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Empowering quantity surveying students through BIM:
A survey on attitudes, benefits, and barriers in learning BIM tools

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Abstract

In the era of Education 5.0, Building Information Modelling (BIM) has become a vital digital competency for future-ready construction professionals. However, many Quantity Surveying (QS) students enter higher education with limited exposure to BIM, creating a gap between academic preparation and industry expectations. This study investigates the attitudes of QS students, encompassing their readiness, as well as the perceived benefits and barriers to learning BIM tools within a tertiary education context. A structured questionnaire was distributed to QS students enrolled in a BIM-integrated course at Universiti Teknologi MARA, yielding 163 valid responses. Data was analyzed using descriptive statistics and the Relative Importance Index (RII) ranking methods. The results reveal that, while most students had limited prior exposure, they expressed strong enthusiasm for learning BIM. Students value BIM's visualization capacity, its role in enhancing understanding of construction processes, and its contribution to collaborative learning. They also recognized BIM as an essential enabler for employability and long-term career development. At the same time, challenges such as hardware limitations, steep learning curves, and time constraints emerged as significant barriers. These findings highlight the importance of institutional support, adequate resources, and scaffolded teaching strategies. Overall, the study demonstrates BIM's potential to empower QS students with digital competency, professional confidence, and career readiness, aligning with Education 5.0. It provides practical strategies for educators to bridge the gap between digital technologies and student capability.

Keywords: *Quantity Surveying, Building Information Modelling, BIM tools, Built environment education, digital learning*

INTRODUCTION

Building Information Modelling (BIM) has become a key digital innovation in the construction industry, enabling enhanced visualization, coordination, and efficiency across project lifecycles. In the era of Education 5.0, higher education institutions are expected to equip students with advanced digital skills to meet the evolving demands of the industry. For Quantity Surveying (QS) students, BIM supports essential tasks such as measurement, cost planning, and project management, making BIM literacy a critical graduate competency (Ismail et al., 2021).

Despite its importance, many QS students in Malaysia enter higher education with limited exposure to BIM tools, resulting in a gap between academic training and professional expectations. Recent studies have highlighted that while students recognize the relevance of BIM, they encounter barriers such as inadequate resources, steep learning curves, and time constraints, which hinder effective adoption (Harris et al., 2024; Imoudu et al., 2022). Such challenges reduce the effectiveness of BIM education in equipping students for digital practice.

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Existing research has primarily focused on curriculum development or industry-level adoption, with fewer studies examining QS students' own perceptions and readiness for BIM. Azhar et al. (2021) emphasize that readiness is a key factor influencing BIM adoption, yet evidence specific to QS education remains limited. Addressing this gap, the present study investigates the attitudes of QS students, including their readiness, perceived benefits, and barriers to learning BIM. The objective is to provide insights that can inform strategies for more effective BIM integration into QS education, ultimately aligning graduate competencies with the aspirations of Education 5.0.

Research Objectives

Based on the research gap identified above, this study aims to examine Quantity Surveying (QS) students' perceptions of Building Information Modelling (BIM) tools within a higher education context. Specifically, the study addresses the following research objectives:

1. To examine Quantity Surveying students' readiness and attitudes toward learning Building Information Modelling (BIM) tools.
2. To identify the perceived educational and long-term professional benefits of learning BIM tools among Quantity Surveying students.
3. To determine the major barriers that hinder Quantity Surveying students from effectively learning and adopting BIM tools.
4. To provide evidence-based recommendations for strengthening BIM integration in Quantity Surveying education in support of Education 5.0.

LITERATURE REVIEW

Education 5.0 and Digital Competencies in Higher Education

Education 5.0 reframes digitalization around a human-centric, values-aligned model of learning, integrating Artificial Intelligence (AI), virtual environments, and collaborative technologies to prepare graduates for industry workplaces (Agarwal, 2025). Rather than treating tools as add-ons, current education emphasizes creativity, ethics, and well-being alongside advanced digital fluency (Arregi et al., 2025). Empirical studies indicate that institutions are modifying courses to incorporate hybrid learning and AI, thereby supporting students' learning experiences and engagement, which correlates with the digital competence of teaching staff and the quality of curriculum design (de Obesso et al., 2023; Dang et al., 2024). Post-pandemic transitions also altered how students create and manage digital content, with measurable improvements in specific competence dimensions (Hervás-Torres et al., 2024). Systematic work in higher education highlights that digital competence encompasses technical, cognitive, communicative, and ethical facets, revealing that gaps persist across learner groups and programs (Zhao et al., 2021; Tra et al., 2024). Education 5.0 is aligned with curricula; therefore, it aims to build transferable digital skills, focusing on collaboration, data handling, and platform fluency, which translate to employability (Agarwal, 2025).

