

ID+Lab - Modelling Interdisciplinarity

Michael Dürfeld | Anika Schultz | Christian Stein

Accepted paper at the III. International Conference of the Hispanic Digital Humanities, Malaga October 2017

Keywords: Interdisciplinarity, Modelling, Semantic Web, Ontologies, Digital Scientific Publishing

Image Knowledge Gestaltung - An Interdisciplinary Laboratory

The Excellence Cluster *Image Knowledge Gestaltung* at Humboldt-Universität zu Berlin is currently one of the most ambitious interdisciplinary research organisations worldwide. Over 350 researchers from over 40 disciplines in humanities, science and design/architecture are working closely together in diverse projects. The overall aim of this "Interdisciplinary Laboratory" is to understand, analyse and model one of the most discussed and still most complex concepts of research: Interdisciplinarity itself. Interdisciplinarity is demanded by funding guidelines for most international research projects, but the forms of implementation vary a lot and many projects fail or fall behind expectations exactly because of non working collaboration between the disciplines.

ID+Lab - Modelling Interdisciplinarity

These problems are directly addressed by the research team "ID+Lab" as part of the "Interdisciplinary Laboratory". As an interdisciplinary team with researchers from the fields of Culture Theory, Linguistics, Information Science, Applied Informatics, Architecture and Design it has developed a method for modelling interdisciplinary structures, that exceeds listing of disciplines and topics and allows for a far more detailed look into the structures of interdisciplinary collaboration. The method is based on 11 actor classes, several relation types (ties) and modelling rules, that are found to be crucial for all interdisciplinary work. With this methodology it is possible to model research projects in a new way that reveals structural peculiarities or flaws and also shows new and promising connections to actors that are not yet associated.

Influenced by Network Theory (Harrison White), Actor-Network-Theory (Bruno Latour) and Systems Theory (Niklas Luhmann) actors are not only understood as human but as well as non-human actors. These eleven classes of actors in interdisciplinary research are: Person, Organisation, Topic, Task, Source, Method, Tool, Event, Place, Time and Money. Every actor has its own agency, relations to other actors and builds clusters of actors. According to Semantic Web Standards every relation or tie between actors is semantically defined. Beyond that, the ID+Model has got the following additions and specifications:

- (1) *Potential Actors*: Besides existing and concrete actors, unknown or not yet clearly defined actors can be modelled. This is important for interdisciplinary research because there are a lot of actors, that are not clearly defined from the start. Knowledge in this sense is more a knowledge of non-knowledge and this needs a presentation inside the model.
- (2) *Potential Ties*: According to these Potential Actors not only actual existing ties but as well not yet existing but possible ties can be modelled. These Potential Ties expand the knowledge space of classical network models.

(3) *Tie Values*: In addition to this specification according the state of the tie as an actual or an potential state every tie can be attributed by a value. A positive value means that the tie is according to the situation that is modelled important, a negative value means that the tie is useless or even hindering.

(4) *Tie Intensities*: Last but not least, ties can be annotated by intensity - on the one hand by the intensity of time and on the other hand by the intensity of interest. Whereas modelling time-intensity gives important information about the research activities and their investment of time, the modelling interest-intensity gives important information, if the researcher likes or dislikes the work.

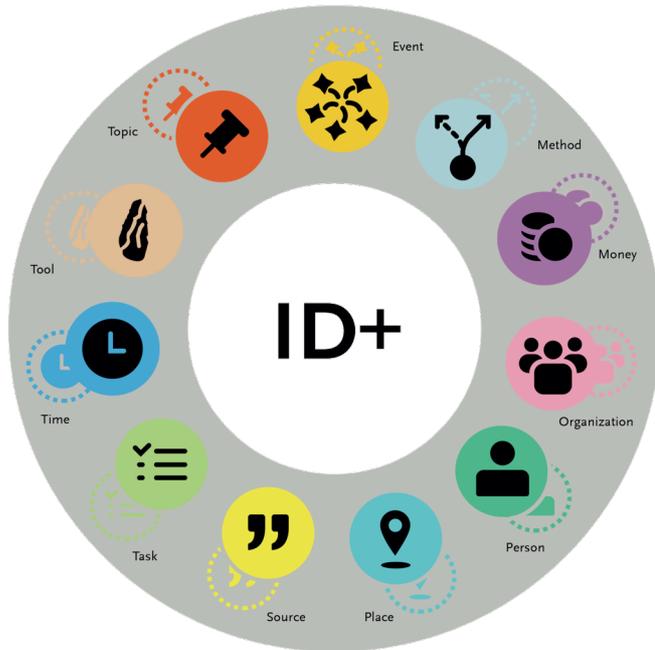


Figure 1: ID+Actors: 11 Classes of Actual and Potential Actors
Anika Schultz | Bild Wissen Gestaltung 2017, CC by 4.0

