Beyond The Mood Board: How Building Information Modeling (BIM) is Transforming Interior Design

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Abstract: Building Information Modeling (BIM) is fundamentally transforming the approach to interior design, moving practice beyond traditional, visually focused methods, such as mood boards, toward a comprehensive, data-driven, and collaborative digital workflow. Moreover, BIM technology offers a centralized platform that integrates non-graphical data, such as material properties and maintenance schedules, directly with the 3D model. This integration improves conceptualization, ensures detailed coordination, and enhances project lifecycle management, significantly lowering errors, costs, and project timelines. Furthermore, major areas of change include hyper-realistic visualization, real-time multidisciplinary clash detection, accurate quantity takeoff, and advanced physical environment analysis. This research presents how building information modeling (BIM) is transforming the interior design domain, positioning interior designers at the forefront of the Architecture, Engineering, and Construction (AEC) industry's technological evolution.

Keywords: Building Information Modeling, Interior Design, Transforming.

I. Introduction:

The Evolution of Interior Design Practice

In the contemporary AEC context, interior design transcends mere decoration, encompassing key elements such as spatial planning, sustainability, user experience, and adherence to complex building codes [1,2]. Historically, traditional workflows relied heavily on two-dimensional (2D) CAD drawings and manual processes for quantity takeoff (QTO). These legacy tools often resulted in data silos, fragmentation, data integrity issues, and error-prone deliverables, necessitating extensive manual intervention and ultimately leading to project delays, rework, and cost overruns. Building Information Modeling (BIM) technology is a holistic approach to designing, documenting, and managing AEC projects [3-5]. Moreover, it has emerged as a foundational shift toward digital tools and methods across all project stages. The concept of BIM has been evolving since Dr. Charlie Eastman initiated the "Building the Description System" in 1975, followed by the development of ArchiCAD in 1984 by Graphisoft, and the formal introduction of the BIM concept by Autodesk in 2002 [6,7]. Lately, BIM has been widely adopted by interior designers, streamlining processes and enhancing efficiency in creating functional, aesthetically pleasing spaces. In light of this, the literature positions BIM as more than a coordination tool, since it is emerging as a foundational platform that reshapes how interior designers conceive, test, and deliver spaces [8-10]. Additionally, BIM's data-driven visualization, integrated collaboration, performance simulation, and compatibility with immersive technologies collectively enable a move "beyond the mood board."

II. Literature Review

BIM as the Foundational Platform for Interior Design

Building Information Modeling (BIM) began as a tool for architects, engineers, and contractors, but over the past decade, its role has broadened to include detailed interior design work [10]. Reviews and meta-analyses show an expanding research base that treats BIM not merely as a drawing/coordination tool but as an integrated platform for design decision-making, visualization, and lifecycle assessment, making it increasingly relevant to interior designers who require precision in finishes, furnishings, and services [11-13]. Furthermore, BIM generates and manages building data throughout its lifecycle, using 3D models as a central repository for detailed information about each component [14-16]. Key software tools used by interior designers include Autodesk Revit, known for creating comprehensive models and facilitating collaboration. ArchiCAD also offers flexible workflows and tools, such as BIMx for interactive 3D exploration and SketchUp, used for rapid prototyping and concept development when integrated with BIM [17,18]. Additionally, A recurring theme is BIM's capacity to replace or augment traditional representational tools (mood boards, 2D plans, and static renderings) with parametric, data-rich 3D models. Studies and practitioner reports highlight that BIM enables realistic lighting studies, material simulations, and rapid alternation of finishes, providing designers and clients with immediate, data-backed feedback during the concept and development stages. This shift supports more iterative, evidence-based design decisions compared with static mood boards. Furthermore, Literature consistently emphasizes BIM's collaborative value: it centralizes information across disciplines, reduces coordination errors, and makes interior elements (furniture, FF&E, MEP interfaces) visible to all stakeholders. Additionally, research finds that interior design practice benefits from the same clash detection, scheduling (4D), and quantity takeoff (5D) advantages as architecture and construction teams, thereby improving constructability and reducing rework. However, effective collaboration depends on agreed data standards and early involvement of interior teams in BIM workflows. Moreover, recent systematic reviews and applications show BIM's growing role in environmental and lifecycle analysis for interiors, facilitating material transparency, embodied carbon estimation, and performance simulations

