



# Revolutionizing Architecture Through AI-Driven Designs: Unveiling Advantages And Challenges

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## Abstract:

2023, Time changed, people's working outlooks changed. They do not want to put in hours of work which can be done effortlessly by using new technologies. This new technology is AI i.e. Artificial Intelligence. Artificial Intelligence (AI) has arisen as a transformative strength in various industries, including architecture. This topic emphasizes the transformation occurring in architecture due to AI-driven design processes. It will also highlight the impact of operating AI technologies in architectural design approaches, examining how these innovations influence creativity, efficiency, sustainability, and its potential challenges.

Keywords: Artificial Intelligence, Architecture, AI-driven design, Innovations, Challenges

## Introduction:

Time is changing; we are evolving, binding ourselves with different technologies to make a faster and better future. We do not want to spend hours on a topic that can be done effortlessly. And for these faster and better outcomes, the technology that is overtaking every other traditional process is Artificial Intelligence (AI). Now the question arises:

What is Artificial Intelligence (AI)? Why there's a hype of AI in today's date? What is its involvement in architecture? How has this new technology evolved architectural designs? What are the tools needed for this transformation?

The answers to all these questions are:

In this 21st century, Artificial intelligence is the most popular domain analysis (1). It refers to the evolution of computer systems capable of performing tasks that require human intelligence. It involves creating strategies and algorithms that foster machines to imitate human intelligence. It includes visual perception, speech recognition, decision-making, language translation, and problem-solving. According to Dombrovsky Vasyl, AI could be portrayed as an "intelligent agent": a machine that perceives its conditions and takes measures that maximize the success probability of its goals. Diverse fields like marketing, engineering, economy, medicine etc. approaches AI as an influencing strength for their creative work. One may claim that AI is a tool for any field to redefine itself. Architecture is the field which is accountable for creating all built environments. It needs to extract potential assets to enhance it, and technology is one of them. Architecture evolves by the developments in AI technologies (1). As Gropius W. (1970) mentioned in his book Scope of Total Architecture, that fine architecture should be a projection of life itself that indicates an intimate knowledge of social, biological, artistic and technical problems. And according to this statement, it becomes easy to say that architecture is a complex practice which needs to consider diverse factors. Because of the complexity of architecture, it has become a better platform for the experimentation of AI. From BIM software

to advanced visual techniques, architecture and AI partnerships, affecting the present and future of designing. According to Steenson (2018), the assistance of AI in architecture can emerge in distinct elements. Firstly, AI provides architecture with speed and an immense amount of data to create analytical details that significantly influence findings at different design phases. Secondly, CAD's algorithmic or parametric design can generate forms that could not exist without computation. There are several AI-driven designing software used in architecture. That leverages AI to assist architects and designers in various aspects of the design process. Some of the software works standalone, but some in advanced software as plugins. If we talk about plugins, the first that comes to the list is **Dynamo** (Fig1), used for Revit software that allows users to operate Virtual Programming to process data and organise custom algorithms (5). Next is **Grasshopper** (Fig 3 & 4) works under Rhinoceros, used in diverse scales and factors of design. Schneider (2011) used Grasshopper for the urban design proposal development. Next is **Project Discover**, an application of generative design used for space planning (7). Another is **DANIEL**, an automatic analysis and retrieval of building floor plans for deep architecture (8).



Figure 1: Elevation design created using Dynamo

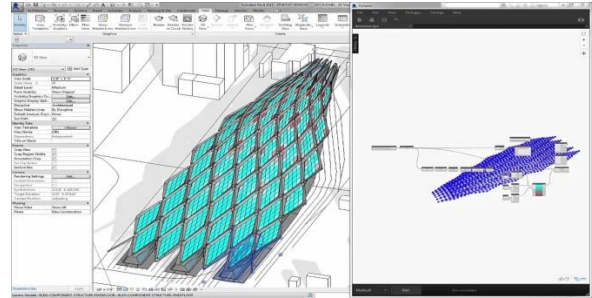


Figure 2: Dynamo; manipulating data parameters in Revit



Figure 3 and 4: Rendered images of Grasshopper

### Result and Discussion:

We researched and concluded various AI software like Grasshopper, BIM, Dynamo and many more, which help Architects deal with complexities. But do architects think of AI as the only solution? Because everything that has advantages comes with some disadvantages too.

So, I took a survey of some architects and non-architects (engineers) for the understanding of AI and AI-driven designs

In this survey, there were 78.6% Architects and 21.4% Non-architects (Figure 5), from which 85.7% had 1- 5 years of experience and 14.3% had above 10 years of experience (Figure 6) and all were aware of AI.

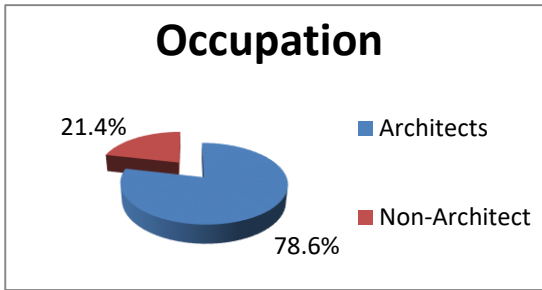


Figure 5

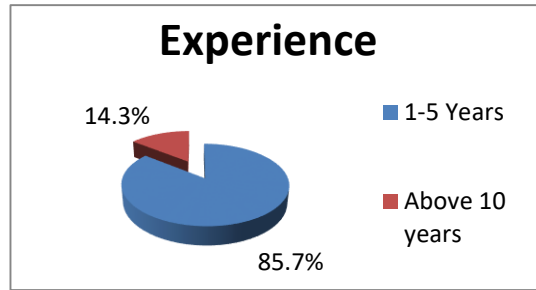


Figure 6

92.9% of people were aware of AI tools used for designing (Figure 7). All 100% people believed AI has the potential to impact the architectural designs.

