Ontology-based modelling also supports model-driven architecture, which is based on a step-wise transformation of computation-independent to platform-specific models and finally converted into code.

BIO

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



Contact:

Prof. Dr. Knut Hinkelmann
knut.hinkelmann@fhnw.ch

EMBRACING CHANGE IN MODEL-DRIVEN ENGINEERING: ADOXX PROTOTYPING FOR INCLUDING BUSINESS STRATEGY INFORMATION

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

BIO

Oscar Pastor is Full Professor and Director of the "Centro de Investigación en 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. Supervisor of 20 completed PhD theses and 31 completed Masters theses on topics that relate to Conceptual Modeling. His research activities focus on conceptual modeling, 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 has created an advanced MDA-based Conceptual Model Compiler called Integranova, 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 Modeling-based interpretation of the Human Genome information.

ABSTRACT

Including business information into model-driven development methods has been widely explored, mainly through business processes and goal models, and model-to-model transformations from requirements to code. As software intensive organizations require to scale their agility through modularized architectures such as microservices, strategic-level information acquires paramount importance to identify business-aligned modules. However, given the broad domain of strategy, designing strategy modeling methods requires an incremental, iterative process, and the appropriate tool support to enable the exploration of feasible and useful models. In this lecture, we present the process of using ADOxx as modeling environment to enable the design of LiteStrat, an organizational modeling method focused on business strategy and organizational structure, and its integration with business process models through Stra2Bis, a set of model-to-model transformation guidelines. Our approach leverages Situational Method Engineering to select and assemble method parts from existing business strategy conceptualizations, and ADOxx strengths for rapid prototyping of modeling tools. Throughout a Design Science cycle, we illustrate how an ADOxx-powered tool supports problem investigation, design, and validation of novel artifacts for model-driven engineering.



Contact:

Prof. Dr. Oscar Pastor
opastor@dsic.upv.es

CONCEPTUAL MODELING OF SERVICE VALUE CO-CREATION IN A CIRCULAR ECONOMY

Prof. Dr. Yoshinori Hara, Kyoto University, Japan

ABSTRACT

In a society with limited resources and various environmental constraints, it is essential to aim for a circular economy. In this lecture, we will discuss conceptual modeling for sustaining the creation of intangible asset values such as services for various stakeholders in such a social environment. As a concrete example, we will explain value co-creation among stakeholders using high contextual information for Japanese creative services. The study of such conceptual modeling will provide useful suggestions, especially in a mature society where both production and demand are becoming scarce.

Yoshinori Hara serves as professor, Graduate School of Management, Kyoto University. His current research focus includes innovation management, service and design management, and open innovation with IT frameworks. Prior to joining Kyoto University, he held various research and key management positions at R&D organizations in NEC Corporation, for 13 years in Japan, and for 10 years in the Silicon Valley, California, USA. He was responsible for conducting research and development on advanced ubiquitous computing including Web/Hypermedia systems, mobile & embedded systems, adaptive user interfaces, advanced information retrieval technologies, system security & reliable systems. 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.



Contact:

Prof. Dr. Yoshinari Hara
hara.yoshinori.2a@kyoto-u.ac.jp

PRE-CONCEPTUAL MODELLING FOR EXPLORING ACTORS AND INTERACTIONS IN REAL WORLD SYSTEMS

Prof. Dr. Siegfried Vössner, TU Graz, Austria

ABSTRACT

Siegfried Vössner holds a PhD degree in Engineering Sciences from Graz University of Technology. Until 1999 he was a postdoctoral fellow and visiting scholar at the Department for Engineering Economic Systems and Operations Research at Stanford University, USA. After being a project manager for McKinsey&Company he became professor and chairman of the institute of Engineering- and Business Informatics in 2003 and was Vice-Dean of the School of Mechanical Engineering and Economic Sciences of Graz University of Technology from 2004-2015 and holds this position again since 2020. He has been a visiting professor at Stanford University, the Naval Postgraduate School in Monterey and at the University of Auckland in New Zealand and is an alumnus of the Strategic Leadership Program from Austrian National Defense Academy. His research interests are: Modeling and Simulation of Business and Social Systems, Systems Architecture and System Engineering, Public Safety and Systems Safety, Critical Infrastructure, Production Systems – Design, Operations, Optimization.



Contact:

Prof. Dr. Siegfried Vössner
voessner@tugraz.at

ABSTRACT

When modeling real world activities involving social, economic and technical aspects conceptual modeling is a necessary prerequisite to set the stage and define the system boundaries, which becomes difficult - especially when not all relevant actors, shareholders and stakeholder as well as their intrinsic and extrinsic motivations are known. One of the methodological challenges is to provide a unified framework to collect as many relevant perspectives and pieces of information and create a most comprehensive but yet insightful and understandable representation. Another challenge is to transform these findings into standardized and re-usable information which can serve as input for other modeling tools downstream in the tool chain. We will present both a methodology based on value networks and a modeling tool (EcoViz), which is intended to address these issues and can also be used right before the typical conceptual modeling starts - in a "pre- conceptual phase" and show some practical applications.

Programme

Overview

11 - 12 July		15 July	16 July	17 July	18 July	19 July
ADOXX TRAINING DAYS	08:45 - 09:00	Opening: The 10th EDITION	Improving Agility in the Post-mass Customization Era K. Medini	Process Algebra to Model Probabilistic Behavior of Smart IoT M.K. Lee	Information Modelling Framework for addressing Information Fragmentation in Systems Engineering D. Kiritsis, B. Zhou	The Industrial Transition towards Smart PSS: Enterprise Modelling to Support Value Creation Processes X. Boucher
	09:00 - 10:00	Practical Aspects of Implementing Digitalization J. Coyne	Modelling Three Rs of Digital Business Ecosystems: Roles, Responsibilities, Resilience J. Zdravkovic	Capability Modelling in Support of Business Ecosystem Design J. Stirna	Ontology-based Modelling for Human and Machine Interpretation and Model-driven Architecture K. Hinkelmann	Service Engineering Models for the Design and Development of Digitalized Product-Service-Systems G. Pezzotta
	10:00 - 11:00	Conceptual Models: Instruments for Digital Ecosystem Development H.C. Mayr	B R E A K N E T W O R K I N G B R E A K			
	11:00 - 11:30	SAPnet: A Security Assessment Platform for SPN in the IoT Ecosystem C. Douligeris, R. Garofalaki	Practice Session Digitalization in Smart Cities with ADOxx[®] OMiLAB@UNIVIE Team	Practice Session Digitalization in Smart Cities with ADOxx[®] OMiLAB@UNIVIE Team	Practice Session Bee-Up[®]: An ADOxx Best Practice P. Burzynski	Spatial Conceptual Modelling: The Example of the Augmented Reality Workflow Modelling Language H.G. Fill, F. Muff
	11:30 - 12:30	L U N C H L U N C H L U N C H				
	12:30 - 14:00	Tracing the Essence of Metamodelling V. Döller	New Education Perspectives: How to profile Experts for a Digital Economy Era I. Lukovic	Decision Models for Processes and ChatBots J. Vanthienen	Embracing Change in Model-driven Engineering: ADOxx Prototyping for Including Business Strategy Information O. Pastor	The OMiLAB NPO: An Introduction K. Hinkelmann, W. Utz
	14:00 - 15:00	Conceptual Modelling: The Abstraction Perspective D. Karagiannis	The Role of Requirements in the Digital Age: Requirements Engineering Revisited M. Glinz	Value Modeling for Ecosystem Design: an e3value primer, application scenarios, and lessons learned S. de Kinderen	Conceptual Modeling of Service Value Co-Creation in a Circular Economy Y. Hara	The Open-Source Tools: Scene2Model and IoT2Model C. Muck, D. Mohammadi Amlashi
	15:00 - 16:00	B R E A K N E T W O R K I N G B R E A K				
16:00 - 16:30	Get Together Open End	Capability Oriented Requirements Engineering E. Kavakli	How to Model Fair Ecosystems? J. Gordijn	Pre-Conceptual Modelling for Exploring Actors and Interactions In Real World Systems S. Vössner	The Community of Practice: Focus on Skills and Cases I. Vaidian, A. Völz	
16:30 - 17:30						