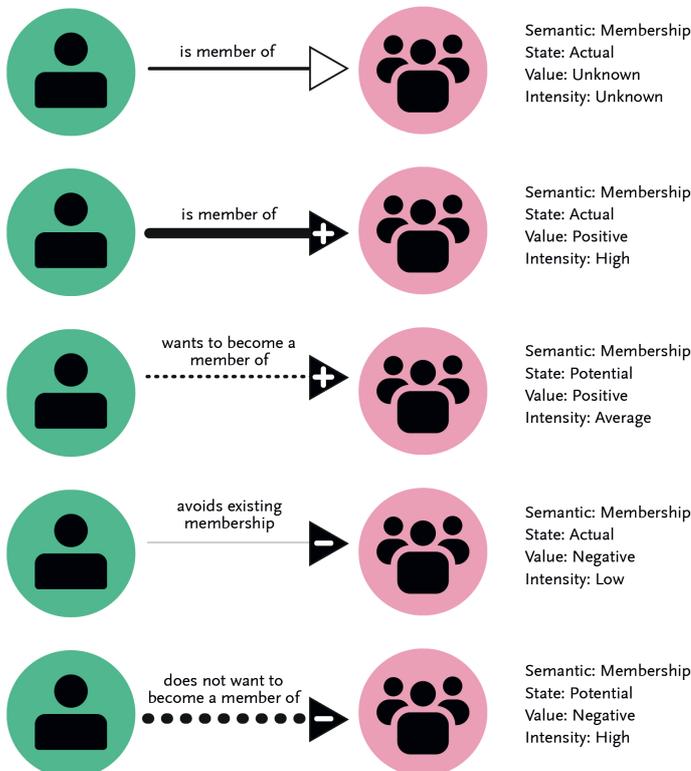


Figure 2: ID+Ties: States - Values - Intensities
Anika Schultz | Bild Wissen Gestaltung 2017, CC by 4.0

The modelling method is formally defined in an OWL ontology, that allows a general usage in the Semantic Web environment. The ontology integrates parts of existing ontologies like Dublin Core, FOAF or CITO and is compatible with common Semantic Web tools for modelling, crawling and visualisation

Usages

The ID+Method is usable for multiple research interests regarding three main fields:

(1) *Digital Scientific Interdisciplinarity Research*: Existing interdisciplinary structures can be modelled to draw an explicit structure of the project development and show the factors that were relevant for the creation of its output. With these modelled structures it becomes possible to evaluate and compare general project setups and progress to detect patterns of successful configurations in interdisciplinary research. This meta perspective allows research organisations, institutes and faculties to get an overview of their activities and optimise their project planning.

(2) *Digital Scientific Project Management*: A more application oriented approach is the self-modelling of a team that currently works with an interdisciplinary approach: They can document the different important situations in their research work. By modelling and visualizing them, they will find possible lacks in the project structure. This relates to all actor classes and derive measures for correction and optimization. Furthermore, possible connections to other projects or actors become visible and might be established. This makes the method a valuable tool to determine crucial factors for scientific project management and planning.

(3) *Digital Scientific Publishing*: The third application relates to the outcome of an interdisciplinary project and contributes to the current debate about Open Science and Open Data. It is argued, that researchers should publish details to how exactly they achieved their results, how experiments were built and integrate raw data and the used algorithms in their publications. The ID+Method addresses this demand from a structural perspective and allows teams not only to publish their results and data, but also the interdisciplinary actor structure that made this work possible. This information is mostly hard to get, but very interesting for other researchers working on similar problems. It also allows for a higher visibility and connectivity of the published results for the publishing authors or teams themselves and therefore contributes to their genuine interest.

First Applications

To use the method, diverse applications have been created that are connected to the habits of different disciplines. It is possible to use the method with analogue model drawing, using printable iconsets. The method is also compatible with digital modelling tools like the Open Source project *Visual Understanding Environment* (VUE). To guide through the modelling process, several questionnaires were developed, especially for beginners, that easily create models step by step for specific purposes like the modelling of a person or a publication. The method has been evaluated and refined in several areas by now. For example, projects in the "Interdisciplinary Laboratory" itself have been modelled and analyzed. Another test field was the workgroup "Two Cultures" within the German Young Academy which uses the method to model the academy itself and also historical interdisciplinary researchers. The interdisciplinary and intercultural master program "Open Design" uses the method for teaching and modelling the interdisciplinary structures of the students. These different usages were essential testings to constantly refine the requirements for an interdisciplinary modelling method.

