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BIM Skill Deployment in Bangladesh's AEC Industry: A Forward-Looking Academic Perspective

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Abstract: Building Information Modeling (BIM) is a revolutionary technology that enhances collaboration, increases efficiency, and improves productivity within the Architecture, Engineering, and Construction (AEC) industry. In Bangladesh, the AEC industry is facing challenges in adopting BIM due to a lack of knowledge and inefficient software use. There is a huge demand for BIM professionals who can use cutting-edge technologies such as BIM dimensional modeling based on Computer-Aided Design (CAD). However, widespread adoption is hampered by a shortage of qualified staff due to the scarcity of university programs offering BIM courses and a lack of curriculum consensus. This research investigates BIM deployment in the Architecture, Engineering, and Construction (AEC) industry, as well as the expectations of recent and future AEC graduates regarding the new BIM curriculum, which includes the Tyler model for sustainability. The study also looks at the challenges of aligning academic BIM curricula in Bangladesh to meet the demands of the AEC industry and bridge the gap between education and practice.

Keywords: *BIM, Tyler Model, Curriculum, AEC Industry, Bangladesh.*

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I. INTRODUCTION

Bangladesh is gradually switching from conventional 2D vector-based construction to Building Information Modeling (BIM). Originally, Object-oriented Building Product Models (OBPM), BIM began in the 1990s and is still being included in Bangladesh's Architecture, Engineering and Construction (AEC) sector [1]. But the lack of thorough BIM skills education impedes industrial development; the present curriculum is limited to software training rather than holistic pedagogy like project-based and constructivist learning [2]. Advanced ideas such as 3D modeling, 4D scheduling, 5D cost estimation, and 6D energy analysis should be introduced in BIM courses to help students grasp and solve problems [2]. Cooperative skills and actual implementations are key to closing the gap between academic understanding and business needs [3]. Accelerating the BIM learning for professional competency has proved successful for pedagogies including Action Learning (AL), Constructivist Learning (CL), Selective Learning (SL), Autonomous Learning (AuL), and Cooperative Learning (CoL) [4],[5].

Despite all these advancements, BIM is underutilized in Bangladeshi higher education institutions. It is treated as an add-on subject or limited to capstone projects, and students get minimum exposure. Limited faculty expertise is another issue; institutions often rely on guest lecturers from the AEC industry. The current curriculum does not align with industry demand, and graduates are not prepared for practical application.

In Bangladesh, BIM-related subjects are not well integrated within AEC departments, as shown in Table 1. Students lack comprehensive BIM training due to time constraints and the breadth of the curriculum, which affects their preparedness for a future-ready workforce.

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Table 1 Current BIM Curriculum Practices in Bangladeshi Institutions

Institution Type (Public & Private)	**Course Level**	**Key Curriculum Features**
Polytechnic/ Technical Institute	Beginner	✓ Develop designs using basic 2D CAD and entry-level BIM tools. ✓ Prepare project documentation, including 2D drawings and quantity take-offs. ✓ Conduct basic 4D simulations for planning & 5D simulations for cost estimation.
University / Engineering College	Advanced	✓ Introduce core BIM concepts, including 3D modeling and operational principles. ✓ Offer training in advanced 2D/3D CAD, clash detection, and collaboration tools. ✓ Perform detailed 4D simulations for scheduling & 5D simulations for cost estimation. ✓ Limited focus on BIM trends and practical skills due to compressed curricula.

Addressing these challenges requires an updated BIM curriculum that integrates AEC principles with BIM software using a project-based learning (PBL) approach. Collaboration with the AEC industry will ensure the development of practical and job-ready skills. By focusing on applied learning, this curriculum aligns academic outcomes with the AEC industry's needs, preparing future-ready professionals [4], [6].

In the Bangladesh context, eventually, this study will develop a forward-thinking BIM curriculum for sustainable AEC practice by using the Tyler model to achieve the research goals and bridge the gap between current academic BIM curricula and AEC industry demands.

II. METHODOLOGY

This research will develop a full BIM curriculum for Bangladesh's Architecture, Engineering, and Construction (AEC) engineering and management programs. The curriculum will be based on two foundational models:

➢ *Product Model:*

This model is goal-oriented, focusing on achieving specific behavioral outcomes that match the needs of the AEC industry in Bangladesh. It clearly defines learning objectives that match industry standards and job market requirements [7].

➢ *Process Model:*

This model emphasizes the active roles of both teachers and students in the learning process, experiential learning, and collaboration. It is more flexible and adaptable as BIM integration is dynamic in the local context [7].