Week 2 20- 21 July		22 July	23 July	24 July	25 July	26 July
LEISURE DAYS	09:00 - 10:00	Understanding Enterprise Modelling Practices E. Proper	Building Digital Leadership: What Capabilities are Needed? B. Johansson	Rescue AI: Smart City Disaster Visualization with Meta Modelling V. Thiruchelvam	Design Ethics and Ethical Designing M. Rossi	INNOVATION SCENARIOS Working Group Results Presentation
	10:00 - 11:00	Conceptual Modelling for Recognition of Technology Acceptance, Attitude and Intention to Use M. Pańkowska	Multi-Level Modelling with the FMMLx: Integrated Design and Execution of DSCM U. Frank	Business Process Innovation as Driver for Digital Transformation in Modern Organizations A. Oberweis	Managing ship arrivals in a port: The Design Process of Interactive Application Software H. Züllighoven	INNOVATION SCENARIOS Working Group Results Presentation
	11:00 - 11:30	B R E A K N E T W O R K I N G B R E A K				
	11:30 - 12:30	Digital Leaders: Innovate Business Models OMiLAB@UNIVIE Team	Digital Leaders: Engineer IoT Environments OMiLAB@UNIVIE Team	Digital Leaders: Compose Digital Ecosystems OMiLAB@UNIVIE Team	Digital Leaders: Showcase Results OMiLAB@UNIVIE Team	INNOVATION SCENARIOS Working Group Results Presentation
	12:30 - 14:00	L U N C H L U N C H L U N C H				
	14:00 - 15:00	Knowledge Graphs for Semantics-driven Systems Engineering R. Buchmann	Different Perspectives of a Digital Innovator A. Florea	The Transformation of Hilti's Software Support to Customer Advocates M. Müller	PhD Research and Beyond within EIS: Trials and Tribulation P. Loucopoulos	INNOVATION SCENARIOS Working Group Results Presentation
	15:00 - 16:00	A Smooth Integration of CM, Knowledge Graph Engineering and Logical Reasoning D. Plexousakis, T. Patkos	Enterprise Modeling as a Knowledge Source in Systems Engineering M. Kirikova	Challenging the Design of Digital Products and Services with Modelling Approaches M. Nemetz	Philosophical Foundations of Conceptual Modelling J. Mylopoulos	INNOVATION SCENARIOS Working Group Results Presentation
	16:00 - 16:30	B R E A K N E T W O R K I N G B R E A K				
16:30 - 17:30	Enabling Smart Traffic for a Smart City: Modeling a City Ecosystem with Vester's Sensitivity Model N. Madeja	Ethical Challenges of Digital Transformation N. Mostafa	Working Group Session Innovation Scenarios	Working Group Session Innovation Scenarios	Closing: 10 YEARS Summer School NEXT: NEMO Innovation Camp Series	

THE INDUSTRIAL TRANSITION TOWARDS SMART PRODUCT-SERVICE-SYSTEMS: ENTERPRISE MODELLING TO SUPPORT VALUE CREATION PROCESSES

Prof. Dr. Xavier Boucher, École des Mines de Saint-Étienne, France

ABSTRACT

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

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



Contact:

Prof. Dr. Xavier Boucher
boucher@emse.fr

SERVICE ENGINEERING MODELS FOR THE DESIGN AND DEVELOPMENT OF DIGITALISED PRODUCT-SERVICE SYSTEMS

Prof. Dr. Giuditta Pezzotta, University of Bergamo, Italy

ABSTRACT

Giuditta Pezzotta is Associate Professor at the Department of Management, Information and Production Engineering and Vice Chancellor for Quality Assurance at University of Bergamo. She received her PhD degree in Management, Economics and Industrial Engineering from Politecnico di Milano in 2010. During her PhD studies, she was a visiting PhD student at DIAL - Institute for Manufacturing - University of Cambridge in UK. Her PhD was in the Service Engineering and Product Service System fields. She has also been visiting researcher at the University of Botswana, Tokyo Metropolitan University and Blekinge Institute of Technology. She carries out her research activities interested in the design, engineering and management of product-service systems and in modeling and simulation of production and service delivery processes. Through her work at the University of Bergamo she has been involved and has coordinated several industrial and research projects related to the Product-Service field. She is author of more than 100 refereed international and national journal and conference papers. Since 2019, she is co-coordinator of the Special Interest Group (SIG) in Service Systems Design, Engineering and Management of IFIP. She is part of the Scientific committee of "Centro interuniversitario di ricerca sull'innovazione e la gestione dei servizi nelle imprese industriali" (<http://www.asapsmf.org/>).



Contact:

Prof. Dr. Giuditta Pezzotta
giuditta.pezzotta@unibg.it

ABSTRACT

Despite their recent introduction and consolidation in the industrial practice, Product Service System business models are subjected to a further revision in order to fully exploit the opportunities and challenges provided by the Industry 4.0 technological paradigm. Companies need to identify and define new business models integrating PSS with digital technologies and, as a result, revise their decision-making processes. The design and development of a Product-Service System (PSS) raises new issues since the service component introduces further requirements than traditional product engineering. Compared to traditional and smart products, services are generally under-designed and inefficiently developed. Approaches such as New Service Development, Service Design and Service Engineering have emerged during the last decades to support the design and development of service either as a system itself or as a constituting element of a PSS. In particular, Service Engineering investigates service design and development with a systematic perspective and with a seamless integration of product and service contents. Purpose of the lecture is to provide a holistic conceptualisation and an up-to-date analysis of the current state of the art on the evolution of the concept of Product Service system and Service Engineering models with a specific focus on their adoption in the PSS context. A critical analysis is also performed with the aim to define a research agenda and the most prominent key actions that could give directions for future research.

SPATIAL CONCEPTUAL MODELING: THE EXAMPLE OF THE AUGMENTED REALITY WORKFLOW MODELING LANGUAGE

Prof. Dr. Hans-Georg Fill, University of Fribourg, Switzerland
Dr. Fabian Muff, University of Fribourg, Switzerland

ABSTRACT

Augmented Reality is a technology that overlays the real world with virtual objects such as images, three-dimensional representations, or videos. When combined with conceptual modeling, the knowledge expressed in the models can be anchored in the real, physical world in a variety of ways. We call this new direction 'Spatial Conceptual Modeling', as opposed to traditional, two-dimensional modeling that does not consider the spatial dimension. To illustrate the properties of spatial conceptual modeling, this talk presents the Augmented Reality Workflow Modeling Language (ARWML). This modeling language enables the definition and execution of complex augmented reality scenarios without the need for programming. The language has been implemented on the ADOxx platform as well as on a new metamodeling platform for natively supporting spatial conceptual modeling.

Hans-Georg Fill is full professor at the University of Fribourg, Switzerland and head of the Research Group Digitalization and Information Systems. He holds a PhD and a habilitation from the University of Vienna in business informatics. He was a visiting researcher at Stanford University, USA, Karlsruhe Institute of Technology, DE and Ecole Nationale Supérieure des Mines at St. Etienne, FR. His research activities focus on the development of IT-based modelling tools, distributed ledger technologies, visualization, and the alignment of conceptual modelling and semantic technologies.

Fabian Muff is a senior researcher and lecturer at the University of Fribourg, Switzerland and a member of the Research Group Digitalization and Information Systems. He holds a PhD from the University of Fribourg in business informatics. His research activities focus on the combination of conceptual modeling and extended reality technologies, as well as the development of a new 3D-enabled metamodeling platform.



Contact:
Prof. Dr. Hans-Georg Fill
 hans-georg.fill@unifr.ch



Contact:
Dr. Fabian Muff
 fabian.muff@unifr.ch

UNDERSTANDING ENTERPRISE MODELLING PRACTICES

Prof. Dr. Erik Proper, TU Wien, Austria

ABSTRACT

Henderik A. Proper, Erik for friends, is Full Professor in Enterprise and Process Engineering in the Business Informatics Group at the TU Wien. Erik has a mixed background, covering a variety of roles in both academia and industry. His core research drive is the development of theories that work. In other words, Erik focuses on research that leads to results that have both theoretical rigour and practical relevance. His general research interest concerns the foundations and applications of domain modelling; in particular in the context of enterprises. Over the past 20 years, he has applied this research drive and general research interest towards the further development of the field of enterprise design management, and enterprise modelling in particular. He is also co-initiator of the ArchiMate research project, which also resulted in the ArchiMate standard for enterprise architecture modelling. Erik is vice-chair of the IFIP 8.1 working group, while also being the representative for the Netherlands in IFIP's TC8 technical committee. He is also the Stellvertretender Sprecher (vice chair) of the EMISA working group of the German Computer Science Society (Gesellschaft für Informatik).



