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Research Paper

BIM-BASED 3D MODELING OF A MULTI-STORY COMMERCIAL BUILDING USING AUTODESK REVIT

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ABSTRACT

The advancement of Building Information Modeling (BIM) has significantly transformed the Architecture, Engineering, and Construction (AEC) industry by enabling intelligent three-dimensional modeling, improved project coordination, and efficient construction planning. Traditional two-dimensional drafting methods often result in design inconsistencies, coordination conflicts, and time-consuming revisions, which increase project cost and construction delays. Autodesk Revit Architecture provides a comprehensive BIM platform that integrates architectural design, visualization, documentation, and quantity estimation within a single digital environment. This project presents the 3D Modeling of a Multi-Story Commercial Building Using Revit Architecture by developing an intelligent BIM model of a modern commercial building consisting of multiple floors with facilities such as office spaces, retail shops, conference rooms, reception area, elevators, staircases, parking facilities, cafeteria, utility rooms, washrooms, emergency exits, and landscaped surroundings. The building model incorporates architectural components including walls, columns, beams, slabs, roofs, doors, windows, curtain walls, ceilings, flooring, lighting fixtures, furniture, and exterior elements using parametric modeling techniques. The developed BIM model automatically generates floor plans, elevations, sections, schedules, quantity take-offs, and construction documentation while maintaining complete consistency throughout the project. High-quality 3D visualization and walkthrough rendering provide realistic interior and exterior perspectives that assist architects, engineers, and clients in evaluating the design before construction. The proposed BIM methodology improves design accuracy, interdisciplinary coordination, project visualization, construction efficiency, and resource management while minimizing design errors and project delays. The study demonstrates that Autodesk Revit Architecture provides an efficient, reliable, and sustainable platform for designing modern multi-story commercial buildings with enhanced productivity and improved lifecycle management.

Keywords : Building Information Modeling (BIM), Autodesk Revit Architecture, 3D Modeling, Commercial Building, Multi-Story Building, Architectural Planning, Walkthrough Rendering, BIM Visualization, Construction Documentation, Quantity Take-Off, Parametric Modeling, Smart Building Design.

I. INTRODUCTION

The rapid growth of urbanization and commercial development has significantly increased the demand for modern multi-story commercial buildings that provide efficient space utilization, improved functionality, and enhanced architectural aesthetics. Commercial buildings accommodate a variety of facilities including offices, retail stores, conference rooms, restaurants, banking services, and business centres within a single structure. Designing such buildings requires careful planning of floor layouts, circulation systems, structural components, lighting, ventilation, fire safety, accessibility, and parking facilities. Conventional two-dimensional drafting methods often result in coordination problems, repetitive revisions, and inconsistencies between architectural drawings, increasing both project cost and construction time. The emergence of Building Information Modeling (BIM) has transformed the Architecture, Engineering, and Construction (AEC) industry by providing an intelligent digital platform that integrates design, visualization, documentation, and project coordination into a single environment. BIM enables architects and engineers to develop accurate three-dimensional models containing complete engineering information for every building component. This integrated approach enhances collaboration among project stakeholders, minimizes design conflicts, improves construction quality, and supports efficient project management throughout the building lifecycle. As a result, BIM has become an essential technology for planning and designing modern commercial buildings.

Autodesk Revit Architecture is one of the most widely used BIM software applications for architectural planning, three-dimensional modeling, visualization, and construction documentation. Unlike conventional CAD software, Revit utilizes parametric modeling, where every architectural element is represented as an intelligent object containing information related to geometry, dimensions, materials, quantities, and relationships with other building components. The software enables designers to develop complete architectural models including walls, columns, beams, slabs, floors, roofs, curtain walls, doors, windows, staircases, elevators, ceilings, furniture, lighting fixtures, and landscaping features. Any modification made to the BIM model is automatically reflected in floor plans, elevations, sections, schedules, quantity take-offs, and three-dimensional views, thereby eliminating inconsistencies between project documents. Revit also provides advanced visualization and rendering capabilities that generate realistic interior and exterior perspectives, allowing architects and clients to evaluate the building before construction begins. Automatic quantity estimation and construction documentation significantly reduce manual drafting effort while improving project planning, estimation accuracy, and interdisciplinary coordination.

