BIM-BASED ARCHITECTURAL DESIGN AND WALKTHROUGH VISUALIZATION OF A MULTIPURPOSE CONVENTION HALL USING AUTODESK REVIT

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ABSTRACT

Building Information Modeling (BIM) has transformed the architecture, engineering, and construction (AEC) industry by enabling intelligent 3D modeling, efficient project planning, and improved collaboration among stakeholders. Conventional architectural drafting methods often involve time-consuming revisions, poor visualization, and coordination issues, which can increase project costs and delays. Autodesk Revit, a BIM-based software platform, provides an integrated environment for architectural planning, structural coordination, material scheduling, and realistic walkthrough rendering. This project presents the BIM-Based Architectural Planning and Walkthrough Rendering of a Multipurpose Convention Hall Using Revit by developing a detailed three-dimensional model of a modern convention hall equipped with functional spaces such as the main auditorium, conference rooms, exhibition area, reception, cafeteria, administrative offices, parking facilities, washrooms, staircases, elevators, and emergency exits. The project utilizes BIM technology for intelligent modeling of architectural components including walls, columns, beams, slabs, doors, windows, roofs, ceilings, lighting fixtures, HVAC spaces, and interior furnishings. Realistic walkthrough rendering is performed using Revit visualization tools to generate high-quality interior and exterior perspectives for design validation and client presentation. The developed BIM model also enables automatic generation of floor plans, elevations, sections, schedules, quantity take-offs, and construction documentation. The proposed methodology significantly improves design accuracy, visualization quality, coordination efficiency, and project management while minimizing design errors and construction conflicts. The study demonstrates that BIM-based architectural planning using Revit provides an efficient, economical, and sustainable solution for designing modern multipurpose convention halls with enhanced visualization, better space utilization, and improved decision-making throughout the project lifecycle.

Keywords : Building Information Modeling (BIM), Autodesk Revit, Architectural Planning, Convention Hall, Walkthrough Rendering, 3D Modeling, Interior Design, BIM Visualization, Construction Documentation, Quantity Take-Off, Smart Building Design, Sustainable Architecture.

I. INTRODUCTION

The rapid growth of urban infrastructure and the increasing demand for multifunctional public facilities have significantly influenced modern architectural design practices. Convention halls play an important role in hosting conferences, exhibitions, seminars, cultural programs, business meetings, weddings, and public gatherings. Designing such facilities requires careful planning of spatial arrangements, structural elements, circulation paths, accessibility, lighting, ventilation, and safety systems to ensure comfort, functionality, and efficient utilization of available space. Traditional architectural drafting methods often involve multiple revisions, manual coordination, and limited visualization, making it difficult to identify design conflicts during the planning stage. These challenges frequently result in increased project costs, construction delays, and coordination errors. Building Information Modeling (BIM) has emerged as an advanced digital technology that overcomes these limitations by integrating architectural design, visualization, documentation, and project coordination into a single intelligent model. BIM enables architects and engineers to create detailed three-dimensional building models while maintaining accurate information about every building component. This integrated approach improves design quality, minimizes errors, enhances collaboration among project stakeholders, and supports efficient decision-making throughout the building lifecycle.

Autodesk Revit is one of the most widely used BIM software platforms for architectural planning, structural modeling, and building visualization. Revit allows designers to create intelligent parametric models consisting of walls, columns, beams, slabs, roofs, doors, windows, staircases, ceilings, curtain walls, lighting fixtures, and interior furnishings. Unlike conventional CAD software, every component created in Revit contains engineering information that automatically updates across plans, elevations, sections, schedules, and 3D views whenever design modifications are made. This significantly reduces drafting time and eliminates inconsistencies between construction drawings. Revit also provides powerful rendering and walkthrough visualization tools that enable architects, engineers, and clients to experience the completed building before construction begins. Realistic rendering improves design validation, material selection, lighting analysis, and interior planning

