Smart Materials for Modern Facades: An AI-Powered Selection Process

N Amer[1] ,G Nagy[2]

[1] Architectural graduate student, the British University in Egypt, Cairo, Egypt.
[2] Professor of Architecture, the British University in Egypt, Cairo, Egypt.
nour193274@bue.edu.eg ; gehan.nagy@bue.edu.eg

Abstract. According to the mid-21st century's technological advancements, artificial intelligence has gained popularity as a transformative tool due to its immense integration in the evolving field of architecture. Evidently, it is being used in the building skin design to enhance the energy efficiency and to reduce the continuously rising energy waste and consumption problem in office buildings. Despite AI's immense advancements, it lacks sufficient data with regards to the turf of smart skin design in office building for energy optimisation. Hence, this research aims to develop a framework for the optimal integration of artificial intelligence in the selection process of smart materials for energy efficient design for office buildings' skin. To reach this aim, a mixed-method approach using quantitative and qualitative analysis will be implemented. First, theoretical research utilising archives and case study analysis is conducted to determine the various applications of AI in architecture, the components of a smart office building skin focusing on smart materials, the definition of energy efficiency and its measurement tools and the miscellaneous AI tools that are inaugurated to design an office building skin. As a result, a framework will be created by integrating the optimal AI tools in the selection process of smart materials for energy efficient smart skin design. Second, the applied studies are performed using empirical and experimental analysis to test and support the framework through case study analysis and comparison to test the framework obtained from the literature review aiming to cover the gap identified in the selection process of the materials.