Contact:
Prof. Dr. Erik Proper
 henderik.proper@tuwien.ac.at

ABSTRACT

Humanity has long since used models in different shapes and forms to understand, redesign, communicate about, and shape, the world around us; including many different social, economic, biological, chemical, physical, and digital aspects. This has resulted in a wide range of modeling practices that can be found across society. When the models as created and used in such modeling practices have a key role to play in the activities in which these modeling practices are 'embedded', the need emerges to consider the effectiveness and efficiency of such processes, and actually speak about modeling capabilities. Models (also) play a natural role in the (continuous) development, operation, and regulation of enterprises. Even more, new technologies, such as AI, low-code, rule engines, IoT, Digital Twins, etc, provide additional drivers and enablers for the (critical) usage of models in enterprises. As a consequence, modeling capabilities have become a crucial (often hidden) part of both the dynamic capabilities and the operational capabilities of enterprises. This makes it relevant to develop a thorough understanding of the artifacts involved in the modeling practices/capabilities in general, and in the context of enterprises in particular. This includes, the notion of model itself, conceptual fidelity of a model, and views. In this lecture we, therefore, explore these cornerstones of modeling practices in general, and in the context of enterprises in particular.

CONCEPTUAL MODELLING FOR RECOGNITION OF TECHNOLOGY ACCEPTANCE, ATTITUDE AND INTENTION TO USE

Prof. Dr. Małgorzata Pankowska, University of Economics in Katowice, Poland

ABSTRACT

Developing complex software may be a challenge for students or those with less technical expertise in software design due to the large number of modeling notation, methods, tools, and technologies. The new technology solutions, e.g., Internet of Things, digital twins, or intelligent objects, i.e., robots, sensors, drones, etc. can also cause difficulties in their implementation process, because of their low understandability. The need to recognize the users' preferences and attitudes was the basic premise to develop the technology acceptance models. That models and theories focus on studying factors affecting acceptance, attitudes, or decision to use. This lecture aims to present and discuss the applicability of statistical methods for evaluation of technology acceptance. The lecturer will explain the acceptance frameworks, e.g., the Revised Technology Acceptance Model (RTAM), Technology Readiness Index (TRI), or the Technology-Organization-Environment (TOE) model. These frameworks are needed for specification of the conceptual models, which are sets of interrelated latent variables. Next, the Structural Equation Modeling (SEM) will be explained and discussed. Further, some statistical model estimation results will be presented. Finally, the pros and cons of the SEM application will be considered.

Małgorzata Pańkowska is PhD, Full Professor of Social Science and Chair of the Department of Informatics at the University of Economics in Katowice, Poland. She received the qualification in econometrics and statistics from the University of Economics in Katowice, the Ph.D. and the Doctor Habilitatus degree from the University of Economics in Katowice. She was visiting professor at ISLA Braganca in Portugal, Trier University in Germany, ICHEC in Brussels, Belgium, VGTU in Vilnius, Lithuania, Istanbul University in Turkey, Ionian University in Corfu, Greece, Universidad de Ibagué, Ibagué-Tolima, Colombia, and Lapland University in Kemi-Tornio, Finland. She is Vice-President in the Board of Information System Audit and Control Association (ISACA) Katowice Chapter. Conference Programme Committee Member: BIR 2022-2022 Perspectives in Business Informatics Research, ICDEc 2022 International Conference on Digital Economy, ISD 2021-2022 Information Systems Development, FedCSIS 2021, PC member 2nd International Forum of Cyber Security, Privacy, and Trust 2022.



Contact:

Prof. Dr. Małgorzata Pańkowska
 pank@ue.katowice.pl

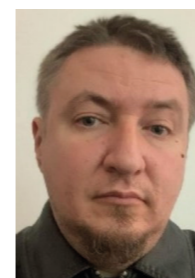
KG4SDSE: KNOWLEDGE GRAPHS FOR SEMANTICS-DRIVEN SYSTEMS ENGINEERING

Prof. Dr. Robert Andrei Buchmann, Babes-Bolyai University, Romania

ABSTRACT

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

Knowledge Graphs have been primarily investigated as engineered artifacts by themselves – from their underlying formalisms (e.g. description logics), enabling technologies (e.g. RDF, LPG) to their knowledge management and semantic enrichment capabilities. We aim to shift focus from what Knowledge Graphs are or how they can be built towards how they can be relevant to Information Systems engineering. We also aim to investigate their place in the Conceptual Modeling paradigm, specifically how Knowledge Graphs can enable new flavors of model-driven engineering or low-code engineering. Research advances on the interplay between Knowledge Graphs and Machine Learning or Natural Language Processing for systems engineering purposes are also discussed.



Contact:

Prof. Dr. Robert Andrei Buchmann
 robert.buchmann@econ.ubbcluj.ro

A SMOOTH INTEGRATION OF CM, KNOWLEDGE GRAPH ENGINEERING AND LOGICAL REASONING

Prof. Dr. Dimitris Plexousakis, FORTH-ICS, Greece
Dr. Theodore Patkos, FORTH-ICS, Greece

ABSTRACT

As Artificial Intelligence (AI) is redefining enterprises at many different levels, new challenges in bringing applications into production arise, involving among others an intense need for clear, human-interpretable, and trustworthy models. Knowledge graphs coupled with formal models for decision-making have a central role to play towards this end. Knowledge graphs offer a semantic manifestation of domain knowledge and requirements, enabling transparent representation and access to the underlying business knowledge; in a sense, they form a network of linked business objects that can be seen as a digital twin of an enterprise or its parts. At the same time, formal tools for decision support enable decision-makers to analyze complex situations and choose solutions based on a solid understanding of the parameters involved. Supporting the whole process through intuitive conceptual modeling tools helps bridging the gap between high-level knowledge and low-level data and services, making the models both human-interpretable and machine-processable. In this lecture, we will explore the coupling of tools for conceptual modeling, knowledge graph engineering, and logical inferencing, by means of the popular, yet complex scenario of multi-vehicle route optimization, which involves the satisfaction and tuning of diverse types of constraints and parameters.

Dimitris Plexousakis is a Professor of Computer Science at the Univ. of Crete and Head of the Information Systems Lab. He obtained a PhD in Computer Science from the Univ. of Toronto in 1996. His research interests lie in the areas of Conceptual Modeling, Knowledge Representation and Reasoning; Formal models and query languages for the Semantic Web; process and service modelling. He has extensive experience in coordinating and participating in National and European Projects and over 150 publications in peer-reviewed journals and conferences.

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



Contact:

Prof. Dr. Dimitris Plexousakis
dp@ics.forth.gr



Contact:

Dr. Theodore Patkos
patkos@ics.forth.gr

ENABLING SMART TRAFFIC FOR A SMART CITY: MODELING A CITY ECOSYSTEM WITH VESTER'S SENSITIVITY MODEL

Prof. Dr. Nils Madeja, Technische Hochschule Mittelhessen, Germany

ABSTRACT

Nils Madeja has been serving as professor of business administration with a special emphasis on digital business at the Technische Hochschule Mittelhessen (THM) University of Applied Sciences in Gießen since 2018. His research and teaching activities focus on digital business models and the digital transformation, particularly on scalability and financing aspects. At THM Business School he heads the Master of Science program in digital business. As a former venture capitalist, Nils has extensive experience in working with start-ups in the digital space (i. e. software, e-commerce, and Internet-based services). He holds a graduate degree in electrical engineering from the University of Kiel and a doctorate degree in business administration from the WHU – Otto Beisheim School of Management. Nils has also lived and worked in Japan for two years.

In this lecture, we will give an overview of a specific conceptual modeling technique, the Sensitivity Model according to Vester. We will study this technique by applying it to model the ecosystem of the small city of Wetzlar with respect to traffic. Wetzlar is undergoing the transformation towards a smart city. As part of its transformation, a number of data-driven traffic management applications have been proposed, and they need to be selected for prototypical development, implementation, and testing. We will show how a Sensitivity Model can be developed by involving relevant stakeholders. And we will demonstrate how the Model can be employed to analyze the key drivers and mechanisms underlying city traffic. We will further discuss how the Model can be used to assess the effectiveness of certain applications on the conceptual stage and, thus, facilitate their selection. In addition, we will share some insights from the real-life project from which the contents of this lecture have been derived.



Contact:

Prof. Dr. Nils Madeja
nils.madeja@w.thm.de

BUILDING DIGITAL LEADERSHIP: WHAT CAPABILITIES ARE NEEDED

Prof. Dr. Björn Johansson, Linköping University, Sweden

ABSTRACT

The lecture will present some thoughts gained from a research project related to automatization of case handling in municipalities. In Sweden today there is a high demand from the government that the 290 municipalities need to use Information Technology (IT) and to digitalize to a higher extent than today. From the municipalities point of view they also see this need for digital transformation. This has made a sort of restructuring/reorganization happens in the municipalities. Some insights and conclusions from this will be presented and discussed, focusing mainly on what capabilities that are needed to be organized, managed and governed and how this could be done. A crucial question is then how to govern and manage needed capabilities, so that the digital transformation will be successful.

