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KEYNOTE ADDRESS 1

DIGITAL DESIGN REALITIES AND FUTURES
Educating Architectural Scientists

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Abstract
In the recent years, qualitative developments in the architectural profession are affecting substantively all facets of design praxis. The way how professional relationships, construction techniques, buildings- materials, design instruments and ways of working are changing is often faster than an educational system can react to. Hereby digital instruments are often the driving forces that facilitate change in praxis and the understanding of architectural education. Computational instruments are by far no longer basic recording and drawing media but progressive partner in design that allow the power of computational logic to be applied to design. The evolution of contemporary digital architecture facilitated by complex software and mostly online networked communications as well as data mining capabilities are among several technological and cultural developments that are driving architectural education to novel directions.

Keywords: *Thermal Comfort, Outdoor, Urban Form, Education, Learning*

Paradigm Shift

The digital technologies have already moved beyond CAD, such as, Building Information Modelling (BIM), parametric design, and digital fabrication. These methodologies have fundamentally altered the how and what of architectural design, especially in the professional context. Both, the 'how' of how we do, and the 'what' of what we do has changed. The way we make architecture has been transformed by the digital instruments, processes and methodologies. How the architectural education evolves to reflect, interpret, translate, or challenge the modes of contemporary practice presents a variety of opportunities as well as risks to 'digital scholars' and 'digital practitioners'. The possibilities afforded by BIM and parametric technologies have directly affected not only 'what' we make with them but at the same time also 'how' we educate architects. Integrating BIM into the way students are educated does subsequently shift the thinking about the generation and definition of architecture, design, its communication and the context it is placed in. New definitions have been developed, not based on the abstract theories or assumptions of the past, but instead on emergent data based in systems of simulation and information management. As the conventions of communication and representation of the past were determinant factors in those architectures the new conventions have proposed new architectures that we can see worldwide. The design studio or architectural praxis that embraces these new conventions in the age of growing computational design sophistication will transform the architectural design product as much as the architectural design process. This model for a comprehensive design praxis examines the relationship between the scale of design and the scale of representation and how this relationship undermines the primacy of abstract representation in architectural design. The future of architectural production and representation in practice and concept is at a crossroads between parametric modelling and BIM as the profession moves beyond traditional practice and its drawing-centric model into a dynamic process/component oriented model of digital practices and the subsequent re-definition of professional services and contractual deliverables.

A computational based architectural design praxis won't take the design of a building as destination but begin with a data-model of one already designed, or that would define a building. The design process has to deal with multi-dimensional logistical planning for construction and staged building processes as well as detailed investigations or analyses of structural, electrical or mechanical systems in consultation and so on. Hereby the network with allied disciplines or consultants is crucial to allow architects to engage in a larger environment of data, people and issues that the digital realm offers to access. Fabrication of building elements, its various systems at 1:1 scale from CNC-processes is hereby one conceptual vehicle for the pedagogical lessons. The computational applications allow a far more detailed simulation and actual construction of the design that conventional studios cannot engage in. The possibility of starting with a data of a building rather than ending with building data has fundamentally changed design pedagogy and opened new possibilities for students in the architectural education.

Digitally Driven Process as Design Partner

The possibility of starting with building rather than ending with building might radically reposition curricular goals, concepts and knowledge in the design studio. The design studio must now reflect new ways of teaching and addressing emergent digital design methods and processes, and critically evaluate their effects and possibilities in architectural production.

Still, it seems necessary to acknowledge that the subject areas must move beyond acting as end users of commercially available software in order that architectural praxis and education as well as all stakeholders from students to teachers, to professionals and end-users have to be engaged substantively in shaping the direction of digital design, its instruments and technologies. Students are impoverished by the blind use of the technology, such as by not exercising the three-dimensional thinking skills of descriptive geometry, unless their engagement goes beyond a superficial level. Here too, the means to that engagement may vary widely. In all cases, some deeper reflection on the nature of computation processes, such as might even be afforded by considering how a calculator works, may provide a much needed foundation over the sometimes superficial, gratuitous and flashy use of that technology. The ultimate condemnation of digital design media is for it to be perceived as a representational device, simply and solely. That it is seen in that way is itself a condemnation of the teaching of digital design.

