# BIM in Kenyan Construction Industry: Benefits, Challenges, and Adoption Processes in Sustainable Construction Projects

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***Abstract*— The construction industry converts a wide range of resources into economic, social, and environmental infrastructure. Kenya's construction industry is emerging as a primary engine of economic expansion, accounting for 7% of the country's gross domestic product. Building Information Modeling (BIM) has become a nascent technology and method in the construction sector of Kenya. Globally, the construction sector is transitioning from conventional CAD to BIM. BIM adoption is accelerating globally, fueled by large private and public sector owners seeking to institutionalize its benefits. Consequently, it is important to know the challenges to BIM adoption and the processes of delivering BIM in the construction industry of Kenya. This study aims to examine the benefits of using BIM, determine its barriers, and formulate the processes for enhancing BIM adoption in the delivery of projects in the Nairobi construction industry. The methodology of this study used quantitative methods and the targeted are contractors' firms in Nairobi. Using the collection of 66 valid questionnaires from 125 C1 contractors, several statistical analyses were performed. The study demonstrated the substantial benefits of utilizing BIM in the Nairobi construction industry. However, there was consensus about the challenges of BIM adoption in the Nairobi construction industry faced by contractors. Furthermore, most of the respondents concurred with the suggested processes for enhancing the adoption of BIM in the delivery of sustainable construction projects in Nairobi city. Therefore, the research identified the significant benefits of BIM usage, challenges, and adoption processes in Kenya's sustainable construction practices.**

***Keywords—BIM, Building Project, Sustainability, Benefits, Challenges, Processes, Kenya***

## I. INTRODUCTION

The construction sector holds a crucial position in Kenya's economic landscape, serving as a key driver of economic expansion and contributing 7% to the country's GDP. Despite its significance, the construction industry faces challenges that impede productivity and return on investments [1]. Recognizing its pivotal role, infrastructure development has been identified as a fundamental pillar in Kenya's vision 2030 development plan, integral to fostering a robust economy [2]. The importance of these endeavors extends beyond the construction sector itself, creating positive impacts on other businesses within the economy through both backward and forward linkages. Of these linkages, the construction industry stands out with its substantial multiplier effect, highlighting its substantial connections with various sectors [3].

Building Information Modeling (BIM) stands as an innovative technology and methodology within the construction industry. It represents a state-of-the-art approach that enables the digital creation of one or more precise virtual models of a building, these digital models serve as invaluable tools for designers, offering enhanced analytical capabilities and control compared to traditional manual methods [4]–[8]. Upon completion, these computer-generated models furnish the exact geometry and data essential for supporting various aspects of the building process, including construction, manufacturing, and procurement [9]–[12].

The construction industry has historically heavily relied on paper, necessitating the physical printing of all project documentation. Traditional practices in the sector predominantly involve the utilization of physical requirements and designs [13], [14]. The roots of digitization in construction can be traced back to the 1970s when the first software products for computer-based building design emerged. The concept of BIM was conceived during this period. An early precursor to BIM, the Building Description System (BDS), proposed functionalities that align with many of the capabilities offered by BIM today [15]–[18]. A graphical user interface for storing and displaying intricate element forms, an interactive visual language for arranging diverse elements in a design space, the ability to generate perspective or orthographic drawings, and a database that can be sorted by attributes such as material type are among these features. Over time, BDS has undergone several stages of evolution to evolve into the comprehensive tool that BIM represents in contemporary construction practices [19], [20].