Björn Johansson is an Associate Professor in Information Systems at Department of Management and Engineering Division of Information Systems and Digitalization, Linköping University, Sweden. Previously he worked as Associate Professor at School of Economics and Management, Lund University 2009-2019 and as Post Doc at Center for Applied ICT at Copenhagen Business School 2007-2009. He received his PhD in Information Systems Development from the Department of Management & Engineering at Linköping University, Sweden in 2007. He is a member of the IFIP Working Groups IFIP 8.6 and IFIP 8.9., and the Swedish National Research School Management and IT (MIT). Johansson is Program Manager of the Master program IT and Management, and responsible for the PhD program in Information Systems at Linköping University.



Contact:

Prof. Dr. Björn Johansson
bjorn.se.johansson@liu.se

MULTI-LEVEL MODELING WITH THE FMMLX: INTEGRATED DESIGN AND EXECUTION OF DOMAIN-SPECIFIC MODELING LANGUAGES AND MODELS

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

ABSTRACT

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. In recent years, he focused especially on multi-level modelling languages and corresponding tools. Further areas of research include method construction, (meta) programming languages, and advanced architectures of application systems. He is also interested in the philosophy of science and fundamental questions related to the subject of research in business information systems and computer science.



Contact:

Prof. Dr. Ulrich Frank
ulrich.frank@uni-due.de

ABSTRACT

Conceptual models are of pivotal relevance for the design, maintenance and use of software systems. However, the design of modeling languages and corresponding tools suffers from serious limitations. They concern the lack of expressiveness, the lack of abstraction and, as a consequence, limited reuse and adaptability, as well as dissatisfactory integrity. Over the last twenty years research on multi-level modeling has produced various approaches to overcome these limitations. Different from traditional language architectures such as the MOF, multi-level architectures enable an arbitrary number of classification levels. This way, they allow for the specification of DSMLs with more general DSMLs and enable relaxing the notorious power-generality trade-off. Furthermore, frustrating problems caused by the lack of expressiveness MOF-like language architectures suffer from can be avoided. This talk will start with explaining the serious shortcomings of prevalent language architectures. Subsequently, essential features of multi-level language architectures are presented. Finally, the talk will give an introduction to a specific multi-level language, the FMMLx, and a corresponding language engineering, modeling and execution environment, the XModelerML. Among other things, the XModelerML enables the common representation of models and tools (because it features a multi-level programming languages). Thus, it does not only allow to overcome the notorious synchronization problem, but also to develop new architectures of enterprise application systems that provide for unprecedented levels of reuse, adaptability and user empowerment. The presentation of core concepts is supplemented with a short tool demo.

DIFFERENT PERSPECTIVES OF A DIGITAL INNOVATOR

Prof. Dr. Adrian Florea, Lucian Blaga University of Sibiu, Romania

ABSTRACT

Innovation is the only way the EU can maintain a strong, sustainable and competitive economy. However, at present, there are large imbalances between the degrees of innovation of EU countries. One solution to mitigate this drawback consists of the development of collaborative networks that replicate the best models of innovation from advanced countries and adapt them to underdeveloped countries in Europe. Such a collaboration exists between Lucian Blaga University of Sibiu, OMiLAB community, and local industrial partners. This lecture emphasizes both the importance of innovation, challenges involved, especially in modest innovator countries of EU, and different perspectives of a Digital Innovator, starting from environment, target domains and specific activities, human resources, and education curricula. Finally, there are presented some practical examples from ULBS, pilot projects targeting industry or agriculture cases aiming to boost the regional innovation.

BIO

Adrian Florea is PhD supervisor and Professor in Computer Science and Engineering at the Lucian Blaga University of Sibiu (LBUS), Romania. He completed his PhD studies in Computer Science from 'Politehnica' University of Bucharest, Romania in 2005. He is HiPEAC affiliate member and ACM Senior member. He has published over 9 books and 111 scientific papers. Adrian Florea has participated to several EU projects and he has notably ensured the technical coordination of the Erasmus+ KA2 strategic projects and EEA international Grants. He is IT Officer of European FORTH-EM Alliance. Since 2019 professor Florea is leading the HPI Knowledge Transfer Institute at LBUS and organized in 2025 the fifth edition of the Sibiu Innovation Days (SID) event. He was researcher in 'iRead' H2020 project (2017-2021), and the technical coordinator of 'DigiFoF' - the Erasmus+ KA2 strategic project (2019-2021). He is also local coordinator of 'EoFSSS' KA220-VET project (2022-2024), an initiative of Erasmus+ funding mechanism for vocational training. Professor Florea is local coordinator of 'RONAQCI' project within the Digital Europe programme (2023-2025) and of 'CoDEMO' project, an initiative supported by the Erasmus+ funding mechanism, Alliances for Education and Enterprises (2023-2026). His domains of professional interest include Advanced Computing Architectures, Prediction Algorithms, Energy efficient systems, Speculation, IoT, Embedded Systems, Software scheduling, Simulation and Benchmarking, Evolutionary Computing, Genetics Algorithms, Multi-objective Optimization Problems, Educational software.



Contact:

Prof. Dr. Adrian Florea
adrian.florea@ulbsibiu.ro

ENTERPRISE MODELING AS A KNOWLEDGE SOURCE IN SYSTEMS ENGINEERING

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

BIO

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

ABSTRACT

In an era of global economy and frequent changes caused by digital transformation, innovation, and other factors, the systems development faces the need for continuous realignment with new enterprise goals, business processes, and technologies. To achieve a successful realignment, availability of knowledge about the enterprise and its environment (including new technologies) becomes an enabler of successful definition of requirements and implementation of changes at the business and technology level. Enterprise models are an important source of knowledge that can be represented using commonly available enterprise architecture notations. Sticking to common notations helps not only to represent the knowledge about the enterprise but also to show a generic knowledge about new technologies, for instance, low-code/no-code development; and such representation, in turn, helps in the adoption of these technologies.



Contact:

Prof. Dr. Mārīte Kirikova
Marite.Kirikova@cs.rtu.lv

ETHICAL CHALLENGES OF DIGITAL TRANSFORMATION

Prof. Dr. Noha Mostafa, British University in Egypt, Egypt

ABSTRACT

During the recent past years, disruptive technologies have emerged with huge power and capabilities that are reshaping our lives on all levels. Cutting-edge technologies such as big data analytics, artificial intelligence, machine learning, 3D printing, blockchain, and cloud services are changing the way we live, work, and communicate. However, with such enabling technologies, come complex challenges, most of them are related to ethics and the responsible use of technology. Endless questions are being raised about issues such as privacy, data security, trust, anonymisation, and ownership. Hence, there is a need to develop an ethical framework that helps the society in safeguarding human rights and ensuring a consistent alignment between technology and values. This comes as even more challenging on the business levels, with the shift towards 'Digital Transformation' that is mainly about 'smartness' and 'connectivity'. The long-running debate on technology vs human can be driven by ethical considerations to minimise the social uncertainty and agitation and enable a smooth digital transformation. In this lecture, we will share ideas on technology and the relevant ethical issues and share our thoughts about how we feel about such technologies and how to be ready for this new era.



Contact:

Prof. Dr. Noha Mostafa
Noha.Mostafa@bue.edu.eg

BIO

Noha Mostafa is an Assistant Professor of Industrial Engineering and Management. She is currently a lecturer in The British University in Egypt. She got B.Sc. and M.Sc. in Industrial Engineering from Zagazig University. She was a visiting PhD student in Tokyo Institute of Technology, Japan in 2016. She finished her PhD degree in Industrial Engineering and Management in 2017 from Egypt-Japan University of Science and Technology (E-JUST), Egypt; the topic was the integration between different functions of the supply chain. Noha has broad research interests including supply chain management, logistics, sustainability, quality management, design thinking, value engineering, data analytics, and information systems.

RESCUE AI: SMART CITY DISASTER VISUALIZATION WITH META MODELLING

Prof. Dr. Vinesh Thiruchelvam, Asia Pacific University of Technology & Innovation, Malaysia

BIO

Vinesh Thiruchelvam has over 26 years of experience in engineering education/academics, ICT, operations & maintenance, facility management, design and project management in various industries ranging from building services/property, oil & gas, district cooling plants, co-generation power plants and the port industry. He has managed deliveries of international projects in the US, Maldives, UK, Hong Kong, Macau, China, India, Russia, Iran, UAE, Qatar, Saudi Arabia, Oman, Vietnam, Brunei, Singapore and Malaysia for the property sector, ports, oil & gas and power plant industries. He is currently the Chief Innovation & Enterprise Officer for Asia Pacific University of Technology & Innovation (APU). Prof Vinesh has engineered emerging tech for various notable solutions addressing societal issues. Once area of advancement in Digital Eco-System embedment into various applications as part of Digital Transformation for organizations.