while enhancing communication between project stakeholders. Automatic generation of quantity schedules, room schedules, material take-offs, and construction documentation further improves project management efficiency and cost estimation. This project presents the BIM-Based Architectural Planning and Walkthrough Rendering of a Multipurpose Convention Hall Using Revit by developing a complete three-dimensional BIM model of a modern convention facility. The proposed building includes functional spaces such as a main auditorium, conference halls, exhibition area, reception lobby, administrative offices, cafeteria, VIP lounge, washrooms, staircases, elevators, emergency exits, parking area, and landscaped surroundings. The entire architectural model is developed using Autodesk Revit with intelligent BIM components for walls, floors, roofs, columns, doors, windows, ceilings, furniture, lighting fixtures, and interior elements. High-quality walkthrough rendering is performed to generate realistic interior and exterior visualizations for design verification and client presentation. The BIM model automatically generates floor plans, elevations, sections, schedules, and quantity take-offs required for construction documentation. The project demonstrates that BIM technology significantly improves architectural planning, visualization quality, interdisciplinary coordination, construction accuracy, and project efficiency while reducing design conflicts and construction errors. The proposed methodology provides architects and engineers with a reliable, intelligent, and sustainable approach for designing modern multipurpose convention halls capable of meeting present and future infrastructure requirements.

II. SURVEY OF RESEARCH

1. Building Information Modeling (BIM) in Architectural Design

Building Information Modeling (BIM) has revolutionized the Architecture, Engineering, and Construction (AEC) industry by providing an integrated digital platform for planning, designing, constructing, and managing buildings throughout their lifecycle. Unlike traditional Computer-Aided Design (CAD), BIM creates intelligent three-dimensional models containing both geometric and engineering information. Researchers have reported that BIM significantly improves collaboration among architects, structural engineers, and construction professionals by enabling real-time coordination of building components. The technology reduces design conflicts, minimizes construction errors, and improves project quality through automatic updating of plans, elevations, sections, schedules, and material quantities. Several studies have demonstrated that BIM-based design improves productivity, reduces rework, and enhances communication among project stakeholders. The use of BIM also supports sustainable construction by optimizing material usage, reducing waste generation, and improving resource management. Consequently, BIM has become one of the most important digital technologies adopted in modern architectural planning and infrastructure development.

2. Autodesk Revit for Architectural Planning

Autodesk Revit is one of the most widely adopted BIM software applications for architectural planning and intelligent building modeling. Researchers have extensively used Revit for developing residential, commercial, institutional, healthcare, and public infrastructure projects because of its powerful parametric modeling capabilities. The software enables designers to create intelligent building components including walls, columns, beams, slabs, roofs, doors, windows, ceilings, staircases, curtain walls, furniture, lighting fixtures, and landscaping elements. Every modification made to the BIM model is automatically reflected in all associated plans, elevations, sections, schedules, and 3D views, thereby eliminating inconsistencies in construction documentation. Researchers have reported that Revit significantly improves drafting efficiency, visualization quality, interdisciplinary coordination, and project management. Automatic generation of quantity schedules, room schedules, material take-offs, and construction drawings further enhances design productivity while reducing manual drafting effort.

3. Walkthrough Rendering and Visualization

Walkthrough rendering has become an essential component of modern architectural design because it enables architects, engineers, and clients to visualize the completed building before construction begins. Researchers have demonstrated that realistic visualization improves design validation, client communication, material selection, lighting analysis, and interior planning. Autodesk Revit provides advanced rendering capabilities that generate high-quality interior and exterior visualizations using realistic materials, textures, lighting effects, shadows, and landscaping elements. Walkthrough animations simulate human movement throughout the building, allowing designers to evaluate circulation patterns, accessibility, space utilization, and user comfort. Comparative studies have shown that BIM-based walkthrough rendering significantly improves design understanding and reduces costly modifications during the construction stage. These visualization techniques also support effective marketing, stakeholder presentations, and project approval processes by providing realistic representations of the proposed facility.

