

# KEYNOTE: INNOVATION AND FUTURE TECHNOLOGIES IN ARCHITECTURE: THE ROLE OF BUILDING PERFORMANCE RESEARCH



## Abstract

For centuries, architects have been driven in their designs by a combination of passion and instinct, honed by decades of apprenticeship and practice. In today's rapidly changing practice and the built environment, this may no longer satisfy heterogeneous design goals and criteria. An alternative path for the architect of the future is research-based design.

Architectural designers are currently faced with many challenges—technological changes, environmental and economic impacts, necessity to innovate and raise the bar in building performance, and the paradigm shift in architecture with the wider adoption of advanced computational design and digital fabrication techniques. There are a number of reasons why progressive practices must continuously invest in scientific research and implementation of advanced technologies, but the need to improve design processes and services is typically the overarching drive. Thus, building performance research is becoming an essential component of contemporary practice and will be redefining the future of the architectural profession.

This presentation focuses on innovations in architecture, relationships between scientific research and design, and the role of building performance research. It is based on Dr. Akšamija's book, "Integrating Innovation in Architecture: Design, Methods and Technology for Progressive Research and Practice" (John Wiley & Sons, 2016). The presentation will discuss why it is necessary to embrace technological changes to improve design processes, products and services, as well as the recent developments in building technologies, materials, computational design, and integration of scientific research with innovative design. Several research projects will be discussed to illustrate relationships between design, technology, and applications of architectural research in practice—including advanced materials/computation/performance-based design and digital fabrication, smart facade systems for generating heating/cooling and electricity, and regenerative buildings.

The last part of the presentation will introduce Dr. Akšamija's forthcoming book, "Research Methods for the Architectural Profession" (Routledge, 2021). The book introduces research as a systematic process, describes how to formulate research questions, provides an in-depth explanation of different research methods (qualitative, quantitative, and experimental), and explains how to select appropriate research methods and execute research studies. Most importantly, it provides guidelines for integrating research into the profession, and uses extensive case studies and practice-relevant examples to illustrate main concepts, procedures, and applications. Integrating research into practice is essential for developing new knowledge, solving design and technical problems, overcoming different types of challenges present in contemporary professions, and improving the design outcomes. Innovation requires a much stronger correlation between research and design, and it is pertinent for the future of architectural practice that research becomes an integral part of the profession.

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**Ajla Akšamija, PhD, LEED AP BD+C, CDT**, is an Associate Professor at the University of Massachusetts Amherst and Building Technology Researcher/Associate at Perkins and Will. Her research expertise includes building science, high-performance buildings, emerging building technologies, digital design and representations, and innovations in architecture.

Dr. Akšamija directed Perkins and Will Building Technology Laboratory ("Tech Lab"), one of the first practice-driven research laboratories focusing on advanced building technologies, high-performance buildings, and computational design. She has worked on developing building analysis and modeling applications, implementation of novel materials in architectural design, and development of new building technologies. Her extensive professional experience includes healthcare facilities, academic buildings, schools, commercial buildings, and mixed-use buildings.

Her most recent book, "Integrating Innovation in Architecture: Design, Methods and Technology for Progressive Practice and Research," was published by John Wiley & Sons in 2016. She also authored "Sustainable Facades: Design Methods for High-Performance Building Envelopes" (John Wiley & Sons, 2013). Dr. Akšamija has contributed to several other books and has published over 70 research articles and invited papers. She has presented at various national and international conferences and is a frequent speaker at industry-based, scientific one of the first peer-reviewed research journals coming from the design industry. Her upcoming book, "Research Methods for the Architectural Profession," will be published in early 2021 by Routledge.