Contact:

Prof. Dr. Vinesh Thiruchelvam
dr.vinesh@apu.edu.my

ABSTRACT

Floods are one of the most often occurring and damaging natural hazards. They impact the society on a massive scale and result in significant damages. To reduce the impact of floods, society needs to keep benefiting from the latest digital eco-system innovations. Drones equipped with sensors and latest algorithms (e.g., computer vision and deep learning) have emerged as an engineered platform which may be useful for flood monitoring, mapping, and detection activities in a more efficient way than current practice. Smart cities with digital twins (SCDT) uses information and communications technology (ICT) to enhance its livability, work-ability and sustainability through the virtual representation of a physical object or system across its life-cycle. The use of meta modelling allows for visualization and assessment of the performance of remote sensing and geographic information system techniques for analysing flood events using UAVs.

BUSINESS PROCESS INNOVATION AS DRIVER FOR DIGITAL TRANSFORMATION IN MODERN ORGANISATIONS

Prof. Dr. Andreas Oberweis, Karlsruhe Institute of Technology, Germany

ABSTRACT

Business processes in the internet age are typically not restricted to single organizations but cross organizational borders to customers, suppliers and other organizations. The design of these business processes is a complex collaborative task, which requires special methodological support. This lecture introduces Horus, which includes a comprehensive set of modelling methods and languages to support the whole life cycle of business processes. Horus is based on high-level Petri Nets for procedure modelling and provides additional modelling support for objects, resources, organizational structures, business goals and business rules. Simulation based concepts are provided to evaluate process models. Besides describing the basic concepts of Horus, the lecture focuses on ongoing research work: Artificial intelligence currently has a strong influence on process modelling. On the one hand decisions based on machine learning approaches have to be included in process models. A pattern based approach is proposed to model different decision scenarios. On the other hand, generative AI tools can be used to support modelers in their modelling activities. Process models can be (at least partially) automatically derived from textual descriptions. Teaching modelling languages is a challenge for universities and other teaching organisations. A software tool is described for (semi-)automatically evaluating process models with respect to syntactic, semantic, and pragmatic correctness. The tool can be used to support teaching staff in evaluating student models from examinations. The tool can also be used to support students in improving their modelling capabilities by providing hints to errors in their models. Finally, non-standard processes in the Internet of Things and in the context of smart mobility are considered. Processes in this area are typically less structured than traditional business processes. Processes interact with their environment via sensors and actors and collect data for (partially) autonomous decisions. Micro processes, which consist of only few activities, are flexibly combined to each other and have to be connected to other running business processes in the environment.



Contact:

Prof. Dr. Andreas Oberweis
andreas.oberweis@kit.edu

Andreas Oberweis is professor for Applied Informatics at the Karlsruhe Institute of Technology (KIT) since more than 20 years. Before, he was professor for Information Systems Development at Goethe Universität Frankfurt am Main. Since 2004 he is also Research Director in the Software Engineering Group at the FZI Research Center for Information Technology in Karlsruhe. His research and teaching interests are in the areas of data engineering, business process management, and software technology. He is co-founder of several companies in the field of business process management and enterprise information systems.

THE TRANSFORMATION OF HILTI'S SOFTWARE SUPPORT TO CUSTOMER ADVOCATES

Dr. Marcel Müller, Hilti Entwicklungsgesellschaft mbH, Germany

ABSTRACT

Marcel Müller holds a PhD in Management of Information Systems from the University of Innsbruck. He joined Hilti in August 2022 as Head of Customer Advocates where he and his globally dispersed team are acting as the interface between customers, Hilti's market organization and the software development. Prior to this he worked for the robotics automation company KUKA in roles such as Head of Digital Product Expert, where he and his team were globally responsible for the customer success of IoT products KUKA is selling to customers; as a Program Manager for a global digital transformation program, where he was globally responsible for the transformation of internal Processes, Master Data Management and the transformation from SAP R/3 to SAP S/4 HANA; and as a Project Manager for IT Nearshoring, where he was responsible to hire over 50 employees and set up an IT Shared Service Center in Budapest (Hungary) as an extended workbench. Before working for KUKA, Marcel was part of the UniCredit Banking Group where he worked on Mergers and Acquisitions. Also, Marcel still teaches the bachelor course "IT Systems – Introduction to the Management of Information Systems" at the Department of Industrial Engineering & Management of the Management Center Innsbruck (MCI) in Austria.



Contact:

Dr. Marcel Müller
Marcel.Mueller@hilti.com

Hilti wants to make construction better and promises its customer's that Hilti is the best partner for productivity, security and sustainability. To do so, Hilti offers not only physical products and related services but also a vast variety of software products. To live up to this customer promise for software products, it is not only important to build „Customer Centric Software Products“, but also to nurture the relationship with customers, to listen and learn from them. To fulfill this promise, Hilti established a software support organization that is currently undergoing a transformation from a “classical software support team” to a “customer advocates team”. The focus of this transformation lies not only on the services that are offered by the customer advocates team, but more importantly it triggers a change in the traditional mindset and skill set of software support engineers. In this slot we will discuss this transformation and derive 10 things customer advocates have to be good at, based also on the Digital Design Thinking approach and workshops conducted in our OMiLAB@Hilti node.

CHALLENGING THE DESIGN OF DIGITAL PRODUCTS AND SERVICES WITH MODELLING APPROACHES

Dr. Martin Nemetz, HILTI AG, Liechtenstein

ABSTRACT

Hilti is providing products, system solutions and software-based services that contribute to make work on construction sites simpler, faster and safer. While Hilti is proud of its leading construction tools and consumables, it has started to engage itself in building digital products and solutions for its customers. In our presentation at NEMO Summer School, we describe how modelling approaches help us in building software solutions that satisfy the needs of our customers. Relevant questions herein are: (1) How do we reduce the variations and hence complexity of provided software features so that we can deliver them fast and in a reliable manner without compromising customer needs? (2) How can we consider future scaling and performance needs in our software architecture? (3) How can we achieve an architecture model that allows for identifying potential issues (or improvement needs) before they impair our software solutions? We work on trying to answer these and other questions by (also) applying modelling approaches in a pin-pointed and efficient way.

Martin Nemetz holds a PhD in Business Informatics from the University of Vienna and has worked for the Hilti Corporation since 2008. Initially, he was a Project Manager for diverse ERP-driven projects. In 2012, Martin was appointed the Head of the Competence Center for on Demand and on Device Services. Martin led his team in defining the way forward for IT in Hilti by evaluating the latest technologies and IT trends such as mobility, cloud services, and social media while checking their applicability for business support and usage. Since 2012, Martin became part of the Hilti IT Leadership Board. In 2015, Martin relocated to Malaysia to further expand and develop the Asia talent hub in Kuala Lumpur - Hilti Asia IT Services as one of the three strategic Global IT locations in Hilti. In this role, his portfolio covers the people, landscape, applications, technologies and the resulting digital transformation. Together with his team, Martin focuses hereby on two-dimensional growth - team size as well as technological and business competence.



Contact:
Dr. Martin Nemetz
Martin.Nemetz@hilti.com

DESIGN ETHICS AND ETHICAL DESIGNING

Prof. Dr. Matti Rossi, Aalto University, Finland

BIO

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



Contact:
Prof. Dr. Matti Rossi
Matti.rossi@aalto.fi

ABSTRACT

Pervasive digitalization provides lots of opportunities for providing new services and making the lives of people and organizations better, easier, and more flexible. At the same time the constant availability of users, the proliferation of surveillance devices, such as drones and video cameras, and the often-questionable use of services in our phones, computers, and networks, which has led Zuboff to coin the term „surveillance capitalism“ to describe the phenomenon. How does this concern us as designers of digital services? When we design systems, we should be informed about the goals of the systems, and we should understand the effects of the designs on users and the society at large. As the systems become more powerful and interconnected, quite mundane decisions about data collection and data sharing can be by accident or by design really powerful tools for bad actors. In the lecture, I will give examples of risks presented by design decisions and I will try to give tools for analyzing the possible ethical risks of designs and guidelines for action when there are ethical dilemmas in design work.

MANAGING SHIP ARRIVALS IN A PORT: THE DESIGN PROCESS OF INTERACTIVE APPLICATION SOFTWARE USING METAPHORS AND USER PARTICIPATION

Prof. Dr. Heinz Züllighoven, University of Hamburg, Germany

ABSTRACT

The lecture describes the path from the task-oriented analysis of ship traffic management in the Port of Hamburg to the design and realisation of a touch table application „Sounding Table“. The focus is on supporting the arrival and departure of large ships in the Port of Hamburg. This example shows how we narrowed the classical gap between the domain-oriented analysis of the application area and the design of the user model. We will outline how design metaphors and user participation have a direct influence both on the usability and on the architecture of the software.