This project presents the 3D Modeling of a Multi-Story Commercial Building Using Revit Architecture by developing a complete BIM model of a modern commercial building using Autodesk Revit. The proposed building consists of multiple floors accommodating office spaces, retail shops, reception lobby, conference rooms, meeting halls, cafeteria, elevators, staircases, washrooms, utility rooms, emergency exits, parking facilities, and landscaped surroundings. Intelligent BIM components are utilized to model architectural elements including walls, columns, beams, slabs, roofs, floors, doors, windows, ceilings, furniture, lighting systems, and exterior landscaping. High-quality walkthrough rendering is performed to generate realistic interior and exterior visualizations for design verification and client presentation. The developed BIM model automatically produces floor plans, elevations, sectional views, schedules, quantity take-offs, and construction documentation required for project execution. The proposed methodology demonstrates that Autodesk Revit Architecture significantly improves design accuracy, visualization quality, interdisciplinary coordination, project management, and construction efficiency while reducing drafting errors and construction conflicts. The project provides an intelligent, reliable, and sustainable BIM-based solution for designing modern multi-story commercial buildings capable of meeting present and future commercial infrastructure requirements.

II. SURVEY OF RESEARCH

1. Building Information Modeling (BIM) in Commercial Building Design

Building Information Modeling (BIM) has become one of the most important technological advancements in the Architecture, Engineering, and Construction (AEC) industry. Unlike conventional Computer-Aided Design (CAD), BIM creates intelligent three-dimensional models that contain both geometric and engineering information for every building component. Researchers have reported that BIM significantly improves project planning, interdisciplinary coordination, visualization, and construction management throughout the building lifecycle. Modern commercial buildings involve complex architectural layouts, structural systems, mechanical services, electrical installations, and plumbing networks that require accurate coordination during the design stage. BIM enables architects and engineers to identify clashes between different building services before construction begins, thereby reducing costly design modifications and project delays. Studies also indicate that BIM improves collaboration among project stakeholders by allowing multiple disciplines to work simultaneously on a centralized digital model. Automatic updating of drawings, schedules, elevations, and sections further enhances design consistency and reduces drafting errors. In addition to improving construction quality, BIM supports sustainable building practices through better material management, energy analysis, and resource optimization. Consequently, BIM has become an essential digital technology for planning and designing modern commercial buildings with improved efficiency, reduced construction risks, and enhanced project productivity.

2. Autodesk Revit Architecture for 3D Building Modeling

Autodesk Revit Architecture is one of the most widely used BIM software platforms for developing intelligent three-dimensional building models. Researchers have extensively applied Revit in residential, commercial, institutional, healthcare, and industrial projects because of its powerful parametric modeling capabilities. The software enables architects to develop complete building models consisting of walls, columns, beams, slabs, floors, roofs, curtain walls, staircases, elevators, doors, windows, ceilings, furniture, lighting fixtures, and landscaping elements. Every architectural component contains engineering information including dimensions, material specifications, quantities, and location. Since Revit maintains a centralized BIM database, modifications made to any building element are automatically reflected in all floor plans, elevations, sections, schedules, and three-dimensional views. This automatic synchronization eliminates inconsistencies between project documents and significantly reduces manual drafting effort. Researchers have reported that Revit improves architectural productivity, minimizes coordination errors, enhances design flexibility, and supports efficient project documentation. Automatic generation of quantity schedules, material take-offs, and construction drawings further assists cost estimation and construction planning while improving project management efficiency.

3. 3D Visualization and Walkthrough Rendering

Three-dimensional visualization and walkthrough rendering have become essential components of modern architectural design because they enable architects, engineers, and clients to visualize the completed building before construction begins. Researchers have demonstrated that realistic rendering improves design validation, client communication, material selection, lighting evaluation, and interior space planning. Autodesk Revit provides advanced visualization tools capable of generating high-quality interior and exterior renderings using realistic textures, lighting effects, shadows, reflections, landscaping, and environmental settings. Walkthrough animations simulate the movement of occupants throughout the building, enabling evaluation of circulation patterns, accessibility, space utilization, and user comfort. Comparative studies indicate that BIM-based visualization significantly reduces construction-stage design changes because clients can identify required modifications during the planning phase. High-quality rendering also improves marketing presentations, investor approvals, and stakeholder communication by providing realistic visual representations of proposed commercial buildings. These capabilities have made walkthrough rendering an indispensable tool in modern architectural practice.

4. Architectural Planning of Multi-Story Commercial Buildings

The architectural planning of multi-story commercial buildings requires careful consideration of functionality, accessibility, circulation, structural safety, fire protection, and efficient utilization of available space. Researchers emphasize that successful commercial building design depends on proper zoning of office spaces, retail areas, conference rooms, cafeterias, parking facilities, utility rooms, elevators, staircases, emergency exits, and service corridors. BIM-based architectural planning enables designers to optimize these functional spaces while maintaining compliance with national building codes and accessibility standards. Intelligent three-dimensional modeling allows architects to evaluate building proportions, façade design, circulation efficiency, and interior layouts before construction begins. Studies have demonstrated that BIM significantly improves interdisciplinary coordination among architectural, structural, electrical, plumbing, and HVAC systems, thereby reducing construction conflicts and improving project quality. Proper architectural planning also enhances occupant comfort, operational efficiency, and long-term building performance while minimizing maintenance requirements throughout the building lifecycle.