4. Architectural Planning of Multipurpose Convention Halls

Multipurpose convention halls require careful architectural planning to accommodate a wide range of activities including conferences, exhibitions, seminars, cultural events, weddings, and business meetings. Researchers emphasize that successful convention hall design depends on efficient

space planning, functional zoning, circulation, accessibility, emergency evacuation, lighting, acoustics, ventilation, and parking facilities. BIM-based architectural planning enables designers to optimize room layouts, seating arrangements, service areas, and utility spaces while ensuring compliance with building regulations and accessibility standards. Intelligent 3D modeling also facilitates coordination between architectural, structural, electrical, plumbing, and HVAC systems before construction begins. Studies indicate that BIM significantly reduces design conflicts and improves construction efficiency for large public buildings such as convention centres, auditoriums, and exhibition complexes.

5. BIM-Based Documentation and Quantity Estimation

One of the major advantages of BIM technology is the automatic generation of construction documentation and material quantity estimation. Researchers have reported that BIM models developed using Autodesk Revit automatically generate floor plans, elevations, sections, door schedules, window schedules, room schedules, material take-offs, and quantity schedules directly from the intelligent building model. Since every drawing is linked to the central BIM database, modifications made to the model are immediately reflected in all project documents without manual intervention. This capability significantly reduces drafting errors, improves documentation accuracy, and simplifies project coordination. Automatic quantity estimation also supports cost estimation, procurement planning, and construction management by providing accurate information regarding building materials and components. Consequently, BIM has become an indispensable tool for modern construction documentation and project planning.

6. Future Trends in BIM and Smart Building Design

Recent developments in BIM technology focus on integrating Artificial Intelligence (AI), Digital Twins, Virtual Reality (VR), Augmented Reality (AR), Internet of Things (IoT), Cloud Computing, and Building Energy Simulation into architectural design and facility management. Researchers are developing intelligent BIM systems capable of monitoring building performance throughout the operational lifecycle using real-time sensor data. Virtual Reality and Augmented Reality enable immersive walkthrough experiences that improve design review and client interaction before construction. Digital Twin technology further extends BIM by creating virtual replicas of physical buildings for maintenance, energy management, and predictive analysis. Future BIM applications are expected to support fully integrated smart buildings with improved sustainability, automation, operational efficiency, and lifecycle management. These advancements will continue transforming architectural planning by providing more intelligent, collaborative, and data-driven building design solutions.

III. PROPOSED SYSTEM

The proposed BIM-Based Architectural Planning and Walkthrough Rendering of a Multipurpose Convention Hall Using Revit aims to develop an intelligent Building Information Model (BIM) that integrates architectural planning, three-dimensional modeling, visualization, and construction documentation within a single digital platform. The proposed system utilizes Autodesk Revit to create an accurate and information-rich 3D model of a modern convention hall containing functional spaces such as the main auditorium, conference rooms, exhibition hall, reception lobby, administrative offices, cafeteria, VIP lounge, washrooms, elevators, staircases, parking area, emergency exits, and landscaped surroundings. The BIM model enables automatic generation of architectural drawings, schedules, quantity take-offs, and realistic walkthrough rendering while improving design coordination and reducing construction conflicts. Initially, the project requirements are identified based on the functional needs of a multipurpose convention hall. The space requirements, occupancy capacity, circulation patterns, accessibility standards, parking requirements, fire safety provisions, and local building regulations are studied before preparing the conceptual layout. The building orientation is selected to maximize natural lighting and ventilation while ensuring efficient utilization of the available site area. Preliminary zoning is carried out to separate public spaces, service areas, administrative offices, and utility rooms, thereby improving operational efficiency and visitor movement throughout the facility.

After completing the conceptual planning stage, the architectural model is developed using Autodesk Revit. Intelligent BIM components including walls, columns, beams, slabs, roofs, doors, windows, curtain walls, staircases, ceilings, floors, furniture, lighting fixtures, and landscaping elements are created using parametric modeling techniques. Every building element contains engineering information such as dimensions, material properties, location, and quantity. Since Revit uses a centralized BIM database, any modification made to one component is automatically reflected in all associated floor plans, elevations, sections, schedules, and three-dimensional views. This intelligent coordination significantly reduces drafting errors and improves design consistency throughout the project. Following architectural modeling, the interior spaces are developed by incorporating furniture layouts, seating arrangements, stage design, lighting systems, decorative ceilings, flooring materials, wall finishes, HVAC spaces, and interior accessories. Exterior components including entrance plazas, pedestrian pathways, parking facilities, green landscapes, boundary walls, and outdoor lighting are also modeled to provide a complete representation of the proposed convention hall. Material libraries available in Revit are used to assign realistic textures, colours, and finishes to architectural elements, thereby improving the visual quality of the building model.