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(thermal, daylighting, acoustics). Integrating LCA and sustainability data into BIM models allows interior designers to make choices that are both aesthetic and performance-oriented, aligning interior design more closely with whole-building sustainability goals [19,20]. Furthermore, for refurbishment and fit-out work, scan-to-BIM methods are emerging as critical point-cloud capture and model generation enable accurate documentation of existing interiors and rapid modeling for renovation scenarios. Studies document frameworks that combine scan data, generative tools, and BIM platforms to speed design iteration and reduce on-site surprises, especially important in complex, occupied interiors [21]. Additionally, there is growing research on coupling BIM with VR/AR and multi-user immersive environments to support interior design review, spatial understanding, and client co-design. Immersive BIM workflows enhance stakeholder engagement by allowing real-time walkthroughs and collaborative decision-making about scale, finishes, and ergonomics, further distancing modern practice from static mood-board presentations [22]. Eventually, the clarity and reliability of information within a BIM model are standardized using the Level of Development (LOD) framework, which articulates how an element's geometry and associated information evolve. Additionally, LOD is crucial for interior design, as it defines the extent to which team members can rely on data [23,24]. For instance, highly detailed interior elements progress through stages such as LOD 100 (Conceptual, using symbols or generic representations) to LOD 350 (Precise Geometry with Connections, outlining the element's interface with other systems) and potentially LOD 400 (Fabrication-ready Geometry, including installation information).

III. Methodology

This study employs a mixed-methods approach to explore how Building Information Modeling (BIM) is transforming interior design practice beyond traditional visualization tools such as mood boards. The research combines qualitative and quantitative methods to gain both depth and breadth of understanding, as shown in Figure 1. A systematic literature review establishes the theoretical foundation by analyzing recent studies on BIM integration in interior design, digital workflows, and design visualization. To capture practical insights, case studies of selected BIM-based interior design projects are analyzed to identify how BIM influences creativity, collaboration, and decision-making. Additionally, semi-structured interviews with interior design professionals provide qualitative data on their experiences with BIM, focusing on its impact on conceptual design, communication, and project efficiency. Complementing this, a survey is distributed to a broader group of practitioners to assess patterns in BIM adoption, perceived benefits, and challenges. Data are analyzed using thematic analysis for qualitative data and descriptive statistics for quantitative data. The integration of multiple data sources ensures reliability and a holistic understanding of how BIM reshapes interior design processes and redefines the creative workflow beyond the conventional mood board.

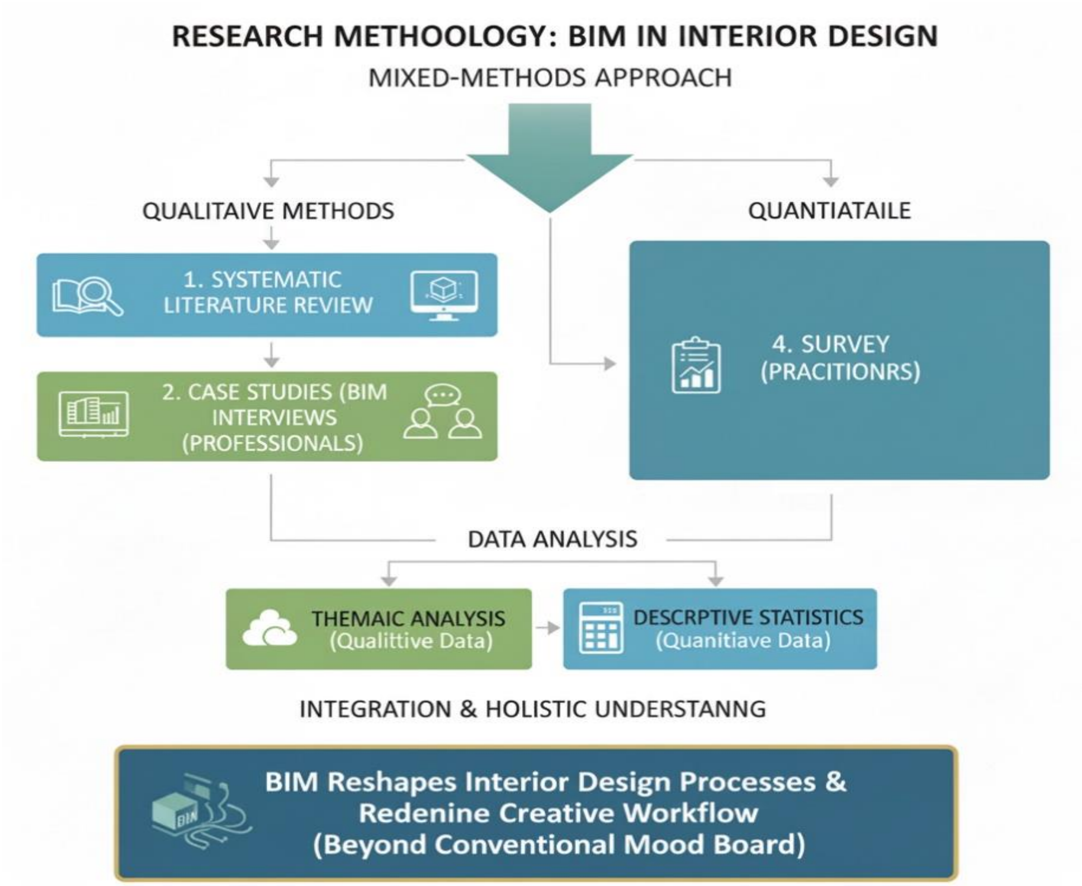

Figure 1: Research Method Design.