Building Information Modelling (BIM) in Quantity Surveying Education

Internationally, Quantity Surveying (QS) courses increasingly embed BIM through hands-on model tasks, cost extraction, and cross-disciplinary collaboration, but depth varies by context (Corrado et al., 2023). In developing regions, awareness and curricular coherence are still being consolidated, with gaps in data interoperability, understanding, and structured exposure across program years (Corrado et al., 2023). The importance of BIM exposure for QS students is currently progressive, providing a link between classroom theory and simulated practice that builds confidence and enhances employability. Reviews emphasize that embedding BIM across levels supports the development of durable skills and professional identity formation for QS learners

(Torres et al., 2025; Alathamneh et al., 2024). Institutional initiatives in Malaysia cite increased advocacy for BIM yet note uneven depth of integration and limited resources that constrain systematic curriculum reform, especially for QS pathways (Jaafar et al., 2024; Othman et al., 2021).

Student Readiness and Attitudes toward BIM Learning

Readiness blends prior exposure, digital literacy, self-efficacy, and access to resources. Higher education studies indicate that student experience is significantly shaped by educators' digital competence and the learning design that scaffolds the use of complex tools (de Obesso et al., 2023; Dang et al., 2024). In BIM contexts, limited prior modelling experience and hardware constraints often decrease confidence, necessitating careful sequencing of tasks (Hervás-Torres et al., 2024). BIM education studies report a mix of enthusiasm for visualization and anxiety about modelling complexity, which leads to the need for structured guidance and peer work help (Torres et al., 2025). Regional adoption studies also capture variability in BIM awareness, signaling the need for curricular support (Corrado et al., 2023).

Perceived Benefits of BIM for Students

Firstly, the benefits of BIM for students are in terms of enhancing their understanding of the construction process. This simulation supports integrated thinking about sequencing, logistics, and visualizations of projects (Rehman et al., 2025). Next, it can improve visualization and collaborative learning. Computational programming and BIM will enable collaboration to improve clash resolution, information sharing, and team coordination (Seghier et al., 2024; Forth et al., 2023; Morin et al., 2024). Furthermore, this can contribute to employability and long-term career development. As organizations scale BIM, model-centred cost skills become differentiators in recruitment and early career roles, especially for QS roles. (Alathamneh et al., 2024; Rinchen et al., 2024).

Barriers and Challenges in BIM Adoption among Students

Studies consistently note high entry costs, especially in hardware specifications and licenses, which serve as the core barrier to BIM adaptation among students, particularly outside institutional labs (Pavón et al., 2025; Waqar et al., 2024). BIM's multi-dimensionality, which involves geometry, data, and parametric. Steep learning curves and time constraints drive cognitive load. Without staged support, students report experiencing time pressure and a decline in the quality of their work (Rinchen et al., 2024). At the program level, uneven staff expertise, limited training, and fragmented support impede scaling. Regional evidence highlights readiness and workflow barriers that mirror industry constraints (Jaafar et al., 2024; Alshibani et al., 2024). These justify the present study's focus on QS students' readiness, perceived benefits, and barriers within a Malaysian higher education context.

RESEARCH METHOD

This study employed a quantitative research design to investigate Quantity Surveying (QS) students' attitudes, perceived benefits, and barriers in learning Building Information Modelling (BIM) tools. The research was conducted among students enrolled in the computer-Aided Design and Drawing (BQS516) course at Universiti Teknologi MARA, Shah Alam, Malaysia, which introduces BIM through Autodesk Revit as part of its curriculum.

A structured questionnaire was developed following a review of the literature on BIM education and digital learning in the built environment. The instrument comprised five sections: (A) General Information; (B) Students' Attitudes in Learning BIM Tools; (C) Long-Term BIM Benefits; and (D) Barriers to Using BIM Tools. The questionnaire included a combination of Yes/No items, frequency-based questions, and five-point Likert scale statements (1 = Strongly Disagree to 5 = Strongly Agree).