After completing the BIM model, walkthrough rendering is performed using the visualization tools available in Autodesk Revit. Camera views are positioned at important locations including the entrance lobby, auditorium, conference halls, exhibition space, cafeteria, and exterior landscape to generate realistic perspectives. High-quality rendering techniques incorporating natural lighting, artificial lighting, shadows, reflections, and material textures provide a near-realistic visualization of the completed building before construction begins. Walkthrough animations enable architects, engineers, and clients to evaluate circulation, accessibility, space utilization, interior aesthetics, and functional relationships among different building components. Finally, the completed BIM model is utilized to automatically generate architectural floor plans, elevations, sectional views, door schedules, window schedules, room schedules, material quantity take-offs, and construction documentation. These outputs support accurate project estimation, construction planning, and interdisciplinary coordination while minimizing manual drafting effort. The proposed BIM-based methodology significantly improves architectural planning accuracy, visualization quality, construction efficiency, project coordination, and client communication. The developed system demonstrates that Autodesk Revit provides a comprehensive and intelligent platform for designing modern multipurpose convention halls with enhanced productivity, reduced design errors, improved sustainability, and efficient lifecycle management.

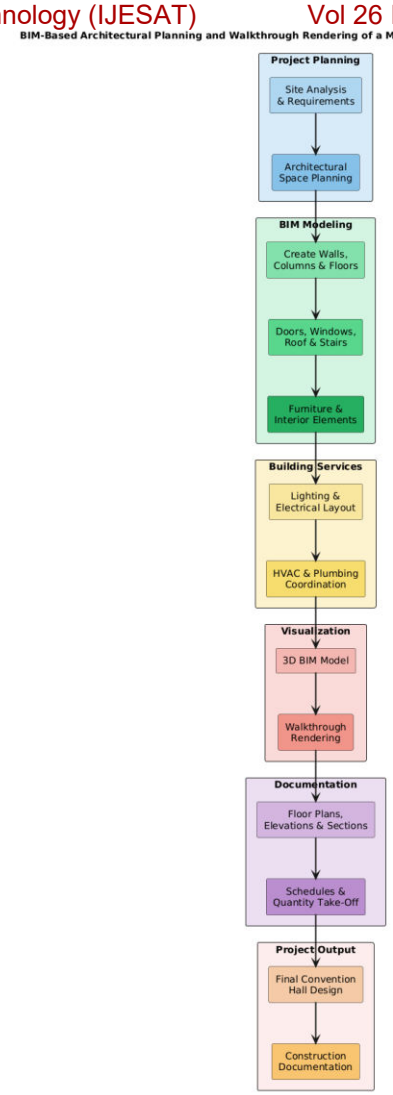

Fig1: Proposed workflow

III. WORKING METHODOLOGY

The proposed BIM-Based Architectural Planning and Walkthrough Rendering of a Multipurpose Convention Hall Using Revit follows a systematic Building Information Modeling (BIM) methodology that integrates architectural planning, intelligent 3D modeling, building coordination, visualization, rendering, and construction documentation within a single digital environment. Autodesk Revit is utilized to develop an information-rich building model that improves design accuracy, reduces coordination conflicts, and enhances collaboration among architects, engineers, and project stakeholders. The complete workflow ensures efficient planning, realistic visualization, and automatic generation of construction drawings required for execution.

Initially, the project requirements are identified based on the functional needs of a multipurpose convention hall. Site dimensions, local building regulations, occupancy requirements, accessibility standards, parking provisions, fire safety regulations, and circulation requirements are carefully studied before preparing the conceptual architectural layout.

Functional zoning is performed to allocate spaces such as the main auditorium, conference halls, exhibition area, reception lobby, cafeteria, administrative offices, VIP lounge, washrooms, staircases, elevators, emergency exits, utility rooms, and parking facilities. Proper building orientation is selected to maximize natural lighting, ventilation, and energy efficiency while ensuring optimum utilization of the available land area.