Social Intelligence

In the above context there is a need for researchers, educators, and professionals to interact efficiently and effectively. However, this is not always possible due to the different knowledge background or complexity of the matter. In recent years, online interactions, multimedia, mobile computing and face-to-face interactions create blended design environments to which some universities or professional have reacted. Social networks, as instruments for knowledge sharing, have provided a potentially fruitful operative base in architecture. These technologies transfer communication, leadership, democratic interaction, teamwork, social engagement and responsibility away from the instructors to the participants. Implementing responsive interactions can move design beyond its conventional realm and enables stakeholders to develop architectural knowledge that is embedded into a community experts with their expertise both online and offline.

Readily available as well as emerging technologies offers users from various disciplines to tap into knowledge and share their ideas. Virtual and augmented realties are employed more readily and such systems provide increased potentials to compensate for other issues that are typically hidden with in conventional representations. For example, by employing an intelligent multi-dimensional model of a building environment, it is possible to explore the influence that environment form micro to macro scales. The results are interactively presented in media that allows architects, planners and stakeholder to make informed decisions on the impact of their design.

Yet it is not as simple as using another tool; parametric designing fundamentally shifts the engagement with the design problem. Parametric designing allows architects to be substantially deeper involved in the overall design and development process extending it effectively beyond production and lifecycle. Leaning parametric design strategies enhance architects' critical engagement with their designs and their communication. Subsequently, the computational aid of parametric modelling alters substantially how and what students learn and architects practice.

While problem-based communication becomes an iterative and reflexive process these current ways of interaction have pedagogical implications that are empowering learners to collaborate and communicate differently by integrating a variety of skills, knowledge and social environments with a rich learning experience. There is a need for educators react proactively to these possibilities of design activities and their digital instruments to allow learners to understand complex dependencies and engage in interprofessional collaboration right from the start. In developing learning opportunities and curricula designer are offered novel opportunities to extend their contribution beyond subject specific problems.

Using media-rich and social platforms allow us to reframe our problems and subsequently the ways in which these problems can be explored in learning activities. They are much more effective at tapping into social capital; thus the process is less dependent on the teacher's formulation of the problem as it becomes possible to embrace global professional and interprofessional social communities and achieve higher levels of collective and social intelligence.

Architectural Scientists

The consequences of digitally driven processes and thinking on architectural education will be profound. The underlying premise for design processes, fabrication and construction will increasingly challenge the historic relationships between architecture and its means of production leading to new demands of the profession on education to adapt and prepare students for digitally enabled Integrated Practice. Academia must completely revisit the curricula and imagine a system that acknowledges the obsolescence of the how and what of that which is taught in today's schools of architecture. Digital design realities already have shifted thinking that calls large segments of contemporary architectural education into question and engages in aspects of science that co-design our built environment.

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KEYNOTE ADDRESS 2

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Summary

Prof. Juergen Reichardt, MSA Muenster School of Architecture, director of RMA architects Essen, Germany, and BRAE architects and engineers, Bangalore, India, has been engaged in various fields of research in programming techniques, digital driven holistic planning energy and ecology efficiency, comprising analysed and executed projects from domestical to complex industrial architectural structures. Following are rough outlines for research in passive houses, contribution to Solar Decathlon competition 2011, GENEering™ programming and SYNFAP® integrated design techniques, moreover TRILOKA international academic university collaboration and student exchange idea.

1. According official 2013 statistical government database 28% of overall german energy demand is caused by private domestical households, 69% of that share is due to mainly winter heating demands. A new European energy strategy tries to cut down these heating demands dramatically. The term **passive house** (Passivhaus in German) refers to a rigorous, voluntary standard for energy efficiency, resulting in ultra low energy demands for heating and cooling, reducing ecological footprint as well. The standard is not only constricted to residential properties; several office buildings, schools, kindergardens and even supermarkets have also been constructed to this standard. Passive design is not an attachment or supplement to architectural design, but a design process that is integrated with architectural design. Although it is mostly applied to new buildings, it has also been widely used for refurbishments. Estimates of the number of passive house projects erected around the world as as late 2014 range from 25,000 to 30,000 structures. The vast majority of passive structures have been built in German-speaking countries and Scandinavia.There was also other previous experience with low-energy building standards, notably the German "Niedrigenergiehaus" (low-energy house) standard, as well as from buildings constructed to the demanding energy codes of Sweden