The study uses the Tyler Model as the basis for curriculum development. This is extensively applied in curriculum design for technical education and engineering [8] and offers a methodical strategy to connect learning results to business needs. There are three phases to the Tyler Model:

➢ *Defining Objectives:*

The AEC sector in Bangladesh and industrial demands guide the curriculum objectives. This covers BIM competencies for local BIM experts, including project management, tools, and multidisciplinary cooperation.

➢ *Organizing Content:*

With CAD simulations and ICT integration, the curriculum combines theory and practice. It addresses cutting-edge BIM ideas, project-based learning, industry case studies mirroring Bangladesh AEC industry's real-world problems.

➢ *Evaluating Outcomes:*

Assessments matching academic and industry standards will help to evaluate the curriculum. These include practical projects, simulations, BIM skills, and knowledge tests; industry comments from Bangladeshi AEC professionals will help direct the evaluation [9].

The study includes local AEC industry trends and issues to guarantee the program satisfies both academia and industry needs. The program covers aspects of the Bangladesh building sector, including local building codes, cost estimates, and project scheduling difficulties. Table 2 lists the study design, approach, and research goals.

Table 2 Review of Research Procedures and Methodologies

Research Aims & Objectives	**Develop a BIM-aligned AEC Engineering and Facility Management course for undergraduate students to ensure future employment in Bangladesh's AEC industry.**
Pre-Analysis for preparing an effective BIM Curriculum	✓ Examine closely the present situation of Building Information Modelling (BIM) in the Architecture, Engineering, and Construction (AEC) sector together with its objectives, advantages, and difficulties.
	✓ Find out how relevant BIM criteria are for AEC companies and how they affect company processes.
	✓ Investigate and review current AEC sector research and reviews on BIM adoption and use trends.
	✓ Review current BIM-based training courses, courses, and events provided by the AEC sector to ascertain their relevance and fit for AEC industry requirements.
	✓ Examine the present situation of engineering education in the AEC field including accreditation procedures, development of BIM-related skills, and BIM incorporation into courses.

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Developing a comprehensive Curriculum for BIM education	✓ Create a strong framework capturing the essence of BIM-based AEC engineering and management.
	✓ Clearly specify objectives for the BIM-related course of instruction so as to guarantee congruence with industry standards and best practices.
	✓ Design a proposed BIM curriculum with pertinent resources, assignments, and exercises.
	✓ Create a pedagogical tool, strategies, approaches catered to particular learning environments and goals.
	✓ Establish criteria for evaluation and assessment for the suggested BIM curriculum thereby guaranteeing uniformity and rigor.
	✓ Create full comprehensive course syllabi containing effectively organize course outlines present in BIM and FM curriculum.
Applying BIM Curriculum for future sustainability	✓ Get technical assessments and professional advice from seasoned architects, engineers, and builders with specific building information modeling (BIM) skills.
	✓ Updated and improved course of study and curriculum to more closely fit the changing needs and requirements of the Architecture, Engineering, and Construction (AEC) sectors.
	✓ Integrating innovative courses including BIM engineering, construction information technology, and facility management into current AEC-based departments including Architecture, Civil Engineering, and Construction Engineering & Management, so implementing an enhanced curriculum for the proposed "Department of BIM Engineering & AEC Management".

III. COMPREHENSIVE ANALYSIS FOR BIM CURRICULUM DEVELOPMENT

This is the Comprehensive Approach to Systematic BIM Curriculum Development for the Next Generation of BIM-Skilled Professionals in Bangladesh:

➢ *BIM Curriculum Preparation Stage:*

To improve AEC education in Bangladesh, universities should have a structured BIM course for a semester. This course should combine BIM with construction IT, so students get both theoretical and practical industry knowledge [10].

The BIM course should cover these topics: (a) academic integration challenges; (b) BIM vs traditional construction; (c) BIM roles in AEC firms; (d) industry BIM skill requirements; (e) BIM in intelligent buildings; (f) engineering and management principles; (g) the AEC industry is moving towards BIM education.

BIM education in Bangladesh is mostly theoretical with limited practical application due to traditional teaching methods, lack of faculty expertise, and shortage of instructors who are skilled in both theory and practice. Faculty-led courses often emphasize breadth over depth, so students are not prepared for real-world implementation. External training mostly focuses on software skills without considering industry context, so there is a gap between theory and practice [6], [10].

Despite high expectations from BIM-trained graduates, industry adoption in Bangladesh is limited to design quality management, 3D visualization, scheduling, constructability assessment, and clash detection. But effective construction planning requires a deeper understanding of BIM principles. Graduates should be proficient in BIM-based quantity take-offs, cost estimation, and digital construction management with hands-on experience of using tools like Tekla, Navisworks, and Revit [6], [10].

