

CONCEPT DESIGN TOOL REQUIREMENTS

Developing a Framework for Concept Design Tool Specifications

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1. RESEARCH RESULTS TO USABLE TOOLS

Early design phases generate high project value with relatively little effort (CURT 2004, p. 4). However, digital tools supporting integrated concept design at a high knowledge level are scarce. Research has focused on specific aspects of design tools yielding focused and disjoint insights. An actionable requirements framework will allow assembly of research results into a meaningful, comprehensive concept design tool set and will reveal gaps which will help identify further research opportunities. Some collected research results may suffice as pieces of the developing tool set, others may have to be developed into functional software. For any such design tool set to be meaningful it needs to be usable by designers, a very important requirement which is, therefore, integral part of the framework.

2. METHODOLOGY

For the initial phase of this effort, proceedings of relevant industry and academic conferences provide an overview of the current domain discourse and major trajectories in it. There are known limitations: (1) for a more complete review of research it will be necessary to draw on additional sources; (2) this poster is expected to be a starting point for discussion; (3) this effort remains by definition incomplete.

3. DOMAIN FRAMEWORK FOR DESIGN TOOL REQUIREMENTS

The framework organizes the domain along three axes: “disciplines” including building performance (Kolarevic and Malkawi 2005), whole lifecycle design (Kohler et al. 1997), multi-objective design optimization (Flager et al. 2008); “project lifecycle” (NIBS 2007, p. 133); and “practice models and technology” like Integrated Project Delivery, Building Information Models (Eastman et al. 2008), parametric models (Akin et al. 2004), or cognitive agents (Peng and Gero, 2006). Other organizational axes are conceivable, however, could be covered implicitly within tools. Initial focus is provided by limitation in disciplines to architectural design and in project lifecycle to early project phases. In its third dimension this research aims at moving the ceiling as high as possible.

4. USABILITY OF DESIGN TOOLS AS FORTH AXIS

Based on Berente et al. (2008, p. 5), workshop discussions about affordances in concept tools, and less formalized user perspectives, a tentative list of usability requirements includes: ease of use, modeling and visualization capabilities, multiplicity, flexibility of interface and representation modes, extensibility, simultaneity, environment representation, domain semantics with coherence, entity identity, traceable entity linkages, abstract objects, diagram support, history, (re)generativity for reconstructive model understanding. These usability requirements establish a forth axis which is due to the nature of the tools and not necessarily inherent in the domain.

5. FUTURE RESEARCH

Continuation of this research will be translation of requirements into tool specifications, evaluation of existing tools, and conclusions about future research and development directions.

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