5. BIM-Based Documentation and Quantity Estimation

One of the major advantages of BIM technology is the automatic generation of accurate construction documentation and material quantity estimation. Researchers have reported that Autodesk Revit automatically generates floor plans, elevations, sectional views, ceiling plans, door schedules, window schedules, room schedules, material quantity take-offs, and construction sheets directly from the intelligent BIM model. Since every drawing is linked to the central BIM database, design modifications are automatically updated throughout the entire documentation set without manual intervention. This feature significantly reduces drafting errors, improves estimation accuracy, and enhances project coordination. Automatic quantity estimation supports procurement planning, budgeting, material management, and construction scheduling while reducing wastage of construction materials. Researchers have concluded that BIM-based documentation considerably improves project efficiency, minimizes human error, and provides reliable information for construction execution and facility management.

6. Future Trends in BIM and Smart Commercial Buildings

Recent advancements in BIM technology focus on integrating Artificial Intelligence (AI), Digital Twin Technology, Virtual Reality (VR), Augmented Reality (AR), Internet of Things (IoT), Cloud Collaboration, and Building Energy Modeling into commercial building design and management. Researchers are developing intelligent BIM systems capable of monitoring building performance using real-time sensor data throughout the operational lifecycle. Digital Twin technology creates virtual replicas of physical buildings that assist predictive maintenance, facility management, and operational optimization. Virtual Reality and Augmented Reality provide immersive visualization experiences that improve architectural review, client interaction, and design validation. Artificial Intelligence is increasingly being applied to optimize building layouts, energy consumption, construction scheduling, and maintenance planning. These emerging technologies are expected to transform BIM into a comprehensive smart building platform capable of improving sustainability, automation, energy efficiency, and lifecycle management of modern commercial buildings.

III. PROPOSED SYSTEM

The proposed 3D Modeling of a Multi-Story Commercial Building Using Revit Architecture aims to develop an intelligent Building Information Modeling (BIM) model that integrates architectural planning, three-dimensional modeling, visualization, and construction documentation within a single digital platform. Autodesk Revit Architecture is utilized to create a complete BIM model of a modern multi-story commercial building consisting of office spaces, retail shops, conference rooms, reception area, meeting halls, cafeteria, elevators, staircases, utility rooms, washrooms, emergency exits, parking facilities, and landscaped surroundings. The proposed system enables efficient architectural planning, realistic visualization, automatic quantity estimation, and coordinated construction documentation while minimizing design conflicts and improving project productivity.

Initially, the project requirements are identified based on the functional needs of a commercial building. The site is analyzed by considering plot dimensions, orientation, accessibility, parking requirements, building setbacks, circulation patterns, fire safety regulations, and local building bylaws. A conceptual architectural layout is prepared by dividing the building into functional zones such as public areas, office spaces, retail units, service rooms, utility spaces, and circulation corridors. Proper building orientation is selected to maximize natural lighting and ventilation while ensuring optimum utilization of available land and energy efficiency.

After completing the conceptual planning, the architectural model is developed using Autodesk Revit Architecture. Intelligent BIM components including walls, columns, beams, slabs, floors, roofs, curtain walls, doors, windows, staircases, elevators, ceilings, railings, and structural elements are created using parametric modeling techniques. Every building component stores engineering information such as dimensions, material properties, family type, quantity, and spatial location. Since Revit utilizes a centralized BIM database, any modification made to one building element is automatically reflected in all associated floor plans, elevations, sections, schedules, and three-dimensional views. This intelligent coordination significantly improves design consistency and eliminates drafting errors.

Following architectural modeling, interior planning is carried out by incorporating office furniture, conference room layouts, reception counters, workstations, meeting rooms, lighting fixtures, false ceilings, flooring materials, wall finishes, HVAC spaces, plumbing fixtures, electrical layouts, and emergency signage. Exterior development includes parking areas, landscaped gardens, entrance plazas, pedestrian pathways, boundary walls, outdoor lighting, and green spaces. Appropriate materials, colours, textures, glazing systems, and façade treatments available in the Revit material library are assigned to building elements to produce a realistic digital representation of the completed commercial building. BIM coordination between architectural, structural, electrical, plumbing, and HVAC systems is also performed to eliminate clashes before construction begins.