Industry demands curricula that cover spatial coordination, communication, design quality control, constructability assessment, 4D/5D simulation, and shop drawings. However, existing university programs do not meet industry requirements. A new or revised BIM curriculum should have: (a) BIM basics; (b) implementation strategies for visualization, communication, clash detection and constructability review; (c) BIM in AEC engineering and facilities management; (d) BIM project planning and execution according to industry standards; (e) software interoperability; (f) expanded ICT in AEC practice [6].

Addressing these curriculum gaps will enable Bangladeshi universities to better prepare graduates for industry demands, bridging the gap between academic training and professional BIM application.

➢ *BIM Curriculum Development Stage:*

Five main phases comprise the development of a Building Information Modeling (BIM) curriculum for Bangladesh, each painstakingly matched with national educational standards and industrial criteria.

- Comprehensive Framework: The curriculum should be flexible enough to change with future BIM advances and combine industry standards and national education legislation. It should also address local building issues pertinent to Bangladesh [11].
- Clear Articulation of Learning Goals: The curriculum should contain quantifiable learning outcomes that emphasize BIM tools, cooperation, and implementation in the project life cycle. It should equip students for the next developments in green building [12].
- Identification of Relevant Knowledge Domains: Important domains comprise modeling methods, data management, and BIM tools. Local building codes and rules should take front stage since they guarantee that the curriculum is customized to Bangladesh's particular demands [13].
- Organized Structuring of Learning Content: Through local case studies, internships, and industry partnerships, content

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should move from basic to advanced BIM principles, theory with actual applications [14].

- Ongoing Evaluation & Refinement: Maintaining the curriculum current with new BIM tools and local industry advancements depends on constant review by students and professionals in the field [15].

- *Comprehensive Framework:*

Bangladesh's Building Information Modeling (BIM) program is set up around a five-phase procedure to produce competent graduates fit for the Architecture, Engineering, and Construction (AEC) industries.

✓ Establishing the Foundational Framework: This phase specifies the extent, target group, goals, and curriculum's applicability to Bangladesh AEC sector. It guarantees that the curriculum meets industry need for BIM and conforms to national education strategy [11].
✓ Literature Review on BIM Implementation: Review of local and worldwide literature on BIM adoption will direct the objectives and approaches of the curriculum to fulfill local industry needs and international standards [12].
✓ Determining Learning Topics & Schedules: Schedules and learning subjects will line up with program goals. Emphasizing basic BIM abilities, AEC engineering knowledge, and industry-relevant management approaches [14], the curriculum will balance theory with practice.
✓ Developing Lectures & Tailored Teaching Methods: The curriculum will apply industry partnerships, case studies, project-based learning, and student-centered teaching approaches. These approaches will give students' academic knowledge as well as practical experience [15].
✓ Implementation & Industry-Academic Collaboration: This phase will guarantee that, via university-industry alliances, the curriculum is applied in the real world. Industry cooperation will comprise R&D projects, internships, and coordinated efforts to give students real-world BIM exposure in the construction sector [13].

This study creates a thorough curriculum in line with industry recruiting criteria that will provide graduates in the Architecture, Engineering, and Construction (AEC) sector the necessary skills needed for employment. To assist this project, universities and AEC companies will form a joint industry-academic alliance. Combining BIM with conventional AEC disciplines, this program generates a workforce that is competent in both. The core structure, as shown in Table 3, is the base of the program. Graduates will broadly understand BIM and Construction Information Communication Technology (ICT), acquiring both theoretical and practical knowledge in AEC engineering and facilities management. The curriculum will develop enhanced skills through AEC enterprise collaboration, focusing on theoretical knowledge, practical application, and employability. The proposed "Department of BIM Engineering & AEC Management" curriculum will be full-time and will provide students with a robust and comprehensive education.

Table 3 A Framework of Suggested BIM-Based AEC Curriculum for Bangladesh.