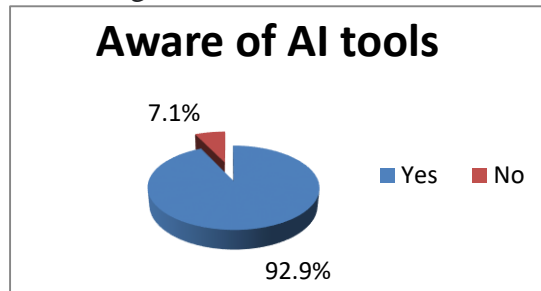


Figure 7

But 14.3% of people don't think AI impact creativity and innovation (Figure 8). All of them thought AI aid in rapid creation of complex architectural design and model. 85.7% of people think AI facilitate faster and more accurate site analysis for architects (Figure 9).

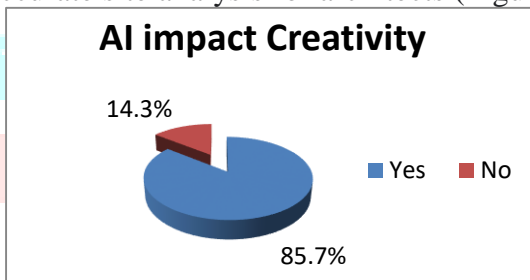


Figure 8

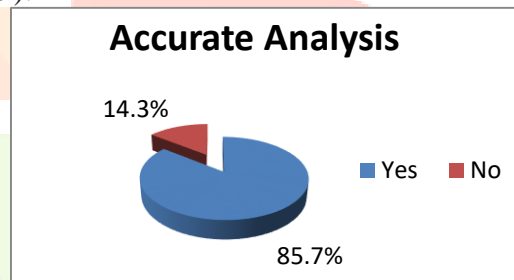


Figure 9

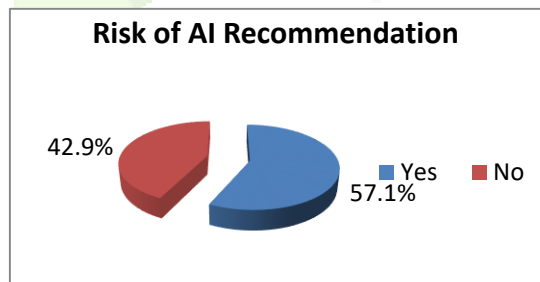


Figure 10

57.1% of people think there's risk of AI generated recommendations regarding practical feasibility (Figure 10). Half of the people think AI reduces the need of human creativity and intuition in design process. 71.4% of people think there's risk of over dependence on AI tools leading to declining traditional designing skills (Figure 11). Half of the people think AI limit the exploration of unconventional design ideas due to reliance on existing data and

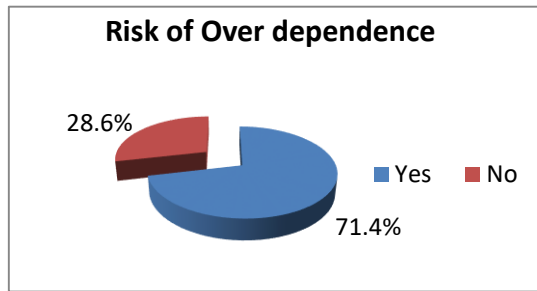


Figure 11

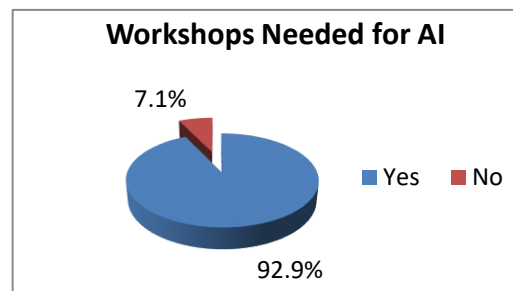


Figure 12

92.9% of people think there is a need for more educational programs and workshops focused on AI (Figure 12).

So, from this survey, we can conclude that people are becoming aware of AI and AI-driven tools for designing, think AI has the potential to impact designs, creativity and innovation, and help create rapid complex designs and models. I believe AI is very helpful in designing but only to an extent as it's making us weak, as it reduces the need for human creativity and intuition in the design process and a decline in traditional design skills because of our over-dependence. At a point, human designing becomes more beneficial as compared to AI. And one should use AI in those circumstances where human is not capable of doing stuff.

#### Conclusion:

Slowly and gradually, AI will become part of the design process. It's advantageous in designing and detailing but only to a magnitude. At a point, human designing becomes more beneficial as compared to AI. Undoubtedly, AI elevates designs to another level and has quite good potential but one should use AI in those circumstances where human is not capable of doing something but the basic design should be handled by humans.

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