After completing the BIM model, 3D visualization and walkthrough rendering are performed using Autodesk Revit. Camera positions are created at important locations including the entrance lobby, office floors, conference halls, cafeteria, retail spaces, staircases, elevators, and exterior surroundings. High-quality rendering techniques incorporating realistic lighting, shadows, reflections, material textures, and environmental settings generate photorealistic interior and exterior views of the proposed commercial building. Walkthrough animations allow architects, engineers, and clients to evaluate space utilization, circulation, accessibility, interior aesthetics, and overall building functionality before construction. Necessary design modifications can be implemented quickly without affecting project consistency.

Finally, the completed BIM model automatically generates architectural floor plans, elevations, sectional views, ceiling plans, door schedules, window schedules, room schedules, material quantity take-offs, and construction documentation. These outputs improve cost estimation, procurement planning, project scheduling, and construction management while reducing manual drafting effort. The proposed BIM-based methodology demonstrates that Autodesk Revit Architecture provides an efficient, intelligent, and reliable platform for designing modern multi-story commercial buildings with improved visualization, better interdisciplinary coordination, enhanced construction quality, reduced project duration, and efficient lifecycle management.

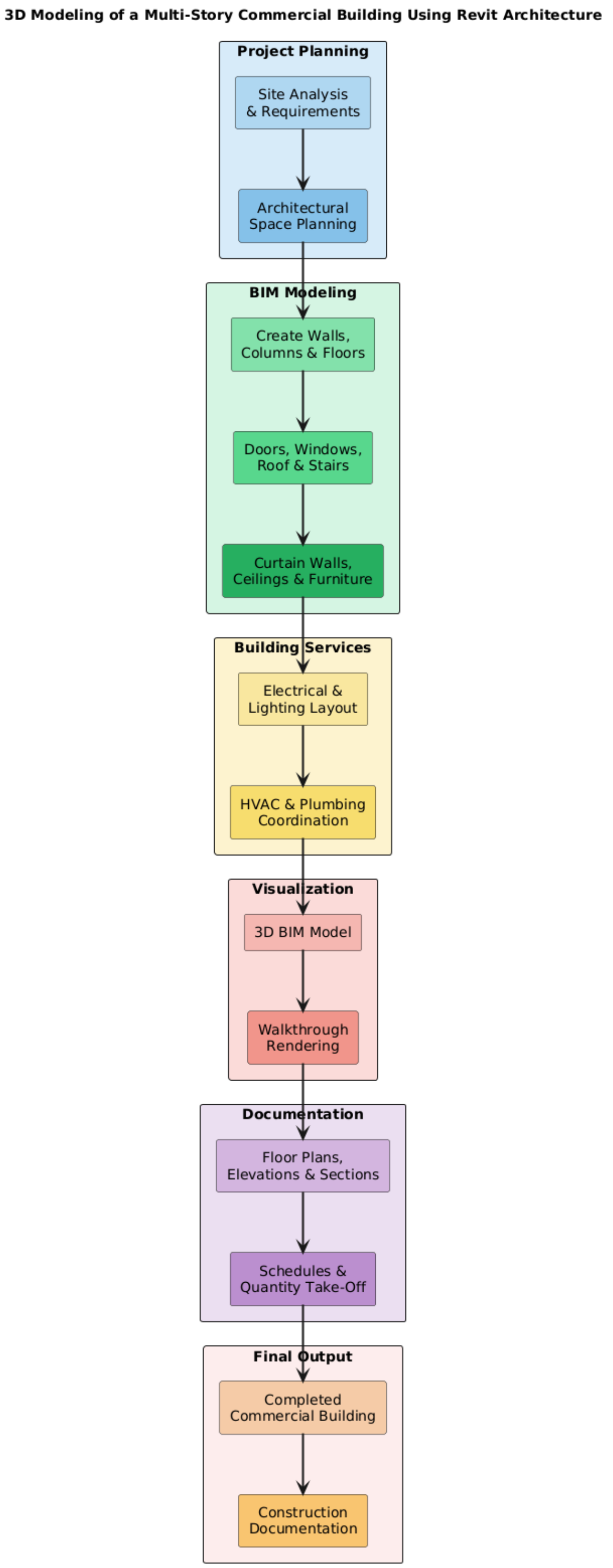

Fig1: Proposed workflow

III. WORKING METHODOLOGY

The proposed 3D Modeling of a Multi-Story Commercial Building Using Revit Architecture follows a comprehensive Building Information Modeling (BIM) methodology that integrates architectural planning, intelligent 3D modeling, visualization, coordination, documentation, and project validation within a single digital platform. Autodesk Revit Architecture is utilized as the primary BIM software because of its advanced parametric modeling capabilities, centralized database, automatic documentation generation, and realistic rendering tools. The methodology is designed to improve architectural accuracy, enhance interdisciplinary coordination, reduce design conflicts, and generate construction-ready documentation for a modern multi-story commercial building.