Revolutıonızıng The Desıgn Process Phases

3.1. Conceptualization, Visualization, and Simulation

BIM technology moves conceptualization beyond simple material inspiration to accurate space planning and visualization through detailed 3D models [25]. The BIM environment provides a 3D working environment where designers construct the model directly in 3D space, embedding real-world space, construction, material, and cost information. This allows stakeholders to observe the interior space from any angle and simulate environmental effects instantaneously. Additionally, advanced visualization capabilities are vital for communication, enabling designers to produce highly realistic virtual walkthroughs and flyovers of proposed designs, which significantly aid client decision-making before construction begins [26]. Platforms like Enscape further enhance design presentations by providing instantaneous rendering and seamless integration with Virtual Reality (VR) for fully immersive design evaluation experiences.

3.2. Enhanced Collaboration and Clash Detection

BIM fosters real-time collaborative design by serving as an open, shared, and up-to-date work platform across disciplines [27]. This seamless interaction among architects, structural engineers, MEP engineers, and interior designers is facilitated in a digital environment. A critical benefit is clash detection, the process of identifying and resolving conflicts between trades early in the design phase. This preemptive resolution of clashes, supported by tools like Revit and Navisworks, minimizes errors and costly rework during construction. Additionally, clashes in interior design can be classified into three main types, as outlined in Table 1.

Table 1: Clashes in Interior Design.

	Type of Clashes	Details
1	Hard clashes	When two physical building elements occupy the same space (e.g., pipes running through beams or columns interfering with walls).
2	Soft Clashes	When elements lack the required spatial tolerance or clearance necessary for access, maintenance, or safety (e.g., insufficient clearance for an air-conditioning unit).
3	Workflow Clashes (4D Clashes)	Conflicts related to the project timeline, scheduling, or material delivery

By integrating 3D models, such as those used for architectural, structural, and MEPF layouts, BIM enhances interdisciplinary coordination and can help eliminate clashes in the pre-construction stage. In light of this, this collaborative approach, proven in large-scale projects such as The Shard in London, ensures that interior elements align perfectly with the overall structure.

3.3. Accurate Documentation and Cost Management (QTO)

In interior design, where precision, material specification, and cost control are crucial, BIM plays a transformative role [28,29]. Accurate documentation and Quantity Take-Off (QTO) generated from BIM models provide designers, contractors, and clients with reliable, data-rich insights that enhance both design integrity and financial accountability. Here, BIM dramatically improves documentation quality and efficiency, and one of its most important and profitable applications is automated Quantity Takeoff (QTO). Additionally, extracting precise Bills of Quantities (BOQs) and Bills of Materials (BOMs) from a clash-free 3D BIM model enhances the accuracy of material calculations for manufacturing and installation budgets, thus lowering material costs and optimizing site usage. In software like Autodesk Revit, QTO is performed using the Schedule/Quantities tool, which relies on accurately assigned element properties, such as the Assembly Code (part of the Work Breakdown Structure, or WBS), to organize extracted quantities. For example, by precisely defining element properties during the design stage, QTO extraction becomes faster and more accurate.

3.4. Physical Environment Analysis and Sustainability

BIM technology enables the shift from design based on rough experience to a physical analysis design mode. Furthermore, this is essential for meeting modern standards for indoor environmental quality, including acoustic, lighting, thermal, and air quality, as shown in Figure 2.