Full-Time (4-Year) Curriculum for "B. Sc. in BIM Engineering & AEC Management" is developed to the proposed "**Department of BIM Engineering & AEC Management**," and incorporating some BIM engineering, construction IT, and facility management coursework into existing AEC-based departments in Bangladesh such as architecture, civil engineering, construction management to help with program enhancement.		
Three Focused Learning Strategies for a suggested BIM-Based Curriculum in Bangladesh		
(1) Fundamental BIM Skills	**(2) AEC Engineering Expertise**	**(3) Collaborative Learning Initiatives**
✓ BIM, CAD Software, ICT ✓ Geometry & Design Composition ✓ BIM Basic & Advanced Techniques ✓ Integration of BIM & CIM System ✓ BIM API and R&D ✓ 3D Viz for Communication ✓ Energy & Environmental Analysis	✓ AEC Engineering & Management ✓ Structural Systems & Engineering ✓ Construction Methods & Materials ✓ Scheduling, BOQ & Cost Estimating ✓ Construction Drawings & Regulations ✓ Quality, Safety & Sustainability ✓ MEP Systems & Facility Management	✓ BIM Prototyping Projects 1&2 ✓ Joint R&D Project (Company Collaboration) 1&2 ✓ BIM Management Techniques ✓ Capstone Project/Thesis ✓ BIM Internship with Company Collaboration
Note: BIM = Building Information Modeling; API = Application Programming Interface; R&D = Research & Development; ICT = Information & Communications Technologies; MEP = Mechanical, Electrical, & Plumbing; BOQ = Bill of Quantity; CIM = Construction Information Management		

- *Clear Articulation of Learning Goals:*

Well-defined, Clear learning objectives are important for students to be ready for the job market and be ready in Bangladesh. These objectives outline program knowledge, skills, and desired behaviors [16], providing students with measurable and achievable milestones.

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BIM Convergent Architecture, Engineering and Construction (AEC) Engineering and Facilities Management Curriculum is designed to equip students in Bangladesh with knowledge relevant to the country's construction industry. With rapid urbanization and infrastructure development projects, BIM is becoming more and more important in Bangladesh for project efficiency, cost estimation, and sustainable development. The curriculum ensures that students get theoretical understanding and practical knowledge relevant to the local construction industry.

Table 4 categorizes the learning objectives in the BIM-based AEC curriculum into three domains: cognitive (knowledge-based thinking skills), affective (emotional intelligence and attitude development), and psychomotor (manual and physical skills) [4] so the learning process is structured, and students can develop a well-rounded skill set.

Table 4 BIM-Based AEC Curriculum Learning Objectives

Learning Aims	No.	Learning Objectives	Type
Understand BIM basics (Ideas + Theories)	1	Understand the general idea and theories of BIM	Cognitive
	2	Analyze trends and modern BIM technologies applied in the AEC industry of Bangladesh	Cognitive
	3	Understand the theories of Computer-Based Modeling, including AutoCAD, Revit, Tekla, Navisworks	Cognitive
Familiarization with BIM in Construction processes	4	Assess BIM implementation methodologies and strategies relevant to Bangladesh	Cognitive
	5	Identify BIM implementation areas in AEC design & construction works, and Facility Management process	Cognitive
	6	Distinguish the importance of BIM applications and stakeholders' roles in the Bangladeshi AEC industry	Cognitive
Learn how to use BIM software.	7	Acquire basic BIM modeling and authoring skills using Autodesk Revit	Psychomotor
	8	Understand how a BIM model uses for simulation, visualization, scheduling, estimation, and analysis that focusing on local case studies in Bangladesh	Cognitive/ Psychomotor
Develop BIM skills & use BIM-allied software in AEC sector	9	Apply functional parametric BIM abilities for freeform & NURBS (Non-Uniform Rational B-spline) modeling	Psychomotor
	10	Explore diverse BIM skills, including 3D scanning, 3D printing, API integrations, with relevance to AEC sector	Psychomotor
	11	Study theories connected to AEC and Facility Management apply to AEC practice in Bangladesh	Cognitive
	12	Connect BIM knowledge to AEC engineering and Facility Management ideas relevant to Bangladesh	Affective
	13	Master BIM-based AEC practice through software applications tailored to local projects	Psychomotor
Become an industry-ready BIM expert for the AEC industry.	14	Apply BIM skills in AEC industry projects, including joint-company and R&D initiatives within Bangladesh	Affective
	15	Enhance creativity by planning virtual projects using BIM	Affective
	16	Recognize and explore emerging BIM-converged technology and construction IT trends in Bangladesh	Cognitive

By incorporating these learning objectives into the curriculum, students get a structured and comprehensive education to face the demands of the modern AEC industry in Bangladesh. The categorization of objectives across cognitive, affective, and psychomotor domains ensures that learners develop theoretical knowledge and practical and interpersonal skills for professional success.

- *Identification of Relevant Knowledge Domains:*

For an effective BIM-based AEC curriculum in Bangladesh, learning objectives, learner activities, and process objectives must match industry needs. Instructional themes should reflect core competencies and adhere to AEC industry standards and norms in Bangladesh [16]. The BIM specialist training curriculum has five learning themes and twenty subtopics and supports a structured four-year study plan for the country's construction industry [4]. As Table 5 shows, the BIM specialist training curriculum (new or existing) has five learning themes and twenty subtopics and matches the objectives in Table 4. This corresponding learning schedule has been developed to ensure a smooth knowledge transition.