After finalizing the conceptual layout, the architectural model is developed using Autodesk Revit. Intelligent BIM components including walls, columns, beams, slabs, floors, roofs, doors, windows, curtain walls, ceilings, staircases, railings, and structural elements are created using parametric modeling techniques. Every component contains engineering information including dimensions, material specifications, location, family type, and quantity. Since Revit uses a centralized BIM database, any modification made to one building component is automatically reflected in all associated plans, elevations, sections, schedules, and three-dimensional views. This automatic synchronization eliminates inconsistencies between drawings and significantly improves project coordination.

Following the architectural modeling stage, interior planning is carried out by incorporating furniture layouts, seating arrangements, stage design, lighting fixtures, false ceilings, flooring materials, wall finishes, decorative elements, HVAC spaces, plumbing fixtures, and electrical provisions. Exterior development includes entrance plazas, pedestrian pathways, landscaped gardens, parking facilities, boundary walls, and outdoor lighting systems. Appropriate building materials, textures, colours, and finishes are assigned using Revit's material library to create a realistic representation of the completed convention hall. The integrated BIM model enables simultaneous coordination between architectural, structural, electrical, and mechanical systems, thereby reducing construction conflicts before project execution.

After completing the BIM model, walkthrough rendering is performed using Autodesk Revit visualization tools. Multiple camera views are created at important locations including the entrance lobby, auditorium, conference rooms, exhibition area, cafeteria, VIP lounge, corridors, and exterior landscape. High-quality rendering techniques involving realistic lighting, shadows, reflections, textures, material finishes, and environmental settings are applied to produce photo-realistic images and walkthrough animations. These visualizations allow architects, engineers, clients, and stakeholders to evaluate interior aesthetics, circulation, accessibility, lighting conditions, and functional space utilization before construction begins. Design modifications can be implemented quickly within the BIM environment without affecting project consistency.

Finally, the completed BIM model automatically generates all required construction documentation including architectural floor plans, elevations, sectional views, ceiling plans, door schedules, window schedules, room schedules, material quantity take-offs, and construction sheets. The automatic extraction of project documentation minimizes manual drafting effort, improves estimation accuracy, and supports efficient construction planning. The developed BIM model also facilitates future maintenance, renovation, and facility management by storing complete building information within a single digital platform. The proposed methodology demonstrates that Autodesk Revit provides an efficient, accurate, and intelligent solution for designing modern multipurpose convention halls with improved visualization, enhanced coordination, reduced project time, and higher construction quality.

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 BIM-Based Architectural Planning and Walkthrough Rendering of a Multipurpose Convention Hall Using Revit was carried out using Autodesk Revit, a Building Information Modeling (BIM) software that enables intelligent three-dimensional architectural modeling, visualization, documentation, and project coordination. The implementation involved site planning, architectural modeling, interior planning, BIM coordination, walkthrough rendering, and construction documentation. The entire workflow followed standard architectural planning principles and BIM practices to ensure accurate design, efficient space utilization, and realistic project visualization.

Initially, the project requirements and architectural planning parameters were identified based on the functional needs of a multipurpose convention hall. The proposed building site was analyzed considering plot dimensions, orientation, accessibility, parking requirements, circulation patterns, fire safety regulations, and local building bylaws. A conceptual layout was then prepared by dividing the building into functional zones including the main auditorium, conference rooms, exhibition area, reception lobby, VIP lounge, administrative offices, cafeteria, washrooms, service rooms, elevators, staircases, emergency exits, and parking facilities. The spatial arrangement was optimized to ensure smooth movement of visitors while maintaining adequate ventilation, natural lighting, and safety provisions.

After completing the conceptual planning, the architectural model was developed using Autodesk Revit. Intelligent BIM components such as walls, columns, beams, slabs, floors, roofs, doors, windows, curtain walls, ceilings, staircases, railings, and structural elements were created using parametric modeling techniques. Every building component contained engineering information including dimensions, material specifications, family properties, quantities, and spatial relationships. Since Revit utilizes a centralized BIM database, any modification made to the model was automatically updated in all associated floor plans, elevations, sectional views, schedules, and three-dimensional perspectives. This intelligent coordination significantly reduced drafting errors and improved overall project consistency.