The first stage of the methodology involves project requirement analysis and site planning. Initially, the client requirements, functional requirements, occupancy capacity, commercial building standards, and local building regulations are carefully analyzed. The site dimensions, plot boundaries, orientation, topography, accessibility, road connectivity, parking requirements, building setbacks, fire safety provisions, and environmental conditions are studied before commencing the design process. The building orientation is selected to maximize natural daylight, improve ventilation, reduce energy consumption, and provide comfortable indoor environmental conditions. Based on these requirements, a conceptual layout is prepared by dividing the building into functional zones such as reception, office spaces, conference halls, retail shops, meeting rooms, cafeteria, utility rooms, washrooms, elevators, staircases, emergency exits, parking facilities, and landscaped open spaces. Proper circulation paths are established to ensure smooth movement of occupants while maintaining compliance with accessibility standards and fire safety regulations.

The second stage involves Building Information Modeling (BIM) using Autodesk Revit Architecture. The architectural model is developed by creating intelligent parametric building components including walls, columns, beams, slabs, floors, roofs, curtain walls, doors, windows, ceilings, staircases, elevators, railings, and structural members. Each building component is created using Revit families that store complete engineering information including dimensions, material specifications, family type, location, quantity, and construction properties. Unlike traditional CAD software, Revit maintains a centralized BIM database where every drawing is connected to the same digital model. Consequently, any modification made to one component automatically updates all floor plans, elevations, sectional views, schedules, quantities, and three-dimensional models without requiring manual corrections. This feature significantly reduces drafting errors and improves project coordination among architects, structural engineers, and MEP designers.

After completing the primary architectural structure, the third stage focuses on interior and exterior architectural development. Interior modeling includes placement of office furniture, workstations, reception counters, conference tables, cafeteria seating, decorative ceilings, flooring materials, wall finishes, lighting fixtures, HVAC spaces, plumbing fixtures, electrical layouts, and fire protection equipment. The exterior portion of the building is simultaneously developed by designing entrance plazas, landscaped gardens, parking areas, pedestrian walkways, green spaces, boundary walls, ramps, outdoor lighting, and façade elements. Various architectural materials such as concrete, glass, steel, aluminium composite panels, marble flooring, ceramic tiles, gypsum ceilings, and glazing systems are assigned using the Revit material library. Realistic textures, colours, reflections, and finishes improve the appearance of the BIM model and allow architects to visualize the completed building during the planning stage.

The fourth stage consists of coordination and clash detection between different engineering disciplines. Since commercial buildings contain numerous structural, architectural, electrical, plumbing, and HVAC components, proper coordination is essential before construction begins. Autodesk Revit enables designers to identify clashes between ducts, beams, columns, pipelines, electrical conduits, and architectural components during the modeling stage itself. Early detection of these conflicts reduces construction delays, minimizes rework, improves communication among project stakeholders, and decreases overall project cost. Simultaneously, room schedules, door schedules, window schedules, furniture schedules, and material schedules are continuously updated based on modifications made within the BIM environment.

The fifth stage involves 3D visualization and walkthrough rendering. After completing the BIM model, realistic visualization is generated using Autodesk Revit rendering tools. Camera positions are placed at strategic locations including the entrance lobby, office floors, conference halls, retail spaces, cafeteria, reception area, staircases, elevators, corridors, terraces, and exterior landscape. Advanced rendering techniques incorporating realistic daylight simulation, artificial lighting, shadows, reflections, textures, environmental effects, and material finishes generate photorealistic interior and exterior perspectives. Walkthrough animation simulates human movement inside the commercial building and allows architects, engineers, investors, and clients to evaluate space utilization, accessibility, aesthetics, circulation patterns, furniture arrangements, and overall functionality before construction begins. Any design modifications suggested during client review can be incorporated immediately within the BIM model without affecting documentation accuracy.

The sixth stage focuses on construction documentation and quantity estimation. One of the major advantages of Autodesk Revit is the automatic generation of construction drawings directly from the BIM model. The completed model automatically produces architectural floor plans, elevations, sectional views, reflected ceiling plans, site plans, door schedules, window schedules, room schedules, furniture schedules, and material quantity take-offs. Since all drawings are linked to the centralized BIM database, modifications performed anywhere within the model are instantly reflected throughout the entire documentation set. Automatic quantity estimation improves procurement planning, budgeting, material management, and project scheduling while reducing manual drafting effort and estimation errors. The generated documentation provides complete information required for construction execution and project management.