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Bangladesh AEC industry is adopting BIM gradually with government led smart city initiatives, infrastructure megaprojects and demand for cost effective and sustainable construction. This curriculum ensures students get skills relevant to national industry needs and global BIM standards.

Table 5 Selecting Learning Topics for BIM-Based AEC Curricula

Main-Topics	Sub-Topics	Allied Objectives	Focusing Semester
Background Knowledge of BIM	✓ Definition and importance of BIM in Bangladesh	1, 3, 6	1
	✓ History of BIM and construction IT in Bangladesh	2, 3, 8	1
	✓ Terminology and theories related to BIM	1, 3, 5	1
	✓ Issues and advantages of BIM adoption in Bangladesh	1, 2, 3, 5, 6	1,2,3,4
Adoption of BIM in AEC Industry	✓ Traditional vs. BIM-based construction in Bangladesh	3, 4, 5, 6	1
	✓ Changing stakeholder roles in BIM adoption	5, 6	1
	✓ BIM-based collaboration strategies	5, 6	2,3
	✓ BIM applications to enhance productivity	5, 8, 11, 12, 13	2,3
	✓ BIM-based project execution planning	4, 5, 11, 12, 13	2,3,4
Knowledge of BIM Software	✓ Authoring skills for architecture, structure, and MEP	3, 5, 7, 11, 12, 13	1,2
	✓ BIM management using simulation and visualization	3, 5, 8, 11, 12, 13	12,3,4
	✓ Advanced BIM skills for complex structures	9, 11, 12, 13	2,3
IT & Innovative Construction	✓ Programming for BIM API solutions	5, 6, 8, 10	2,3
	✓ 3D scanning and printing for BIM applications	5, 6, 7, 10	3
	✓ Emerging trends in BIM and ICT for Bangladesh	10, 14, 15, 16	3,4
Design & Construction Management	✓ Basic AEC and CM knowledge	11,12,13	2,3
	✓ Applying BIM in Bangladeshi projects	11, 12, 13	12,3,4
	✓ BIM for scheduling, cost, and quality management	13, 14, 15	1,2,3,4
	✓ Integrating BIM with CM	14, 15, 16	2,3,4

This curriculum ensures that students get knowledge of BIM applications relevant to Bangladesh's infrastructure and real estate development. It addresses the challenges of slow adoption of digital construction methods, lack of skilled professionals, and integration with local building codes and standards. Through this structured learning process, graduates can contribute to BIM-enabled construction efficiency, cost reduction, and sustainability in Bangladesh's growing AEC industry.

- *Organized Structuring of Learning Content:*

These outline the thematic organization and schedule of the Building Information Modeling (BIM) curriculum adapted to Bangladesh. The curriculum aims to achieve two main objectives: first, to develop student competency for real-world application in construction industry of Bangladesh and second, to meet the academic and professional standards set by regulatory bodies like Institute of Architects Bangladesh (IAB), Institution of Engineers, Bangladesh (IEB) and University Grants Commission (UGC) of Bangladesh [22].

The four-year undergraduate program has general science, social science, and humanities courses in the first year to provide a well-rounded education. From the second year onwards, a project-based learning (PBL) approach was developed in collaboration with industry partners, including the Institute of Architects Bangladesh (IAB), Institution of Engineers, Bangladesh (IEB), Public Works Department (PWD), and leading construction firms assessing student skills. Course sequencing ensures integration of theoretical knowledge with practical application and thematic coherence. The four-year structure, as shown in Table 6, organizes subjects into thematic learning units to develop student understanding and skill. The curriculum has 37 courses updated every year to reflect the changing pedagogical and industry-specific goals in Bangladesh.