Following the architectural modeling stage, the interior spaces were developed by incorporating furniture layouts, seating arrangements, stage design, decorative ceilings, lighting fixtures, flooring materials, wall finishes, HVAC spaces, plumbing fixtures, electrical layouts, and emergency exit signage. Exterior development included landscaped gardens, entrance plazas, pedestrian pathways, parking areas, boundary walls, outdoor lighting, and green spaces. Appropriate materials, textures, colours, and finishes available in the Revit material library were assigned to building elements to create a realistic digital representation of the completed convention hall. Coordination between architectural, structural, electrical, and mechanical systems was performed using BIM tools to eliminate clashes before construction.

After completing the BIM model, walkthrough rendering was performed using the visualization features available in Autodesk Revit. Multiple camera positions were created at strategic locations including the entrance, reception lobby, auditorium, conference halls, exhibition area, cafeteria, VIP lounge, corridors, and exterior landscape. High-quality rendering settings including realistic lighting, shadows, reflections, textures, daylight simulation, and material finishes were applied to produce photorealistic interior and exterior views. Walkthrough animations enabled detailed visualization of visitor movement, circulation paths, seating arrangements, accessibility, and space utilization before the commencement of construction. This visualization process assisted architects and clients in evaluating design quality and making necessary modifications during the planning phase.

Finally, the completed BIM model was used to automatically generate all necessary construction documentation including architectural floor plans, elevations, sectional views, ceiling plans, door schedules, window schedules, room schedules, material quantity take-offs, and construction sheets. These outputs significantly reduced manual drafting effort and improved project estimation, construction planning, and interdisciplinary coordination. The implementation demonstrated that Autodesk Revit provides a comprehensive BIM platform for designing modern convention halls with improved design accuracy, realistic visualization, enhanced coordination, efficient documentation, reduced project duration, and higher construction quality. The developed BIM model also serves as a valuable digital asset for future building maintenance, renovation, and facility management throughout the building lifecycle.

VI. RESULTS EXPLANATIONS

Figure 2. Three-Dimensional BIM Model of the Convention Hall

Figure 2 illustrates the complete three-dimensional Building Information Model (BIM) of the proposed multipurpose convention hall developed using Autodesk Revit. The architectural model includes the auditorium, conference halls, exhibition spaces, reception area, cafeteria, administrative offices, VIP lounge, staircases, elevators, parking facilities, and landscaped surroundings. Intelligent BIM components such as walls, columns, beams, slabs, roofs, doors, and windows were created using parametric modeling techniques. The developed model provides a realistic visualization of the entire building before construction begins, allowing architects and clients to evaluate the building form, proportions, and space utilization. Because every architectural element contains engineering information, any modification automatically updates the floor plans, elevations, sections, and schedules. The BIM model significantly improves design coordination, minimizes construction conflicts, and provides an accurate digital representation of the proposed convention hall, thereby enhancing project planning, visualization, and overall construction efficiency.

