

## “Virtual Design Studio”—Part 1: Interdisciplinary design processes

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### Abstract

The “Virtual Design Studio (VDS)” is a software platform currently under development in support of an integrated, coordinated and optimized design of buildings and their energy and environmental systems. It is intended to assist collaborating architects, engineers and project management team members throughout from the early phases to the detailed building design development. The platform helps to facilitate the workflow and the processing of information in combination with appropriate, task-based performance simulation tools as further analyzed in Part 2 of this study (DOI: 10.1007/s12273-013-0111-1). The present paper summarizes how VDS relates to the building design process and its typical project stages, performance-based design considerations and respective performance optimization strategies. It outlines the methodology and scope for the organization, implementation and respective requirements for the VDS platform development based on the interdisciplinary design needs. Part 2 will present the methodology for the systems integration and software implementation of VDS.

### Keywords

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### 1 Introduction

The Austrian philosopher “Ivan Illich argued that the modern era of technology, characterized by tools, instrumentality, and function, gave way in the late twentieth century to the age of systems, characterized by complex configurations, self-organization, and emergence. This shift indicates the careful separation of design intention from means of construction codified in architectural contracts as well as the need-finding, problem-solving conventions of engineering practice. The shift from tools to systems heralds the emergence of complex performance problems—active glass walls and self-powered buildings—that demand hybrid responses. New practices are emerging from partnerships of architects, engineers, and others that blur disciplinary boundaries and advance new techniques in design and construction. [...] Ecological, economic, and professional realities demand alternative models.”

This quote from the ACSA (Association of Collegiate

Schools of Architecture) 2011 Conference on “Performative practices: Architecture and engineering in the twenty-first century” (ACSA 2011) describes objectives that are very similar to ours for the development of an integrated Computer Simulation Environment for Performance-Based Design of very low energy and high IEQ (indoor environmental quality) buildings. The development of an interdisciplinary design and simulation platform is hereby intended to address the above mentioned issues, the required flexibility and the application of a Holistic Systems Thinking.

Buildings designed and constructed using a performance-based energy and IEQ design process that optimizes the interaction between the building envelope and HVAC (heating, ventilation, and air conditioning) systems, among other design aspects, can save significant energy costs yet providing better indoor climate and air quality. These buildings can be constructed for the same or nearly the