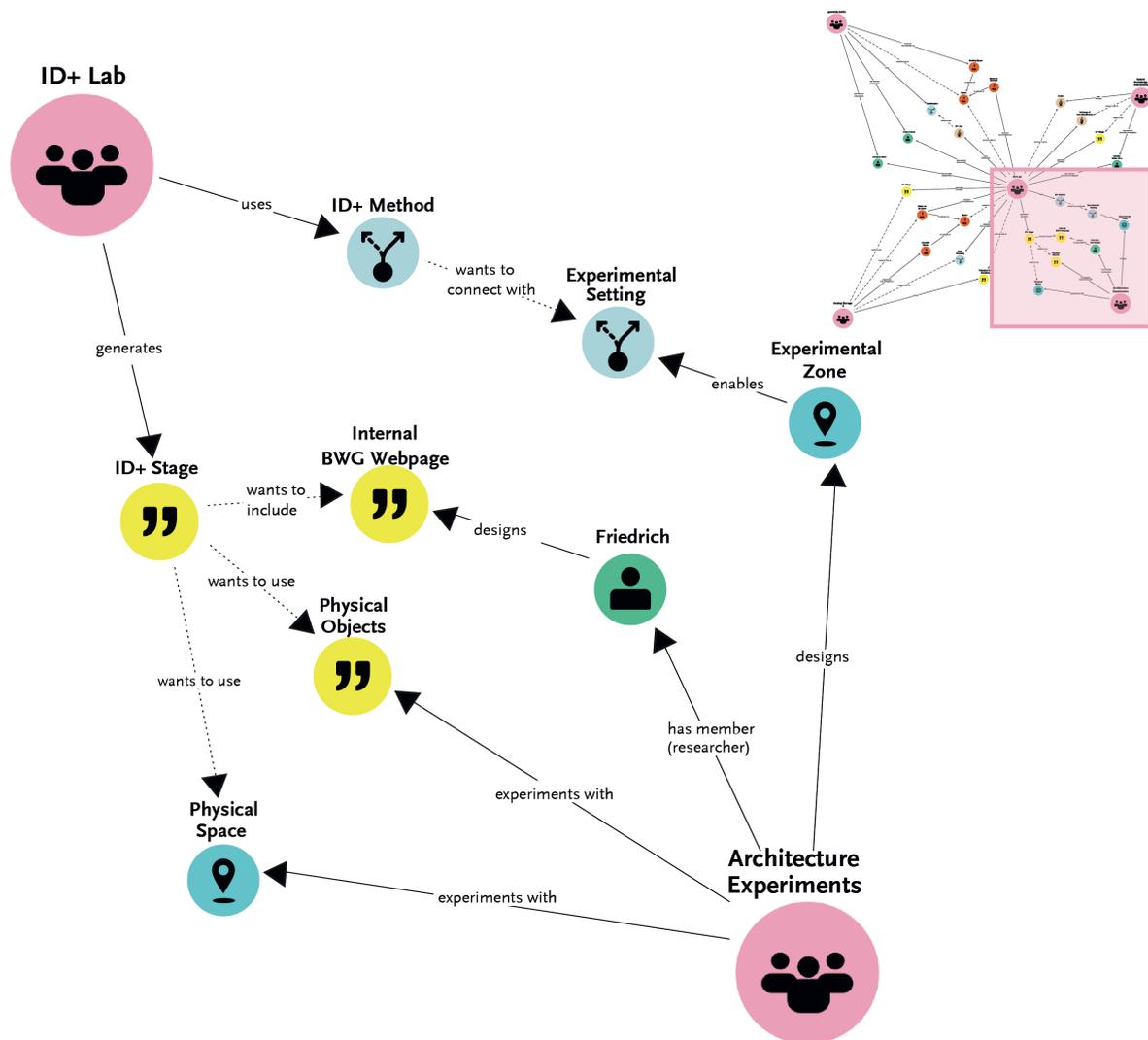


Figure 3: ID+ and VUE: Modelling Project Intersections

Anika Schultz | Bild Wissen Gestaltung 2017, CC by 4.0

ID+App and ID+Stage

To transfer the method into a specific digital application the use case of Digital Scientific Publishing was chosen. Therefore a Web-App has been developed that combines a modelling tool (ID+App) with a publication platform (ID+Stage) that is specialised for interdisciplinary publications. The result of the ID+App is an ID+Publication: it is a combination of the published research document as text, image, video, algorithm, dataset or object with the specific ID+Model of its interdisciplinary context. Published on the ID+Stage, publications are automatically connected through their models among each other. They form a highly connected publication graph that shows connections far more detailed than bibliographic methods can create. The user of the ID+Stage gains the benefit of reaching more potentially relevant material and understanding how it was created. The publishers become more visible, find new connections for their own work and gain a broader reader circle.

One central design challenge for the ID+App development was to give the users a clearly understandable entry point into the modelling process. Although the users can proceed very openly within the software and explore several ways of modelling, nevertheless the software is guiding the user in certain ways, e.g. by using visual hierarchies and arrangements of elements. For the ID+Stage an important aspect was to visualise the network including all actors and their relationships to each other. Legibility had to be guaranteed at different levels, ranging from an overview to detailed and comparative views. Furthermore the visualisations should adapt to individual requirements. ID+App and ID+Stage are in development right now.