The final stage is model validation and project completion. The completed BIM model undergoes detailed verification to ensure that all architectural dimensions, room layouts, structural elements, circulation pathways, accessibility standards, fire safety requirements, and building regulations are satisfied. Clash detection reports are reviewed to confirm coordination between architectural, structural, HVAC, plumbing, and electrical systems. The rendered walkthrough is evaluated for lighting quality, interior aesthetics, façade appearance, landscaping, and user experience. After successful validation, the BIM model becomes the final deliverable for client approval, construction execution, facility management, and future renovation. Since the entire project information is stored within a single BIM database, the digital model can also be utilized throughout the operational life of the building for maintenance, asset management, and future modifications.

Engineering Formulae

Equation (1): Building Area

$$A = L \times B$$

Where:

(A) = Building Area (m²)

(L) = Building Length (m)

(B) = Building Width (m)

Equation (2): Floor Area Ratio (FAR)

$$A_t = \sum_{i=1}^{n} A_i$$

Where:

FAR = Floor Area Ratio

Total Floor Area = Total Built-up Area (m²)

Plot Area = Site Area (m²)

Equation (3): Building Coverage

$$Coverage = \frac{\text{Ground Floor Area}}{\text{Plot Area}} \times 100$$

Where:

Coverage = Site Coverage (%)

Built-up Area = Ground Floor Area (m²)

Plot Area = Total Site Area (m²)

These equations are commonly used in BIM-based architectural planning, building design, space planning, and construction quantity estimation using Autodesk Revit and are suitable for inclusion in an IEEE-format project report.

V. IMPLEMENTATION

The implementation of the proposed 3D Modeling of a Multi-Story Commercial Building Using Revit Architecture was carried out using Autodesk Revit Architecture, a Building Information Modeling (BIM) software that integrates architectural planning, three-dimensional modeling, visualization, construction documentation, and project coordination within a single digital platform. The implementation consisted of site planning, architectural modeling, structural modeling, interior development, BIM coordination, walkthrough rendering, quantity estimation, and construction documentation. The entire modeling process was performed according to standard architectural planning principles and BIM workflows to produce an accurate, intelligent, and construction-ready building model.

Initially, the project requirements and building specifications were identified based on the functional requirements of a modern commercial building. The proposed site was analyzed considering plot dimensions, orientation, accessibility, parking requirements, local building regulations, fire safety provisions, and environmental conditions. Based on these requirements, a conceptual architectural layout was prepared to accommodate office spaces, retail shops, reception lobby, conference rooms, meeting halls, cafeteria, elevators, staircases, utility rooms, washrooms, emergency exits, service areas, and parking facilities. Proper zoning and circulation planning ensured efficient movement of occupants while maximizing natural lighting, ventilation, and space utilization.

Following conceptual planning, the architectural model was developed using Autodesk Revit Architecture. Intelligent BIM components including walls, columns, beams, slabs, floors, roofs, curtain walls, doors, windows, ceilings, staircases, elevators, railings, and glazing systems were created using parametric modeling tools. Each building element stored engineering information such as dimensions, material specifications, family properties, quantities, and location. Since Revit utilizes a centralized BIM database, modifications performed on any architectural component were automatically updated throughout the floor plans, elevations, sectional views, schedules, and three-dimensional models. This intelligent synchronization significantly improved design consistency and reduced manual drafting errors.

After completing the structural framework, interior architectural elements were incorporated into the BIM model. Interior development included office furniture, workstations, conference tables, reception counters, cafeteria furniture, decorative ceilings, flooring materials, wall finishes, lighting fixtures, HVAC spaces, plumbing fixtures, electrical layouts, and fire safety equipment. Exterior development consisted of parking areas, entrance plazas, landscaped gardens, pedestrian pathways, outdoor lighting systems, boundary walls, green spaces, and façade treatments. Appropriate materials, colours, textures, glazing systems, and decorative finishes available in the Revit material library were assigned to produce a realistic digital representation of the commercial building. Coordination between architectural, structural, HVAC, electrical, and plumbing systems was simultaneously performed to eliminate design clashes before construction.

After completing the BIM model, walkthrough rendering and three-dimensional visualization were performed using Autodesk Revit rendering tools. Camera views were positioned at important locations including the reception area, office floors, conference halls, commercial spaces, cafeteria, corridors, staircases, elevators, terraces, and exterior landscape. High-quality rendering settings incorporating realistic daylight simulation, artificial lighting, shadows, reflections, textures, and environmental effects generated photorealistic interior and exterior perspectives. Walkthrough animations enabled architects, engineers, and clients to evaluate circulation, accessibility, space utilization, interior aesthetics, and building functionality before construction. Design modifications identified during visualization were immediately incorporated into the BIM model while maintaining complete project consistency.

