

Preface

Dear reader,

we are very pleased, that with this new book series of our institute cluster, we succeeded in bringing together our scientifically diverse and widespread publications. Especially for such an interdisciplinary research institution like the ZLW/IMA & IfU the wish for an “integrated presentation” is quite great, since the represented disciplinary cultures - from engineering und natural sciences over humanities, social and communicational sciences up to economics - meet very different publication cultures. It is therefore of most importance for us to unite all contributions from a specified period in one book. The idea to publish an annual book edition, which contains a comprehensive selection of publications of the institute cluster, originated from this wish. Almost all publications were peer-reviewed and published in recognized journals or conference proceedings of the various disciplinary cultures. This is the first edition of this series.

In the last months the institute cluster ZLW, IMA & IfU has been reorganized. Together with the division managers we summarized our existing research fields and those introduced by Sabina Jeschke in five department-overlapping research fields. These fields run transversely to the organizational structure of the five areas of operations (departments) of the institute cluster, which are depicted in the underlying matrix.

The **agile and turbulence-suitable processes** field summarizes our research activities on systems that are turbulent in their level of complexity. Therein the transfer of the agility principle of the software development to the process management plays an important role.

Our research and application areas lie in knowledge and technical intensive organizations. To these belong e.g. the Cross Sectional Processes, which deal with efficient networking and transparency of the research processes in large, distributed and highly networked research clusters. Examples are the Cluster of Excellence “Integrative Production Technology for High-wage Countries” and “Taylor- made Fuels from Biomass” at the RWTH Aachen University. - The challenge for the research project Med-on@Aix (a telematic-supported high-performance rescue system) is the formation of organizational and logistical consistency in highly complex and non-predictable rescue scenarios. - Projects like the “value proposition of the IT”, which deal with the determination of assessments in complex environments, build the bridge to the new research focus: Dynamical IT-Outsourcing/Cloud Computing.

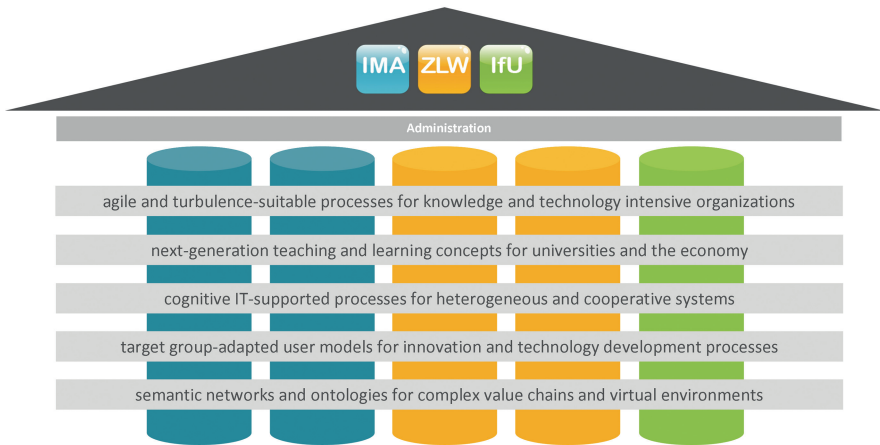


Fig. 1 Research Profile of ZLW/IMA & IfU

The research field **next-generation teaching and learning concepts** does not only address the demand on new ways of teaching and teaching processes for the generation grown up with the internet. It also involves the different approaches to teaching and learning along different diversity categories with the focus on age and gender and with the consideration of different mental user models.

A typical example for Universities is one of the largest projects of the institute cluster, the project KISSWIN. On behalf of the Federal Ministry of Education and Research (BMBF) a nationwide platform for young scientists is built and operated. This includes also an annual convention with around 1000 participants. - To address also the younger academic generation we opened the student laboratory RoboScope in July 2010, which focuses on robotics and is sponsored by the federal state North Rhine-Westphalia. This is the first building block of the RWTH Education Labs with the prime target group being school children. - The economical side within this research field is covered for example by the EU project RELOAD. In RELOAD microteaching units are developed for employees of DIY stores, which can be used for further qualification during work time.

The research field **cognitive IT-supported processes** covers the numerous project areas, which primarily deal with the cognition of technical systems and the development of cognitive-supported models that base on these systems.

Within this research field belongs the research area “partly automated systems” which has been ongoing for about 10 years and involves electronically coupled truck convoys. - In future we will intensify our research on automated elements up to completely automated driving. - Recently the conception of cognitive, artificial intelligence-supported controls to plan flexible, adaptive assembly systems for a larger diversity of products (keyword: “Factories of the Future”) have become a greater matter of interest. - Also the interaction of heterogeneous robot teams will be considered at the ZLW/IMA & IfU as well as research on humanoid robots.

With **target group-adapted user models** we cover a research field, which has a long tradition at the institute cluster. The aim is the development of technologies and human-machine interfaces considering the user models of the different target groups, the human “going from servant to user”.

An example is the by European forwarding agents driven development of a new type of container within the project Tellibox, which is sponsored by the European Union. The development is oriented towards the loading requirements of the haulers, which is especially a challenge for the construction teams. - Another socially extremely relevant topic is “accessibility”, in particular barrier-free concepts for web services, software concepts, devices and machines using user and model centered development and multi modal user concepts.

The research questions within the field **semantic networks and ontologies** have been addressed in more and more of our projects over the last years. Especially in complex value chains, which are close to applications, this topic is an enormous challenge for researchers.

Within the Cluster of Excellence “Integrative production technology for high-wage countries” the institute makes an important contribution to the semantic coupling of the differently structured simulations of applications. This enables a continuous simulation of complex production procedures. Centerpiece is the development of an ontology basis through which the different parts of the simulations can communicate. - Development of ontologies and semantic networks of the focus of the project AsIsKnown for the determination of trends that overlap several sectors in the design of carpets, curtains and upholstered furniture. The network is used now European-wide. - Within the new research focus “web services, semantic web, cloud computing” ontologies play an important role for the design and implementation, and orchestration of single services to complex process chains. The five core research fields display the structure of this book.

The complete work is now lying before us of which we are happy about. Our deepest thanks goes to our personal assistant Dr. Alicia Liedtke for her tireless and thorough sighting and compilation of the articles and the coordination of this publication project, which was an unusual task for an experimental physicist. Grateful acknowledgements are also due to those who supported us with the formatting and correction of the articles. Also, we thank the Springer Verlag for publishing this volume and thus helping us to position the research activities of our institute cluster into an international frame. We hope that this series of publications is contributing to the global promotion of broad and interdisciplinary research methods. Further we would like to express our gratitude to the RWTH Aachen University for providing an open, inspiring atmosphere and a great scientific infrastructure, which make the RWTH Aachen to an extraordinary University. Finally, we thank all employees from our heart for their never ending commitment, for their creativity and that they do make the institute to something very special!

Aachen,
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