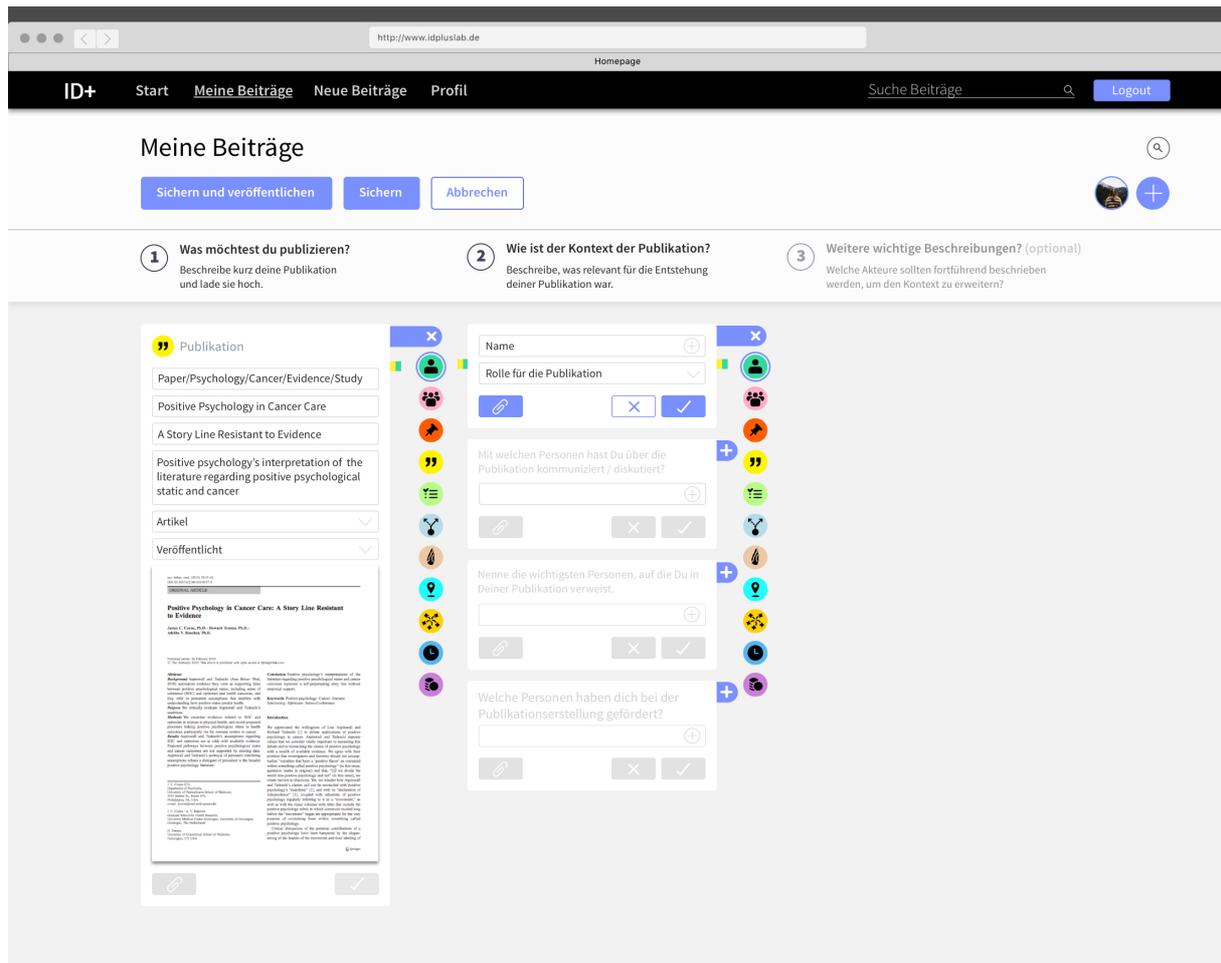


Figure 4: ID+App: The Modelling Tool

Anika Schultz | Bild Wissen Gestaltung 2017, CC by 4.0

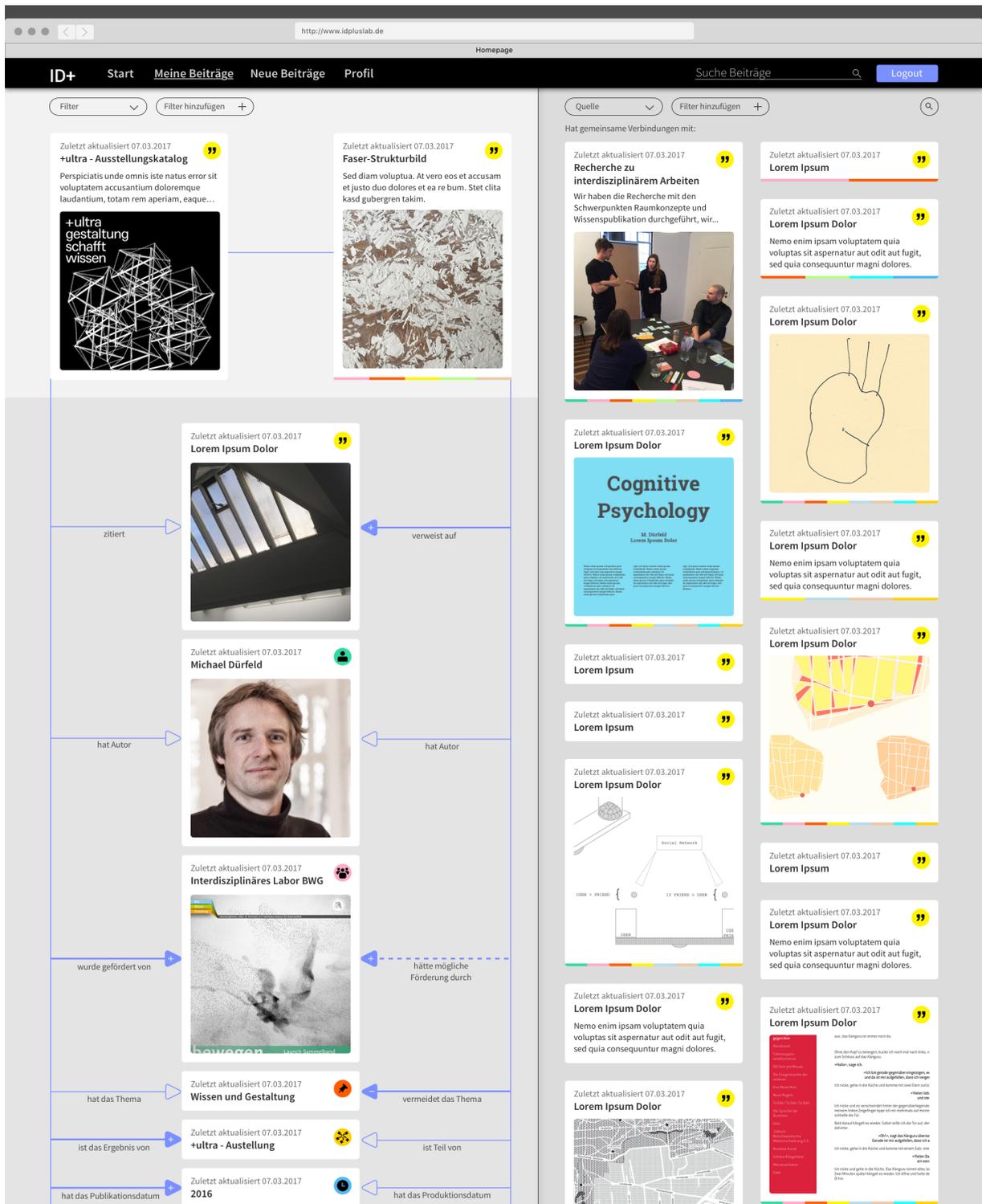


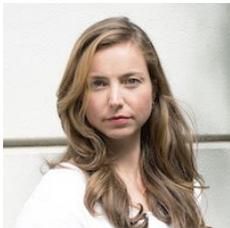
Figure 5: ID+Stage: The Publication Tool
 Anika Schultz | Bild Wissen Gestaltung 2017, CC by 4.0