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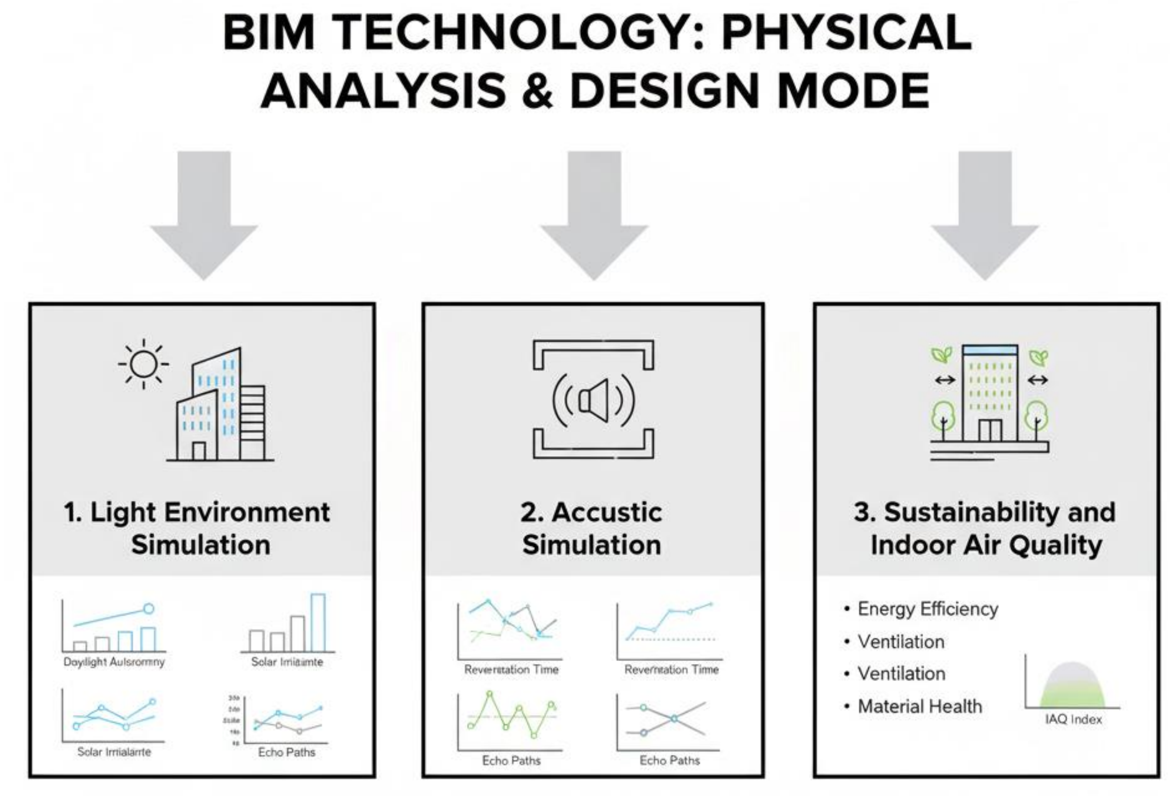

Figure 2: Research Method Design.

Additionally, the BIM technology, physical analysis, and design mode cover the following aspects:

1. Light Environment Simulation: The BIM model can be imported into specialized lighting design software (e.g., DIALux, AGi32) to quickly calculate and graphically display illumination results, helping designers avoid energy waste and meet specific lighting needs.

2. Acoustic Simulation: BIM aids acoustic calculations by conveniently counting and outputting data related to decoration materials, sound absorption coefficients, and areas, facilitating the calculation and adjustment of reverberation time.

3. Sustainability and Indoor Air Quality: BIM incorporates energy analysis tools to assess the environmental impact of design decisions, supporting the creation of sustainable interiors. Furthermore, by establishing a library of material data that records physical properties, BIM software can calculate levels of harmful substances such as VOCs, advancing air quality control efforts from the design and construction stage onward.

Integration and Lifecycle Management

The building information model established by BIM is a set of components with data attributes and constraints that can be transmitted and shared among different professions throughout the entire building lifecycle, realizing the reuse of information. This ability to integrate information enables continuous optimization based on acoustic, light, and heat analysis results and ensures clash errors are detected through a comprehensive model. Finally, BIM provides an extensive database of all interior components, which is invaluable during the operational phase (LOD 500) for facility management, maintenance, and future renovations. For instance, the Smithsonian Institution’s National Museum of African American History and Culture utilized BIM for efficient facility management.

IV. Conclusion

BIM is not merely a software tool; it is a paradigm shift that integrates technology and the environment, enabling interior designers to manage projects from conceptualization through construction, including drawing, visualization, and documentation. While challenges such as the traditional separation between construction and design engineering persist, along with the need to upskill and manage implementation costs, the benefits of BIM are irrefutable. By adopting BIM, interior designers gain a competitive edge, increase project efficiency and accuracy, and open doors to specialized career paths, such as BIM coordinator or manager roles. As the AEC industry moves toward trends like stronger AI integration, generative design, cloud-based collaboration, and Digital Twins, proficiency in BIM is essential for creating efficient, sustainable, and innovative interior environments. Eventually, the transition

"Beyond the Mood Board" marks the necessary evolution toward a digital, data-rich approach that guarantees reliability and precision throughout the interior design process.

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