Table 6 BIM-Based AEC Curriculum Structure

Year	Semester	Course Name	Learning Mode			
			L	P	C	R
1st Year	**1st Semester**	Understanding BIM Software	✓			
		Fourth Industrial Revolution & Construction in Bangladesh	✓			
		Introduction to Construction Engineering	✓			
		Introduction to Construction Management	✓			

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		Architectural Geometry & Composition	✓			
	2nd Semester	BIM Basics for Architecture		✓		
		BIM Basics for Building Structure		✓		
		BIM Basics for MEP		✓		
		Building Structure & Design Principles	✓			
		Building Construction Processes in Bangladesh	✓			
2nd Year	**1st Semester**	Building Materials & Sustainable Construction	✓			
		BIM Exercise for Architecture		✓		
		BIM Exercise for Building Structure		✓		
		BIM Exercise for MEP		✓		
		BIM Exercise for Analysis & Implementation		✓		
	2nd Semester	Schedule & Cost Management for Bangladesh	✓			
		IT Information Systems & BIM Integration	✓			
		BIM API Basics		✓		
		BIM Enhancement for Free-Form Structures I		✓		
		Understanding & Interpretation of Building Drawings	✓			
3rd Year	**1st Semester**	BIM Prototyping Project I			✓	
		Quality & Safety Management in Bangladesh	✓			
		BIM API Practice		✓		
		BIM Enhancement for Free-Form Structures II		✓		
		3D Scanning & 3D Printing in Construction		✓		
	2nd Semester	BIM Prototyping Project II			✓	
		Project Planning for BIM Practice	✓			
		AEC Industry-Joint R&D Project I			✓	
		Building MEP Systems in Bangladesh		✓		
		Construction Regulations & Compliance	✓			
4th Year	**1st Semester**	BIM Management Exercise		✓		
		Structural Analysis & Simulation	✓			
		Quantity Take-Off & Cost Estimation		✓		
		AEC Industry-Joint R&D Project II			✓	
		BIM & ICT in Construction	✓			
	2nd Semester	Practical BIM Internship & Industry-Based Learning			✓	
		Graduation Project/Thesis				✓
Note: L = Lecture, **P** = Practical, **C** = Company Collaboration, **R** = Research.						

First year curriculum has lecture-based BIM software training by industry experts in academic and corporate setup. As students' progress, the curriculum becomes more hands on to prepare students for BIM careers in Bangladesh. Corporate stakeholder involvement ensures industry relevance.

Years two and three are mostly lecture-based except for "Quality and Safety Management" and industry sponsored initiatives like "BIM Upgrade for Free-Form Structures" and "BIM Prototyping Projects". Free-form structure implementation uses the latest tools in Bangladesh. Prototyping project involves students directly in industry-led projects to have hands-on learning.

Fourth year has intensive course work on BIM software, ICT applications, AEC engineering, and facilities management relevant to Bangladesh. Students will also be involved in Problem-Based Learning (PBL) initiatives, including industry research and development. This will prepare the graduates to contribute to the AEC industry of Bangladesh and other infrastructure development.

- *Ongoing Evaluation and Refinement:*

A systematic approach was followed in developing the research-based Building Information Modeling (BIM) enabled Architecture, Engineering and Construction (AEC) engineering and construction management program. To ensure the program's validity and industry relevance, each participating institution must implement the curriculum in a new department [4], [17], [18]. Industry engagement is important; AEC firms in Bangladesh must actively recruit graduates and integrate their BIM skills in their projects. A structured BIM validation and feedback mechanism will be implemented to assess the curriculum and ensure continuous improvement [19].

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Formed to validate the curriculum composed of six AEC/MEP and BIM management specialists, two university education experts, and two polytechnic education experts, it was a ten-member expert panel. The panel carefully went over the curriculum to make sure it satisfied Bangladesh's professional and educational criteria. The COVID-19 epidemic led to remote discussions with these specialists over the phone to get input [28]. Table 7 lists the several degrees of experience among the panel members as well as their positions in academia and the AEC sector in Bangladesh.

Table 7 Educational and AEC Industry Experience in Bangladesh

Field/Sector	Types of Interviewees		BIM Experience (Years)	Position	Role of Activities
Academic	University	Interviewee #01	10-12	Associate Professor	Teaching & Research
		Interviewee #02	7-8	Assistant Professor	Teaching & Research
	Polytechnic Institute	Interviewee #03	4-5	Chief Instructor	Teaching
		Interviewee #04	2-3	Instructor	Teaching
AEC Industry	AEC Consultants	Interviewee #05	12-15	Architect	Architecture/Interior Design
		Interviewee #06	10-12	Civil Engineer	Structure Design & Supervision
		Interviewee #07	8-10	MEP Consultant	MEP Design & Construction
	PM/CM/BIM/FM Managers	Interviewee #08	10-12	PM/CM Manager	Managing all associated Project activities
		Interviewee #09	5-7	BIM Manager	BIM execution in Design & Construction Process
		Interviewee #10	6-8	FM Manager	Overseeing maintenance, safety & satisfaction

Note: PM = Project Management; CM = Construction Management; FM = Facility Management; BIM = Building Information Modeling

Ten phone interviews were done to get comments on the applicability and influence of the BIM curriculum in Bangladeshi surroundings. Based on four essential themes, the expert panel assessed the curriculum:

- Industry Alignment: Determines whether BIM is aligned with the current and future operational aspects of the AEC industry.
- Learning Outcomes: Articulating BIM competencies for graduates in response to current and future needs.
- Instructional Materials: Comparison with respected educational and professional standards to ensure the quality and relevance to the AEC industry demands.
- Pedagogical Effectiveness: Evaluation of BIM teaching methodology, content delivery, and inter-disciplinary collaboration strategies and approaches [20].