The project is part of the Interdisciplinary Laboratory *Image Knowledge Gestaltung*, Cluster of Excellence of the Humboldt-Universität zu Berlin, funded by the German Research Foundation, DFG.

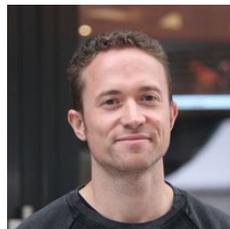
Authors



Michael Dürfeld (Dr.-Ing.) studied Architecture and Urban Planning in Hamburg and Berlin. He earned his doctoral degree from Technische Universität Berlin with the thesis »The Ornamental and the Architectural Form. System-theoretical Irritations« (2007). He is a founding member of »Netzwerk Architekturwissenschaft e.V.« (Network for Architectural Science) and was a practicing architect and research fellow in Santiago de Chile. Michael Dürfeld started his own business with an »Office for Architectural Theory Services« in Berlin. Since 2012 he is a research associate at the Cluster of Excellence "Image Knowledge Gestaltung. An Interdisciplinary Laboratory". In 2013, he was a guest professor in the interdisciplinary study program "Diversity of Knowledge" at Humboldt-Universität zu Berlin. Since 2015 he is a lecturer in the international and interdisciplinary master program „Open Design" at Humboldt-Universität zu Berlin and Universidad de Buenos Aires. Furthermore and since 2016, he is working in the management of the priority area „Architectures of Knowledge“ at the Cluster of Excellence.



Anika Schultz (Dipl.- Des.) studied Product Design at Berlin Weissensee School of Art and majored in Interaction Design. Her diploma thesis explored the visualisation of online searching and finding processes. After a period as a freelancer in Madrid, she worked as a designer at a Berlin digital agency. In April 2015 she started as a freelance researcher in the Interdisciplinary Laboratory and since 2016 she is research assistant at the cluster. Anika Schultz works in the project »Em•pa•thy«, where she is collaborating on the development of a patient-oriented application which supports patients in taking responsibility for informed actions. Within the project »ID+Lab«, she is designing a digital publication platform and a tool for modelling interdisciplinary collaboration. Furthermore she is member of the project „gamelab.berlin“ and works in several projects as a designer. Her research fields are Digital Health Care, Communication Processes, Visual Data Organisation and Tangible Interaction.



Christian Stein (Dr. phil.) was born 1981 in Gifhorn, Germany. He studied literary studies, linguistics and informatics at the Technical University Braunschweig. From 2009 to 2012 Christian Stein did his doctorate on „Primacy of Language - Leitmotif and Topology of the Subject in Arno Schmidt“, supervised by Prof. Stauf. At the same time, he worked on topics as terminology's management and models of foreign language, bridging the areas linguistics, informatics and engineering. Modeling language and knowledge in interdisciplinary contexts turned out to be determining for his further engagement. Since 2012 he is pursuing his academic interests and researching with the Humboldt-Universität zu Berlin at the Interdisciplinary Laboratory Image Knowledge Gestaltung in the priority area „Knowledges of Architecture“. Key subjects in his work are semantic networks, modeling interdisciplinary, spacial theory and an epistemology of interdisciplinarity.

Other current Project Members

Wolfgang Schäffner (Prof. Dr.) Historian of science and media technologies, Co-Director of the Cluster of Excellence *Image Knowledge Gestaltung. An Interdisciplinary Laboratory* at Humboldt-Universität zu Berlin.

Benjamin Thomack (Dipl.Ing.) Software developer. His diploma thesis had the design of an open standard for mobile flyers in location based services and their implementation based on Android.

Joshua Pacheco (Bsc. Des.) began pursuing a degree in Psychology at the Eberhard Karls Universität in Tübingen in October of 2013. He transferred to the Interface Design programme at the University of Applied Sciences Potsdam in October 2015.