Heinz Züllighoven (born 1949) studied electrical engineering at RWTH Aachen University, then German literature and language as well as mathematics at the University of Bonn. In 1989 he received his doctorate from the Department of Computer Science at the TU Berlin. Between 1991 and 2015 he held a chair as full professor in the Software Engineering Department at the University of Hamburg. In 1994 he founded a start-up company, now WPS GmbH with Guido Gryczan and since 1999, in addition to his half-time professorship, where he acted as managing director until 2021. He still advises his former company and non-profit organizations. Heinz Züllighoven is one of the leading authors of the object-oriented tool & material approach and has published extensively on various software technology topics. The book „The Object-Oriented Construction Handbook“ on the WAM approach was published by Morgan Kaufmann.



Contact:

Prof. Dr. Heinz Züllighoven
Heinz.Zuellighoven@wps.de

PHD RESEARCH AND BEYOND WITHIN EIS: TRIALS AND TRIBULATION

Prof. Dr. Pericles Loucopoulos, Manchester University, UK

ABSTRACT

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



Contact:

Prof. Dr. Pericles Loucopoulos
periloucopoulos@icloud.com

ABSTRACT

Research has often been regarded as a “wicked problem”, an activity of informed curiosity when researchers state what they are doing when they don’t really know what they are doing. It is a process which is guided by a particular methodology the choice of which is based on the contextual setting of the research topic (the challenges) as well as the motivation for a solution (the deliverables). In this lecture, we will examine issues involved in research with particular emphasis on research in the field of Enterprise Information Systems (EIS). We will examine the issues underpinning the EIS domain, the emergence of research needs from digitisation, to interpretation and more recently to transformation of enterprises. Given this context, we will explore different research methodologies that may be deployed, such as those of Design Science Research, Action Research, Case Study, Survey Design, Mixed Methods and Qualitative Methods, each one of which is suited to different motivational characteristics of the underlying research goals. We will also explore the social dimension of research, including issues encountered by researchers in settings involving communities within their specific research environment as well as other related communities (e.g. the NEMO Summer School) and the broader EIS community. Branching out from a close research environment by exploiting gained experiences, towards collaborative initiatives, competing for research funding and helping the next generation of researchers will also be addressed in this lecture.

PHILOSOPHICAL FOUNDATIONS OF CONCEPTUAL MODELLING

Prof. Dr. John Mylopoulos, Toronto University, Canada

ABSTRACT

We review and analyze four theses/answers to the most fundamental question for research on Conceptual Modelling, „What is a conceptual model?“ For each thesis we offer evidence that it is credible and consider some of the research questions it entails. Our study draws ideas from Philosophy, Cognitive Science, Engineering and the Social Sciences, as well as several areas within Computer Science, including Databases, Software Engineering (SE), Artificial Intelligence (AI) and Information Systems Engineering (ISE).

BIO

John Mylopoulos earned his Ph.D. from Princeton in 1970. He joined the computer science department at the University of Toronto that same year, where he remained for the majority of his career until he retired in 2009. Since then, Dr. Mylopoulos has also held faculty positions at the University of Trento and the University of Ottawa. He holds honorary doctorates from the Aristotle University of Thessaloniki, Kapodistrian University of Athens and the RWTH Aachen University in Germany. Over the course of his highly accomplished career, Dr. Mylopoulos has established himself as one of the most influential researchers in computer science, making lasting contributions to the research areas of Artificial Intelligence, Databases, and Software Engineering, where he pioneered the use of conceptual modeling and knowledge representation.



Contact:

Prof. Dr. John Mylopoulos
jm@cs.toronto.edu

OMiLAB

DAY

DIGITAL LEADERS SESSIONS

ADOXX SESSIONS

INNOVATION SCENARIOS

THE OMILAB NPO: AN INTRODUCTION

Prof. Dr. Knut Hinkelmann, OMILAB NPO, Germany
Dr. Wilfrid Utz, OMILAB NPO, Germany

ABSTRACT

In recent years, we could observe a fast-paced evolution of technologies (infrastructure, hardware, software) in a ubiquitous manner leading to a change of perception how we build, organize, and run business operations. Enterprises constantly need to reflect on a strategic level how these changing circumstances are influencing their business models, operation, and regulatory/organisational framework they operate within to stay competitive and transparently develop and adapt their roadmap for digital transformation. Consequently, innovation process are required to continuously evaluate, trigger changes and adapt to specific needs on a societal and business level. The above observation motivates this talk, introducing the Open Models Initiative Laboratory (OMILAB) that supports an active global community for conceptual modelling who benefits from open artefacts. To this end it acts as a facilitator to the development of scientific methods and technologies for all those who value models. In addition OMILAB acts as a platform, where participants can bring in ideas related to modelling and engage in the exploration process. The Digital Innovation Environment (DIEn) powered by OMILAB enables design, engineering and training activities for organisations pursuing Digital Transformation initiatives. Stakeholders from multi-disciplinary backgrounds are supported to create innovative ideas as Digital Business Models, to materialise them in proof-of-concept implementations using Digital Twins and to evaluate their feasibility in a laboratory setting as/through the OMILAB Innovation Corner, within a corporate or academic context focusing on Digital Innovation.

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

Wilfrid Utz received his PhD from the University of Vienna, Research Group Knowledge Engineering in the field of metamodel design and conceptual structures. He has been involved in international research and innovation projects and gained experience in the field of modeling method conceptualization, meta-model design, and implementation of modeling tools using ADOxx in various application domains. His research and professional interest relate to the knowledge representation using meta-modeling concepts and platforms. He is responsible for managing and organising the OMILAB NPO activities.



Contact:

Prof. Dr. Knut Hinkelmann
 knut.hinkelmann@omilab.org



Contact:

Dr. Wilfrid Utz
 wilfrid.utz@omilab.org

THE OPEN-SOURCE TOOLS: SCENE2MODEL AND IOT2MODEL

Dipl.-Ing. Christian Muck, OMILAB NPO, Germany
Danial Mohammadi Amlashi, University of Vienna, Austria

ABSTRACT

Christian Muck works as a developer and researcher at the OMILAB NPO, where he is involved in funded research projects and creating support for OMILAB's digital innovation environment, focusing on implementing conceptual modelling tools. Additionally, he is pursuing his Ph.D. in the doctorate program Business Informatics at the University of Vienna, where his research interest lies in creating a digital modelling tool for design thinking supported by semantic-rich technologies.

Danial M. Amlashi is currently pursuing his Master's degree in Business Informatics at the University of Vienna. As a research engineer in the Knowledge Engineering research group since 2020, his interests span metamodelling, cyber-physical systems, and digital twins. In metamodelling, he abstracts real-world entities into formal representations to optimize complex systems. He also explores the integration of physical components and computational systems in cyber-physical systems. Additionally, his work on digital twins involves creating virtual counterparts for real-time insights and decision-making.



Contact:

Christian Muck
 christian.muck@omilab.org



Contact:

Danial Mohammadi Amlashi
 danial.mohammadi.amlashi@univie.ac.at

ABSTRACT

In OMILAB's Digital Innovation Environment (DIEn), models play a central role in capturing and validating innovative ideas alongside their prototypes. In this context, open-source modeling tools are leveraged to facilitate the creation of these models, thereby supporting the development of innovative ideas. Among other tools, Scene2Model and IoT2Model are utilized for this purpose within the DIEn. This lecture will demonstrate how these tools are integrated into OMILAB's DIEn by showcasing them within the framework of a representative innovation scenario. Subsequently, the resulting conceptual models will be evaluated in a proof-of-concept environment, providing insights into their practicality and applicability.

THE COMMUNITY OF PRACTICE: FOCUS ON SKILLS AND CASES

Iulia Vaidian, OMILAB NPO, Germany
Alexander Völz, University of Vienna, Austria

ABSTRACT

The OMILAB Community of Practice is supported at a conceptual and technical level by the underlying Digital Innovation Environment. Within this environment, conceptual modelling forms the shared domain of the community, and it is utilized to connect the business world and the digital world with physical devices through model-based approaches. The OMILAB community thereby supports the development of skills and capabilities for the next digital leaders through know-how, expertise, and resources, by answering among others: What capabilities are exercised in an experimentation and exploration environment? What skills are expected from the next digital leaders? Within this context, the domain "Smart City" forms the foundational case to demonstrate the skills required by a digital leader in today's complex environments. Namely, it is essential to have a disruptive vision while balancing the interest of multiple stakeholders from multi-disciplinary backgrounds with technological capabilities and overall feasibility.