The feedback from the expert panel was used to modify the curriculum. Adjustments were made based on industry needs so that graduates can contribute to the growing AEC sector of Bangladesh. Table 8 summarizes the Expert key feedback themes and the corresponding modifications incorporated into the curriculum.

Table 8 Summary of Expert Feedback and Curriculum Refinements

Evaluation Theme	Key Feedback from Experts	Refinements Implemented
Industry Aligned Curriculum Content	Needs greater focus on local BIM standards and regulatory framework	Added Bangladesh-specific BIM guidelines and case studies
Learning Goals and Outcomes	Greater clarity and articulation are needed in defining BIM competencies	Revised curriculum objectives to align with industry expectations
Instructional Materials	More hands-on projects and real-world applications required	Integrated practical BIM modeling projects with local industry involvement
Pedagogical Approach	Stronger interdisciplinary collaboration recommended	Introduced joint projects involving Architecture, Civil, MEP, and Facility Management disciplines

The curriculum will be reviewed periodically to ensure its relevance and effectiveness. Industry engagement will continue to be a key component, with regular feedback loops with AEC firms, academic institutions, and policymakers in Bangladesh. Future updates of the curriculum will incorporate emerging BIM technologies and best practices so that graduates can meet the changing industry needs [21]. International BIM standardization bodies will also be collaborated with to maintains global relevance, and graduates will have skills that are competitive in both local and

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international job markets.

➢ *BIM Curriculum (New/Updated) Implementation Stage:*

A new "Department of BIM Engineering & AEC Management" will be introduced in Bangladeshi educational institutions to integrate BIM into Architecture, Engineering and Construction (AEC) curriculum. This strategic move will provide a framework for curriculum development to align with industry needs and international best practices.

The existing department will update and change the AEC curriculum to include BIM courses so that graduates can have the necessary skills for Bangladesh's construction industry. It will work with key industry stakeholders, including AEC firms, MEP design organizations, BIM service providers, and software vendors to ensure practical relevance.

Collaboration with international BIM standardization bodies will make the graduates globally competitive, and research in BIM applications will address Bangladesh's infrastructure needs. This initiative will bridge the gap between theoretical knowledge and practical industry applications so that professionals can be ready for the digitally driven construction industry [19], [21].

IV. CONCLUSION

Bangladesh's growing interest in BIM shows the need for a structured and industry-aligned educational framework. BIM education in Bangladesh is limited and not aligned with global AEC industry standards. This study fills the gap by developing a BIM-integrated AEC curriculum suitable for Bangladesh's AEC practice and construction scenario.

The curriculum is designed to make graduates BIM-competent so that they can apply in the AEC industry immediately. It introduces the structured process for student selection, assessment and grading, and collaboration with professional design consultancy and construction firms. By linking BIM with real-world practices, this initiative will pave the way for future research and development in Bangladesh's AEC education sector. Strengthening BIM education will help the country to meet the needs of the growing construction industry and align with international standards.

➢ *Conflict of Interest*

The authors declare no conflict of interest if manuscript is published.

➢ *Author Contribution*

The authors of the manuscript titled " BIM Skill Deployment in Bangladesh's AEC Industry: A Forward-Looking Academic Perspective" contributed to the research work as follows: Study conception and design: Mohammad Abdul Awal. Data collection: Mohammad Abdul Awal. Analysis and interpretation of results: Mohammad Abdul Awal. Draft manuscript preparation: Mohammad Abdul Awal, Avizit Biswas.

Every author checked the data and approved the last draft of this paper. Every author assumes accountability for the work's integrity and accuracy.

REFERENCES

[1]. R. Sacks, C. M. Eastman, and G. Lee, "A model for building information modeling in the construction industry," Building Research & Information, vol. 32, no. 4, pp. 307-318, 2004. https://doi.org/10.1080/09613210410001709167.

[2]. M. Benner and S. McArthur, "Building information modeling education in construction management programs: A review of the literature," Journal of Construction Engineering and Management, vol. 145, no. 3, p. 04018099, 2019. https://doi.org/10.1061/(ASCE)CO.1943-7862.0001623.