The survey was distributed to students enrolled in the BQS 516 course, and a total of 163 valid responses were collected. Data was analyzed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics (frequency, mean, and standard deviation) were used to summarize student responses. At the same time, the Relative Importance Index (RII) method was employed to prioritize and rank the significance of attitudes, benefits, and barriers.

FINDING AND DISCUSSION

The findings in Table 1 indicate that while a majority of students (62.6%) had heard of BIM before enrolling in their course, fewer had practical exposure to it. Only 33.1% reported using BIM software before taking the course, and just 22.1% had prior experience with such tools. In terms of frequency, most students were occasional users: 32.5% used BIM rarely, 26.4% used it weekly, and 11% used it monthly. Notably, 27.6% had never used BIM software for academic purposes. This suggests that although BIM awareness is relatively high, actual hands-on experience remains limited among students prior to structured learning.

Table 1 General Information

Questions	Answers	Frequency (No.)	Percentage (%)
Have you heard of Building Information Modelling (BIM) before enrolling in your current course?	Yes	102	62.6
	No	61	37.4
	Total	163	100
Have you used any BIM software before taking this course?	Yes	54	33.1
	No	109	66.9
	Total	163	100
Have you had prior experience using BIM software before this course?	Yes	36	22.1
	No	127	77.9
	Total	163	100
How frequently do you use BIM software for academic purposes?	Daily	4	2.5
	Monthly	18	11.0
	Never	45	27.6
	Rarely	53	32.5
	Weekly	43	26.4
	Total	163	100

In terms of students' attitudes toward learning BIM tools (refer to Table 2), the students demonstrated positive attitudes toward learning BIM, with the strongest agreement on the desire to enhance their knowledge of BIM applications (RII = 0.861). BIM was perceived as exciting (RII = 0.855) and engaging (RII = 0.836), while students also recognized its role in fostering collaboration (RII = 0.825) and critical thinking (RII = 0.823). Regarding software use, students highlighted the benefits of visualization (RII = 0.840), improved understanding of building components (RII = 0.833), and construction processes (RII = 0.826). For readiness, the strongest perceptions were that BIM provides a competitive job advantage (RII = 0.843) and motivates them to explore advanced applications (RII = 0.837). However, relatively lower rankings were given to course preparation (RII = 0.737) and confidence in workplace performance (RII = 0.784), indicating areas for instructional improvement.

Table 2 Students' Attitudes in Learning BIM Tools

Descriptions	RII	Rank
Attitudes towards Learning Construction		
I would like to enhance my knowledge of BIM applications.	0.861	1
I find BIM software to be an exciting tool for learning.	0.855	2
I find BIM software engaging and interesting.	0.836	3
BIM enhances my ability to work in a collaborative environment.	0.825	4
Learning BIM improves my critical thinking skills.	0.823	5
I enjoy working with BIM tools.	0.788	6
I will only use BIM tools when required.	0.774	7
Attitudes towards BIM Software		
Creating BIM models has improved my ability to visualize buildings.	0.840	1
BIM has improved my understanding of building components (e.g., floors, columns, beams).	0.833	2
BIM has helped me understand building construction.	0.826	3
BIM improves my understanding of sustainable design and construction practices.	0.818	4
Using BIM has enhanced my problem-solving skills in construction projects.	0.810	5
I can develop a model and generate plans, sections, elevations, and quantity take-offs using BIM tools.	0.806	6
I have developed a strong foundational understanding of building construction, enabling me to learn BIM independently.	0.802	7
Attitudes towards BIM Readiness		
BIM provides a competitive advantage in the job market.	0.843	1
I am willing to explore advanced BIM applications further.	0.837	2
BIM skills will enhance my ability to work in multidisciplinary teams.	0.825	3
I am aware of BIM developments in my country.	0.816	4
I am satisfied with the BIM knowledge acquired in this course.	0.787	5
I am confident in performing well in a BIM-enabled work environment.	0.784	6
I have gained a clear understanding of BIM through this course.	0.780	7
I was adequately prepared for this course.	0.737	8

Whilst, based on Table 3, regarding long-term BIM benefits, the students strongly believed in the long-term value of BIM for their careers. The highest-rated benefits were gaining a competitive edge in the job market (RII = 0.845), closely followed by their importance for career development (RII = 0.843) and professional usefulness (RII = 0.837). Students also value BIM for teamwork enhancement (RII = 0.827) and building confidence in job applications (RII = 0.822). Importantly, BIM was seen as transformative in shaping perspectives on construction processes (RII = 0.811) and technical drawing production (RII = 0.804). Overall, these results suggest students view BIM competency as a crucial asset for employability and professional growth.