Iulia Vaidian holds an MSc in Supply Chain Management from the Vienna University of Economics and Business and gained experience in design thinking, business process management and conceptual modelling concepts and technologies in her responsibilities as part of the OMILAB team. Herein she focuses on innovation using design thinking methods and their tool applications in models, as well as contributing on community management and community of practice building activities. She gained experience in various EU-funded projects, such as CoDEMO 5.0, "OMiKA2 – Open Models Initiative" and "DigiFoF – The FoF Designer: Digital Design Skills for Factories of the Future".

Alexander Völz holds an MSc in Business Administration and has started his doctorate programme in Business Informatics at the University of Vienna in October 2021. His involvement with Business Informatics emerged during the master programme, where he was working as student assistant at the Department of Electronic Business. Early on, Alexander was involved in the publication process of scientific articles, and as a result of a fruitful collaboration project, he was able to publish a paper on the topic of Machine Learning as a Service during his master programme. Additionally to his current doctoral studies, Alexander is an employee of the research group Knowledge Engineering at the University of Vienna where he takes part in the teaching and research activities. His current research fields encompass the topics Smart City, Machine Learning as well as Metamodeling Concepts and Technologies.



Contact:
Iulia Vaidian
iulia.vaidian@univie.ac.at



Contact:
Alexander Völz
alexander.voelz@univie.ac.at



Research Projects
(EU-funded, international, bilateral)



ADOxx-based Tools Developers



NEMO ALUMNI
Participants
and Speakers



Book Series (Editors & Authors), Research Publications



Global Network of Nodes (Academia and Industry)



BEE-UP - AN ADOXX BEST PRACTICE

Dipl. Ing Patrik Burzynski, OMiLAB NPO, Germany

ABSTRACT

The research field of Conceptual Modelling identifies models as artefacts describing a real or proposed system on an abstraction level that is adequate for a given purpose. This presentation focuses on the Bee-Up multi-language modeling environment and key features that increase the value of models beyond their basic function (as diagrammatic documentation/ communication support). Bee-Up supports modeling with several established languages - BPMN, EPC, ER, UML, Petri Nets - enriched with semantic links between various model types. The goal of the presentation is to highlight that Bee-Up is not limited to diagramming with established languages, but also facilitates model-value through model analysis, transformation, execution, and integration with other systems. A selection of these will be demonstrated. Theoretical aspects about what is under the hood of Bee-Up model processing capabilities will also be briefly discussed. Bee-Up is an educational tool available at <https://bee-up.omilab.org>.

Patrik Burzynski is a computer scientist, currently working as part of the OMiLAB team, developing various applications, from classical applications to cloud services. His interests include programming and meta-modelling. During his study of Business Informatics at the University of Vienna he was involved in several international research projects (e.g., plugIT, ComVantage). After finishing his master's degree (Dipl.-Ing.) he worked at the University of Vienna for the research group Knowledge Engineering as a university assistant, teaching courses on Modelling and Meta-Modelling and working on the Bee-Up tool before moving on to join the OMiLAB NPO. In the OMiLAB NPO he is responsible for the open-source software area and is currently working on different open-source projects, such the ADOxx meta-modelling platform.



Contact:
Dipl. Ing. Patrik Burzynski
patrik.burzynski@omilab.org



Digitalization in Smart Cities with ADOXX OMiLAB@UNIVIE Team

The term Smart City describes a concept that is increasingly gaining the interest of city administrations, as more than 150 cities worldwide have formulated a strategy for becoming a Smart City. Nevertheless, a variety of definitions is used to describe different application areas within such cities and a widely accepted understanding of the concept has yet to be established. Commonly, sub-domains like Smart Mobility, Smart Environment, or Smart Governance are used to categorize present and potential Smart City applications.

In the ADOxx practice sessions, we will primarily focus on the aspects of city infrastructure and 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 this context, three building blocks have been designed to familiarize the participants with modeling concepts, model querying and model processing in an independent application domain.

How to model concepts of a Smart City?

Basic metamodelling concepts required to realize a modelling language for a Smart City are taught. Tools of the OMiLAB, e.g., the GraphRep generator will be introduced and utilized to create graphical visualizations for the Smart City concepts.

How to analyze Smart City models using query techniques?

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.

How to process Smart City models using simulation?

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.



^[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.

ADOxx.org The Open Source Metamodelling Platform

Practical work during NEMO is performed using ADOxx, the meta-modelling and development platform to realize modelling tools.

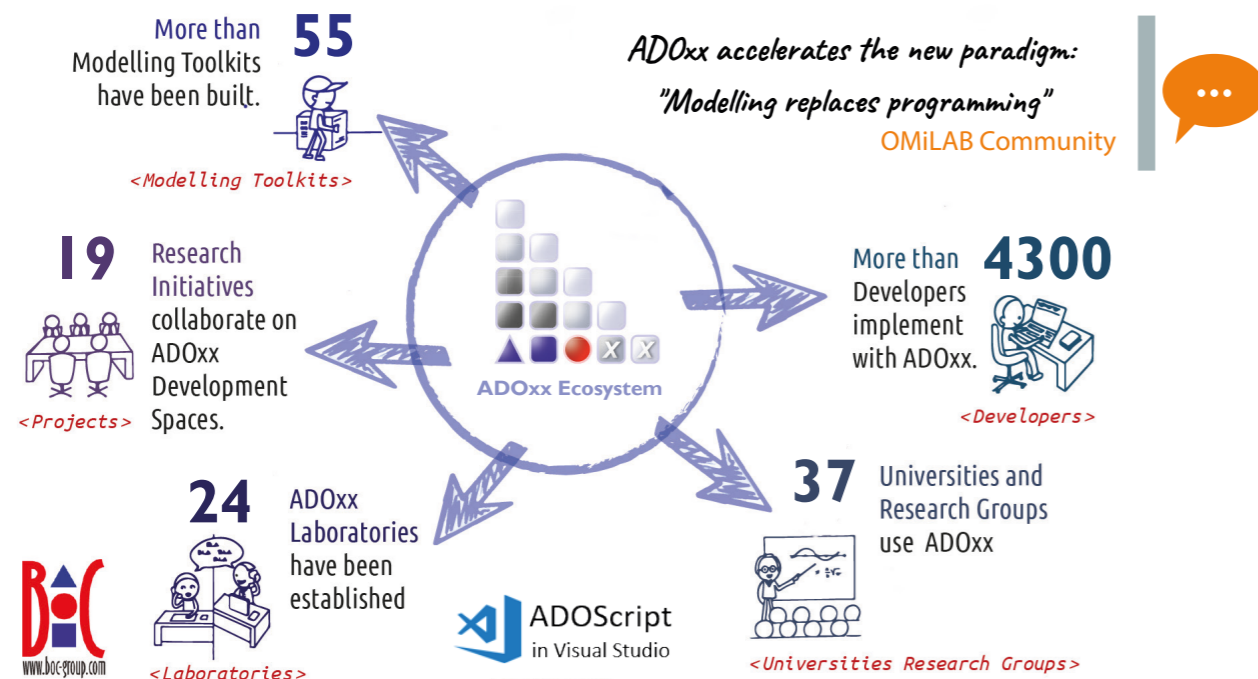
ADOxx enables to:

- Create full-fledged individual modelling tools using pre-build platform features
- Develop the notation, syntax, and semantic of a modelling language with a script-based approach
- Realize Microservices encapsulating algorithms and mechanisms with the OLIVE Framework
- Deploy modelling tools: local or distributed.

