

Examiner's Report on Doctoral Dissertation by Marie Davidova: Wood as a Primary Medium to Eco-Systemic Performance: A Case Study in Systemic Approach to Architectural Performance

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The dissertation covers exploration of 'responsive wood' field that is, in comparison to other, usually basic, research in this area, the closest one to architectural and urban design practice. As opposed to contemporary work by other authors focusing on ply-wood and laminates, this 'Research by Design' is focused on traditional techniques of the performance of solid wood cut in tangential section. This is reasoned by presented LCA analysis arguing for its greater sustainability. While the other authors argue for better programmability of ply-wood, this research brought these answers for solid wood solution through material science literature and hands on investigations.

This rich work is crucial for its acquisitions in three main categories: methodology, material science and architectural and urban design. This article based thesis is well structured, making these categories clear in chapters and concluding part. The whole structure is covered as such:

After the introducing part that is defining the work's position in the field, the thesis chronologically positions the research by design prototypes into the broader perspective of other research in the field of responsive wood. It is concluding with the LCA comparison of solid wood and ply-wood model of one of the prototypes, modelled for the Czech Republic's environment. The results clearly argue for the use of solid wood.

The methodology chapter is examining approaches and development of involved processes and methodologies within the project. This covers Systems Oriented Design, Research by Design through full-scale prototyping, as well as transdisciplinarity of the work. The concluding subchapter called 'Systemic Approach to Architectural Performance: The Media Mix in Creative Design Process' discusses and introduces visions for merging digital design tools with prototyping and prototypes observations, while handling different interrelated large amount of data as a designer in relation to GIGA-mapping for 'co-design' and 'Time Based Design'. The core of this chapter is the fusion of the actors, design-research processes and the design results themselves, serving as prototypes of larger project.

The chapter on material is a deep investigation into forestry, wood material science and its weathering. It is explaining the reason why pine wood was selected for the project based on forests eco-systems and its material properties. The chapter is richly referenced with other research and craftsmen's interviewing as well as hands on experimentations of its own. The core of this chapter are its acquisitions in wood's responsive material properties and its relation to other biological organisms, especially algae.

The chapter focused on prototyping is the most down to earth part of the thesis, discussing research's first speculations, different struggles faced when prototyping and what has been proven, dismissed or discovered through prototypes observations in time. The chapter introduces two main projects subchapters Environmental Summer Pavilions and Ray, each of them covered by two full-scale prototypes. All of these prototypes are interlinked, one informing the other during the design-research process. The chapter proves that architectural design-research cannot rely on digital simulations, that are far too little complex to simulate the real world. Therefore, the core of this chapter is the exposition of the prototypes within natural environment and in the case of the pavilions within public space. The research includes study on the prototypes' environmental interaction, including the interaction with social systems. Therefore, it examines the performative properties not only of relative humidity and temperature, but also of the beauty of the prototypes.

The chapter of the research's application is taking its role in biotic and abiotic environmental perspective in reference to climate change in studied location, the Czech Republic. It places the research case study into larger context of different options of semi-interior boundary conditions researched on traditional architecture in Norway, the location of climate extremes. It is arguing for relevance of this application in practice that is exemplified on Responsive Transformer project. It discusses the work's performance and the opportunistic use it generates across the social and biotic systems. The core of this chapter is its exposition relevance and solution of today application of responsive wood research into architectural practice. It is a unique acquisition within the, otherwise mainly basic research focused, field.

The closing chapter presents the summary of research's rich acquisitions within the structured areas of methodology, material research, and architectural and urban design. It also speculates and interprets its outcomes in architectural and urban design practice and research. It is concluding with a new design field called Systemic Approach to Architectural Performance that has been further on defined by the candidate as such:

'SAAP is fusion of process-based fields formally initiated by integration of **Systems Oriented Design** and **Performance Oriented Architecture**. It develops methodology and generates theory through experimental practice. SAAP involves **Time Based Eco-Systemic Co-Design** that is performed by both **biotic** and **abiotic** agents, including **humans**.'

The concluding chapter is clearly structured, defining the design-research's unique trans-disciplinary acquisitions, interpretations and further speculations. The conclusion of it is clear, hitting wider scope of environmental, social and design issues than the original research field of responsive wood or even Performance Oriented Architecture and Systems Oriented Design. This seems to be very relevant, as the introduction chapter justifies this rich and multi-layered form of the thesis through critique of reductionist approach within design-research. It is a clear concept of 'Research by Design' to hit complex relations of the real world within the researched field and it is the main strength of this thesis.

As a practising architect, I must conclude, that the work is ferly relevant for contemporary architectural and urban design practice. The core of it is the trans-disciplinary solution for practice application, both within the architecture and built environment as well as within the architectural practice design processes and management. In the time of climate change, we need to seek for sustainable solutions within the one of the most energy demanding field with a large impact at both, micro- and macro- climate. This project is proposing such solutions, arguing that the building industry and building law has to shift from energy consuming ventilations and insulations. The work addresses only primary energy resources for its performance of climate, habitual and social moderation. It is proposing 'non-anthropocentric' approach of co-living of humans with the rest of the eco-system. Therefore, the work takes crucial part in fight for biodiversity and climate change adaptation. The work also claims to generate theory through experimental practice. This seems to be true and relevant especially for practitioners, seeing it combined with experimental design proposals and reality check through full-scale prototyping. My closing conclusion is that the work is alarmingly relevant for future development. **I therefore propose to accept the submitted thesis with honours.**

Yours truly,

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