[3]. O. A. Olatunji, "BIM education and training: Opportunities and challenges for the AEC industry in Africa," International Journal of BIM and Construction, vol. 7, no. 2, pp. 112-118, 2019.

[4]. S. Lee, J. Yu, and D. Jeong, "BIM education in a construction IT course for civil engineering students," Journal of Professional Issues in Engineering Education and Practice, vol. 145, no. 4, p. 04019008, 2019. https://doi.org/10.1061/(ASCE)EI.1943-5541.0000426.

[5]. J. Donaldson, "Understanding the value of pedagogical approaches to construction education: The case of action learning," Construction Management and Economics, vol. 32, no. 6, pp. 542-551, 2014. https://doi.org/10.1080/01446193.2014.897712.

[6]. Y. H. Ahn, Y. H. Kwak, and S. J. Suk, "Contractors' transformation strategies for adopting building information modeling," Journal of Management in Engineering, vol. 29, no. 3, pp. 224-235, 2013. https://doi.org/10.1061/(ASCE)ME.1943-5479.0000140.

[7]. M. Neary, Curriculum Studies in Post-Compulsory and Adult Education: A Teacher's and Student Teacher's Study Guide. Nelson Thornes, 2003.

[8]. G. O'Neill, "Initiating curriculum revision: Exploring the practices of educational developers," International Journal for Academic Development, vol. 15, no. 1, pp. 61–71, 2010. https://doi.org/10.1080/13601440903529839.

[9]. R. W. Tyler, Basic Principles of Curriculum and Instruction. University of Chicago Press, 2013.

[10]. S. Lee, H. Park, and J. Won, "Developing a structured BIM curriculum for architecture, engineering, and construction education," Automation in Construction, vol. 106, p. 102849, 2019. https://doi.org/10.1016/j.autcon.2019.102849.

[11]. M. T. Rahman, "The role of Building Information Modeling in the Bangladesh construction industry: Policy, progress, and future directions," Building Information and Technology, vol. 4, no. 2, pp. 97-108, 2021.

[12]. S. M. Alam, S. H. Ahmed, and F. R. Khan, "Building information modeling: A step toward sustainable

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25oct1143

Construction in Bangladesh," Journal of Construction Engineering and Management, vol. 146, no. 7, p. 04020086, 2020. https://doi.org/10.1061/(ASCE)CO.1943-7862.0001857.

[13]. S. Siddique, S. Zaman, and M. Choudhury, "Assessing BIM adoption in Bangladesh: From theory to practice," Journal of Building Technology, vol. 12, no. 4, pp. 102-118, 2022.

[14]. R. Jahangir, S. M. Ahmed, and M. Rahman, "Application of BIM in architectural and construction education: A Bangladesh perspective," International Journal of Engineering Education, vol. 39, no. 1, pp. 234-247, 2023. https://doi.org/10.1016/j.ijee.2022.06.010.

[15]. M. A. Mollah, M. M. Hossain, and N. Akhter, "Curriculum development for BIM education in Bangladesh: Challenges and opportunities," The International Journal of BIM Education, vol. 3, no. 1, pp. 45-58, 2021.

[16]. J. McKimm, Curriculum Design and Development. Medical Education Department, University of Bedfordshire, 2007.

[17]. Y. H. Ahn, C. S. Cho, and H. Kim, "State-of-the-art BIM applications in construction," Journal of Construction Engineering and Management, vol. 135, no. 10, pp. 953-965, 2009. https://doi.org/10.1061/(ASCE)CO.1943-7862.0000140.

[18]. C. Gordon, S. Azhar, and S. Ahmed, "BIM education: Bridging the gap between academia and industry," Journal of Building Engineering, vol. 25, p. 100791, 2019. https://doi.org/10.1016/j.jobe.2019.100791.

[19]. K. Rahman and M. Haque, "Impact of BIM adoption in Bangladesh's construction industry," International Journal of Architecture and Construction, vol. 12, no. 3, pp. 45-60, 2021.

[20]. M. S. Islam, M. M. Rahman, and R. Hasan, "Evaluation of BIM curricula in South Asian universities: A Bangladesh perspective," Journal of Construction Education and Research, vol. 18, no. 2, pp. 150-169, 2022.

[21]. A. Khan and S. Alam, "Integration of BIM in construction education: A roadmap for Bangladesh," Journal of Civil Engineering and Management, vol. 29, no. 1, pp. 10-25, 2023.

[22]. University Grants Commission of Bangladesh, "Curriculum Guidelines for Engineering and Technology Programs," 2022. https://www.ugc.gov.bd.