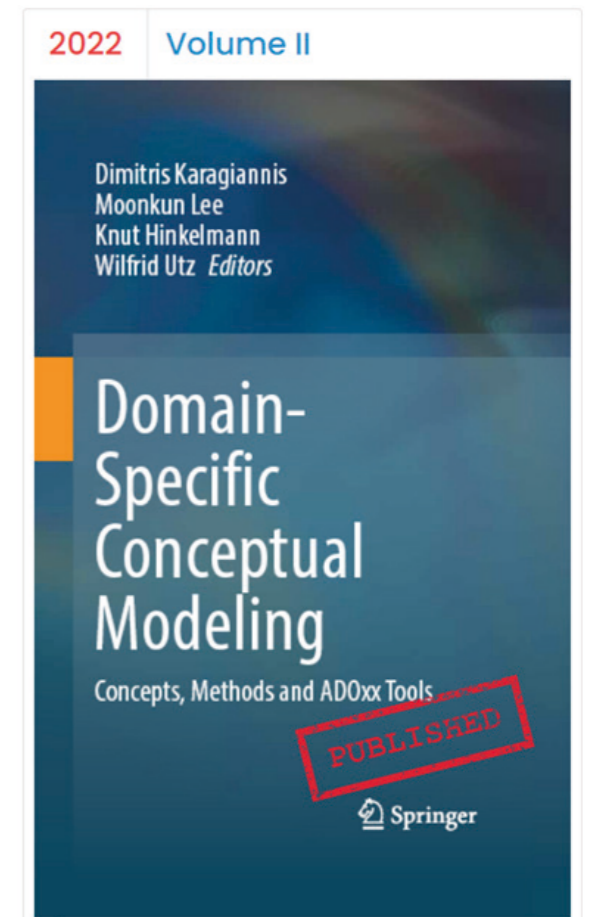
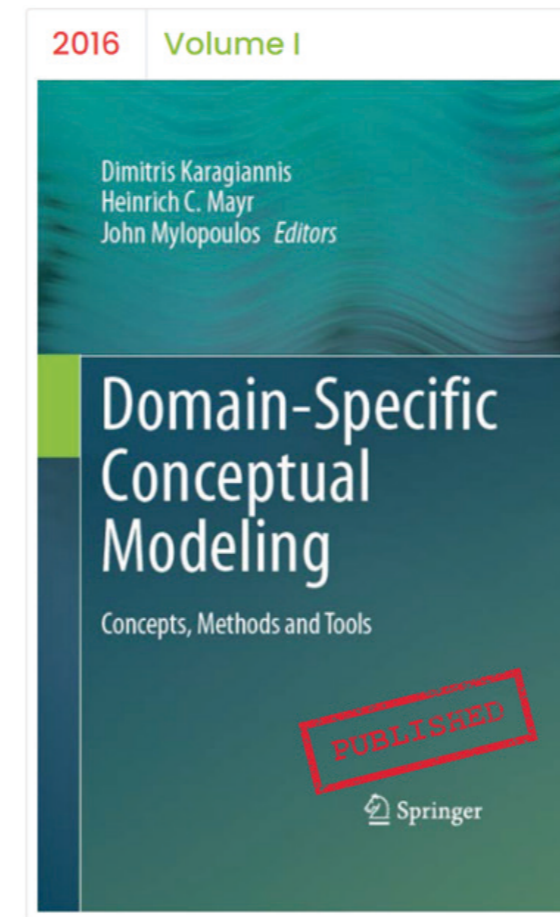
Access ADOxx at: <https://www.adoxx.org/>

Domain-specific modelling tools developed on ADOxx by the OMiLAB Community of Practice available at: <https://www.omilab.org/activities/projects/>

MAKE MODELLING WORK



OMiLAB Community of Practice A Comprehensive Picture of the Results



<https://books.omilab.org>

Access Volume I



Springer: <https://link.springer.com/book/10.1007/978-3-319-39417-6>

Access Volume II



Springer: <https://link.springer.com/book/10.1007/978-3-030-93547-4>

Get in touch to be involved in Volume III !

Innovate Business Models OMiLAB@UNIVIE Team

The digital era is shaped by increasingly complex business models, which are part of ecosystems, involve dependencies, integrate physical objects, and propose disruptive and innovative solutions. These business models place a strong emphasis on the interaction between humans and machines, as they require domain-specific knowledge and technical realization.

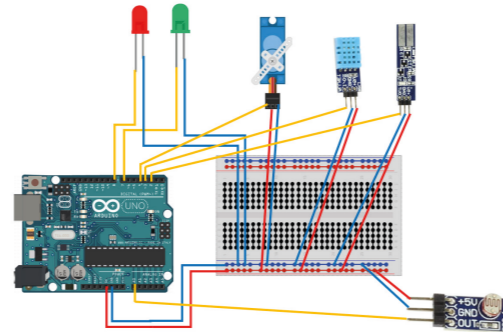
The next digital leaders should have a disruptive mindset and dare to replace existing concepts completely, as well as lead and manage their realization. The aim of this practical session is to foster co-creation in multi-disciplinary teams through design thinking using the Scene2Model tool and environment.



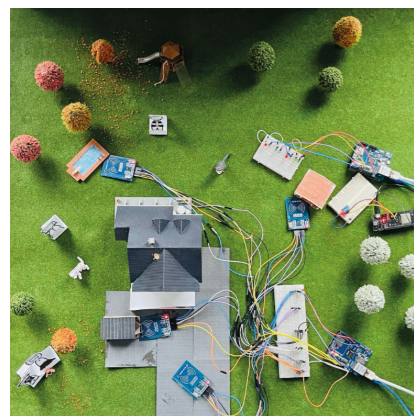
Engineer IoT Environments OMiLAB@UNIVIE Team

The conceptual output of the business models realized in the previous session, namely digitalized model artifacts serve as input for determining the physical and digital experiment environment.

Being aware of the semantic technologies at hand and understanding the capabilities and requirements of IoT hardware components will be the focus of this session.



Compose Digital Ecosystems OMiLAB@UNIVIE Team



The Digital Innovation Environment of OMiLAB facilitates the composition of digital ecosystems, as it builds on the notion of digital business models and employs a Digital Twin as a conceptual representation of an intelligent offering.

Adequate devices and technologies will be provided for participants to experiment with, instantiate a selected modelling method and realize an experiment based on the application scenario chosen.

Innovation Scenarios Using Digital Design Thinking

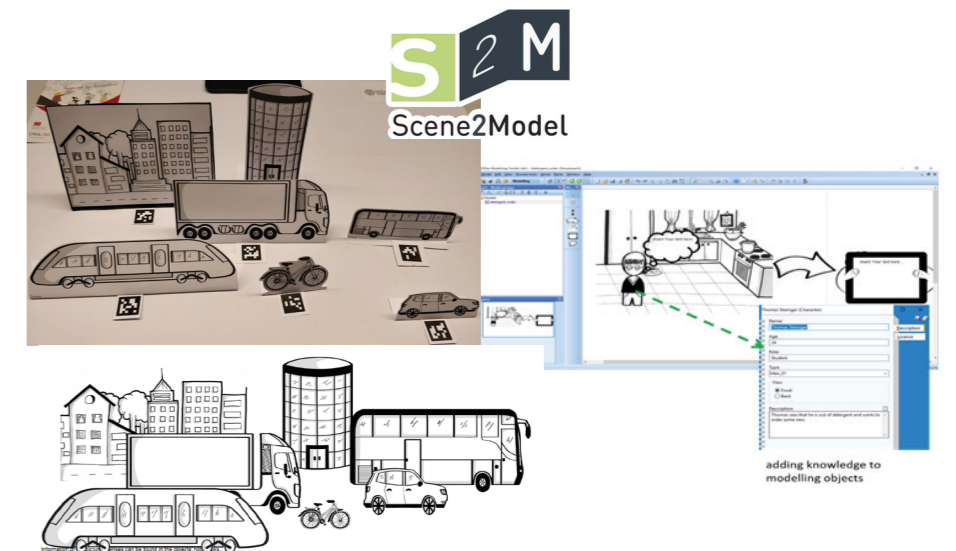
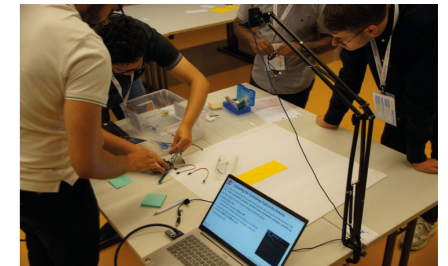
Innovation and transformation, as well as the emergence of disruptive business ecosystems have gained increasing significance. One approach to tackle this complex task is Design Thinking, which applies designer problem-solving techniques for agile, ideation, prototyping and testing in innovative processes through collaboration among stakeholders. The goal is to generate ideas by using different design thinking methods, based on tangible visualization of certain aspects of the problem within a developed solution space, where collaboration among stakeholders plays a central role.

Models is enabled, so that they can be processed and used within modelling tools, further decomposed, and combined with available enterprise assets. This approach enables a location and time-independent collaboration of globally distributed networks and stakeholders, implied by the digital transformation and globalization of businesses. The interplay of Conceptual Modelling and Design Thinking establishes a connection between unrestrained design artefacts and more formal abstractions (e.g., business process models).

Design Thinking enables early exploration and validation of design(s) of new services, smart products, and disruptive business models, but it restricts to location and temporal availability of stakeholders. Absent stakeholders must be informed afterward, which is often not directly supported by the Design Thinking methods applied.

Following the introduction into Design Thinking, participants will experience hands-on the storyboards as a Design Thinking method. We will use the SAP Scenes as haptic figures to depict scenes, building the key moments of a storyboard, and exploring innovative and smart solutions in the context of a „Smart City“. Supported by the Scene2Model tool, the participants will transform these scenes into diagrammatic models while simultaneously semantically enriching them.

Through the Scene2Model tool, a transformation of the physical visualization into digital conceptual mo-



adding knowledge to modelling objects

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