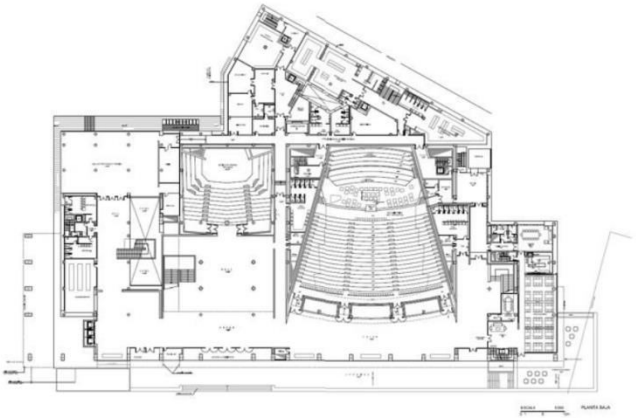

Figure 3. Architectural Floor Plan of the Convention Hall

Figure 3 presents the architectural floor plan prepared using Autodesk Revit. The floor plan illustrates the functional arrangement of the main auditorium, conference rooms, exhibition hall, reception lobby, cafeteria, administrative offices, washrooms, circulation corridors, staircases, elevators, and emergency exits. The layout was designed to ensure smooth movement of visitors while maintaining accessibility, safety, and efficient space utilization. Parametric BIM modeling enabled rapid modifications without affecting the accuracy of associated drawings. Automatic dimensioning, room identification, and intelligent object placement improved drafting quality and reduced manual effort. The floor plan also supports quantity estimation and construction documentation by accurately defining the geometry and location of every architectural component. The optimized layout enhances operational efficiency while satisfying functional and architectural requirements of a modern multipurpose convention hall.

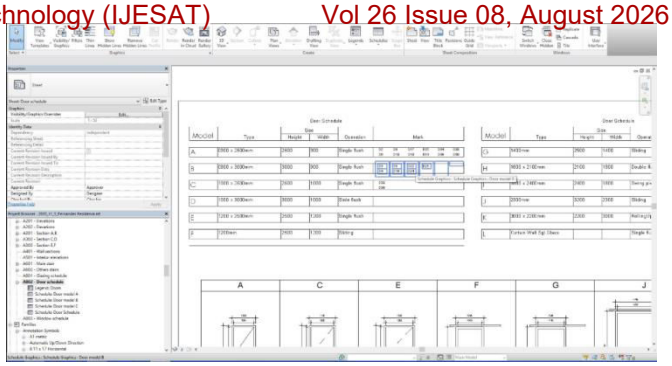

Figure 5. BIM Documentation and Quantity Take-Off

Figure 5 presents the BIM-generated documentation produced automatically from the Autodesk Revit model. The software generated architectural floor plans, elevations, sectional views, door schedules, window schedules, room schedules, material quantity take-offs, and construction sheets directly from the intelligent BIM database. Since all project documents are linked to the central model, any design modification is automatically reflected throughout the entire documentation set, eliminating inconsistencies and reducing drafting errors. Automatic quantity estimation improves cost planning and material management while supporting efficient procurement and construction scheduling. The BIM documentation demonstrates one of the major advantages of Revit over traditional CAD drafting by integrating design, visualization, estimation, and documentation into a single coordinated platform. This significantly improves project accuracy, productivity, and construction management for large public buildings such as multipurpose convention halls.

VII. CONCLUSION

The present study successfully developed a BIM-Based Architectural Planning and Walkthrough Rendering of a Multipurpose Convention Hall Using Revit by utilizing Building Information Modeling (BIM) technology for intelligent architectural planning, three-dimensional visualization, and construction documentation. Autodesk Revit was used to create an integrated BIM model consisting of architectural components such as walls, columns, beams, slabs, roofs, doors, windows, staircases, ceilings, furniture, lighting fixtures, and landscaping elements. The developed model enabled automatic generation of floor plans, elevations, sections, schedules, quantity take-offs, and realistic walkthrough renderings from a centralized digital database. The use of BIM significantly improved design accuracy, coordination among building components, and overall project efficiency compared with conventional drafting methods.

The architectural planning successfully accommodated all essential functional spaces required for a modern multipurpose convention hall, including the main auditorium, conference rooms, exhibition hall, reception lobby, cafeteria, administrative offices, VIP lounge, washrooms, parking facilities, and landscaped surroundings. The intelligent BIM

model facilitated efficient space utilization, smooth circulation, accessibility, fire safety planning, and compliance with building regulations. Parametric modeling ensured that modifications made to any building component were automatically reflected throughout the entire project documentation, thereby eliminating drafting inconsistencies and reducing design errors.

The walkthrough rendering generated using Autodesk Revit provided realistic visualization of both the interior and exterior environments before construction. High-quality rendering techniques involving realistic materials, lighting effects, shadows, reflections, and environmental settings enabled architects, engineers, and clients to evaluate the building aesthetics, seating arrangements, lighting quality, interior finishes, and spatial relationships. The visualization process enhanced communication among stakeholders, simplified design validation, and minimized the possibility of costly modifications during construction. Automatic generation of quantity schedules and construction documentation further improved estimation accuracy and project planning while reducing manual drafting effort.

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