Finally, the completed BIM model automatically generated architectural floor plans, elevations, sectional views, reflected ceiling plans, door schedules, window schedules, room schedules, material quantity take-offs, and construction documentation required for project execution. Automatic quantity estimation improved cost planning, procurement, budgeting, and construction scheduling while minimizing manual drafting effort. The completed BIM model also served as a comprehensive digital database for future facility management, renovation, and maintenance activities. The implementation demonstrated that Autodesk Revit Architecture significantly improves architectural planning, visualization, interdisciplinary coordination, documentation accuracy, construction efficiency, and lifecycle management of multi-story commercial buildings, making BIM an effective solution for modern commercial infrastructure development.

VI. RESULTS EXPLANATIONS

Figure 2. Three-Dimensional BIM Model of the Commercial Building

Figure 2 presents the complete three-dimensional Building Information Model (BIM) of the proposed multi-story commercial building developed using Autodesk Revit Architecture. The model includes office floors, retail spaces, reception lobby, conference rooms, cafeteria, staircases, elevators, parking facilities, and landscaped surroundings. Intelligent BIM components such as walls, columns, beams, slabs, curtain walls, roofs, doors, and windows were created using parametric modeling techniques. The developed model enables architects and engineers to visualize the complete building before construction begins. Since every architectural component stores engineering information, modifications made to the model are automatically reflected in floor plans, elevations, sections, schedules, and quantity estimates. The BIM model improves design coordination, minimizes construction conflicts, and enhances project planning. The realistic three-dimensional visualization assists clients in understanding the overall building appearance while enabling architects to optimize architectural layouts, façade treatments, and functional space utilization before project execution.

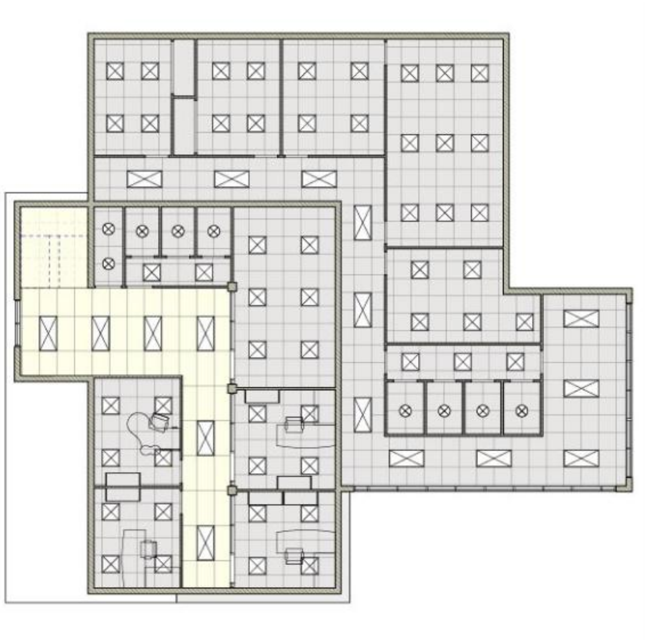

Figure 3. Architectural Floor Plan of the Commercial Building

Figure 3 illustrates the architectural floor plan generated using Autodesk Revit Architecture. The layout includes reception areas, office cabins, conference halls, retail shops, meeting rooms, cafeteria, washrooms, service rooms, elevators, staircases, emergency exits, and circulation corridors. The functional arrangement was designed to maximize space utilization while maintaining efficient movement of occupants throughout the building. Automatic room labeling, dimensioning, and intelligent object placement improved drafting accuracy and eliminated inconsistencies commonly found in conventional CAD drawings. The floor plan also supports quantity estimation and construction documentation by accurately defining the geometry and dimensions of every architectural component. Parametric BIM modeling enables rapid modifications to the layout while automatically updating all related drawings and schedules. This intelligent planning approach significantly improves design quality, operational efficiency, and project coordination for modern commercial buildings.

Figure 3. Architectural Floor Plan of the Commercial Building

Figure 3 illustrates the architectural floor plan generated using Autodesk Revit Architecture. The layout includes reception areas, office cabins, conference halls, retail shops, meeting rooms, cafeteria, washrooms, service rooms, elevators, staircases, emergency exits, and circulation corridors. The functional arrangement was designed to maximize space utilization while maintaining efficient movement of occupants throughout the building. Automatic room labeling, dimensioning, and intelligent object placement improved drafting accuracy and eliminated inconsistencies commonly found in conventional CAD drawings. The floor plan also supports quantity estimation and construction documentation by accurately defining the geometry and dimensions of every architectural component. Parametric BIM modeling enables rapid modifications to the layout while automatically updating all related drawings and schedules. This intelligent planning approach significantly improves design quality, operational efficiency, and project coordination for modern commercial buildings.

Figure 5. Exterior Perspective View of the Commercial Building

Figure 5 illustrates the exterior perspective view of the proposed multi-story commercial building developed using Autodesk Revit Architecture. The visualization includes the building façade, curtain wall glazing, entrance plaza, landscaped gardens, parking areas, pedestrian pathways, boundary walls, and outdoor lighting arrangements. The realistic rendering allows architects to evaluate the architectural appearance, façade design, colour combinations, material finishes, and relationship between the building and surrounding environment. Natural daylight simulation and shadow effects further enhance the visual quality of the model. The exterior perspective assists clients and project stakeholders in understanding the overall architectural concept before construction begins. The rendered model also supports project presentations, design approvals, and marketing activities by providing an accurate visualization of the completed commercial building.

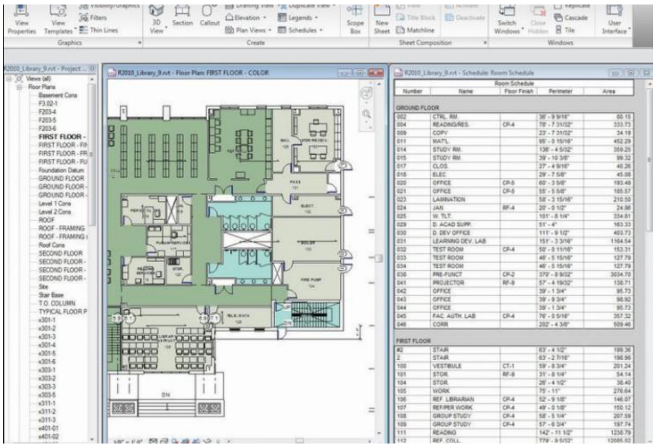

Figure 6. BIM Documentation and Quantity Take-Off

Figure 6 presents the BIM-generated construction documentation automatically produced from the Autodesk Revit model. The software generated architectural floor plans, elevations, sectional views, reflected ceiling plans, door schedules, window schedules, room schedules, and material quantity take-offs directly from the centralized BIM database. Since all project documents remain interconnected, any modification performed within the model is immediately reflected throughout the documentation without requiring manual revisions. Automatic quantity estimation improves budgeting, procurement planning, and construction scheduling while minimizing drafting errors and material wastage. The BIM documentation demonstrates one of the major advantages of Autodesk Revit over conventional CAD software by integrating modeling, visualization, documentation, and quantity estimation into a single intelligent platform. This significantly improves construction efficiency, project coordination, and lifecycle management for modern multi-story commercial buildings.

VII. CONCLUSION

The present study successfully developed a 3D Modeling of a Multi-Story Commercial Building Using Revit Architecture by utilizing Building Information Modeling (BIM) technology for intelligent architectural planning, three-dimensional visualization, and automated construction documentation. Autodesk Revit Architecture was used to create a comprehensive BIM model consisting of architectural elements such as walls, columns, beams, slabs, floors, roofs, curtain walls, doors, windows, staircases, elevators, ceilings, furniture, lighting fixtures, and landscaping components. The intelligent BIM environment enabled automatic generation of floor plans, elevations, sectional views, schedules, quantity take-offs, and realistic walkthrough renderings from a centralized digital database. The implementation demonstrated that BIM significantly improves design accuracy, project coordination, and documentation quality compared with traditional drafting methods.

The developed commercial building model successfully incorporated all essential functional spaces required for a modern commercial complex, including office spaces, retail shops, conference halls, reception lobby, meeting rooms, cafeteria, utility rooms, washrooms, parking facilities, and landscaped surroundings. Efficient architectural planning ensured proper space utilization, smooth circulation, accessibility, fire safety compliance, and user convenience. The use of parametric modeling enabled automatic updating of all associated drawings whenever modifications were made to the BIM model, thereby eliminating drafting inconsistencies and reducing the possibility of design errors during project execution.

The realistic 3D visualization and walkthrough rendering generated using Autodesk Revit enabled architects, engineers, clients, and stakeholders to evaluate the architectural appearance, interior design, lighting arrangements, furniture layouts, façade treatments, and circulation pathways before construction commenced. High-quality rendering with realistic materials, textures, shadows, reflections, and environmental effects enhanced the presentation quality and facilitated better communication among project participants. Walkthrough visualization also reduced the likelihood of construction-stage modifications by allowing design improvements to be identified during the planning phase.

Automatic generation of architectural drawings, schedules, material quantity take-offs, and construction documentation further improved estimation accuracy, procurement planning, construction scheduling, and overall project management. The centralized BIM database ensured complete consistency among architectural plans, elevations, sections, and schedules while reducing manual drafting effort and documentation time. This intelligent workflow enhanced productivity and improved coordination between architectural, structural, electrical, plumbing, and HVAC disciplines.

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