Table 3 Long-Term BIM Benefits

Descriptions	RII	Rank
BIM provides a competitive advantage in the job market.	0.845	1
I consider BIM to be essential for my future career development.	0.843	2
I am confident that BIM knowledge will be beneficial for my professional career.	0.837	3
BIM skills will enhance my ability to work in multidisciplinary teams.	0.827	4

Descriptions	RII	Rank
My knowledge of BIM has increased my confidence in applying for future job opportunities.	0.822	5
Learning BIM has changed my perspective on building construction processes.	0.811	6
I will be able to use BIM tools to produce technical drawings in the future.	0.804	7

However, several barriers were identified in the use of BIM tools, as shown in Table 4. The most significant was the high technical specifications required for laptops and equipment (RII = 0.853). This was followed by the need for extensive training (RII = 0.840) and the considerable time required to master BIM skills (RII = 0.838). Cost concerns related to purchasing hardware (RII = 0.821) also posed barriers. Other challenges included software complexity (RII = 0.768), time management difficulties (RII = 0.767), and adapting to learning styles (RII = 0.766). Lower-ranked but still notable issues were poor internet connectivity (RII = 0.742), limited BIM components (RII = 0.741), and unreliable power supply (RII = 0.737). These findings highlight the infrastructural, financial, and pedagogical hurdles that must be addressed to maximize BIM integration in education.

Table 4 Barriers to Using BIM Tools

Descriptions	RII	Rank
High technical specifications required for laptops and equipment.	0.853	1
Need for extensive training.	0.840	2
Time required to master BIM skills.	0.838	3
High cost of purchasing laptops and PCs.	0.821	4
Security concerns laptops and equipment.	0.783	5
Complex user interface of BIM software.	0.768	6
Challenges in managing time effectively while learning BIM.	0.767	7
Difficulty in adapting to different learning styles.	0.766	8
Limited access to technical information.	0.744	9
Poor internet connectivity.	0.742	10
Restricted choice of BIM components.	0.741	11
Lack of reliable power supply.	0.737	12

Overall, the results of this study reflect broader trends in BIM adoption and digital education within the built environment. First, the strong student attitudes and high perceived benefits align with findings from studies that show students and academia recognize BIM as a valuable driver for Quantity Surveying (QS) practice (Babatunde, Ekundayo, Babalola, & Jimoh, 2018). The recognition of visualization, model-based output, and improved cost planning as key benefits suggests that educational experiences that align with fundamental industry tools greatly enhance digital competency.

However, barriers such as high equipment costs, limited training, and steep learning curves are consistent with many Malaysian studies that explore obstacles to BIM implementation. For instance, the case study on BIM adoption in Malaysia highlights financial constraints and a lack of skilled personnel as major impediments (Muniandy, Rahman, & Esa, 2023). Similarly, a study on barriers among QS firms in Northern Malaysia identifies software/hardware costs, as well as insufficient education/training, as the top challenges (Anwar et al., 2024).

From an Education 5.0 perspective, which emphasizes learner-centric education supported by advanced technology, these findings suggest that while students are motivated and see long-term advantages, there is a need to strengthen institutional support systems. This includes providing access to sufficient computing resources, structured training modules, and curriculum content that gradually builds students' confidence and proficiency with BIM tools; otherwise, the promise of Education 5.0 may be hindered by infrastructural and pedagogical gaps.

CONCLUSION

This study investigated the attitudes, perceived benefits, and barriers experienced by Quantity Surveying (QS) students in learning Building Information Modelling (BIM) tools within a higher education setting. Based on responses from 163 students enrolled in a BIM-integrated course, the findings indicate that while most students had limited prior exposure to BIM, they demonstrated positive attitudes and readiness to adopt digital tools as part of their learning. Students recognized BIM's value in enhancing visualization, improving understanding of construction processes, and strengthening employability prospects, which reflects its growing importance in QS practice.

However, several challenges were also identified, including hardware limitations, steep learning curves, and time constraints, which may hinder the effectiveness of BIM integration. These findings highlight the need for greater institutional support, improved access to resources, and structured teaching strategies to ensure that BIM learning is both accessible and impactful.

In conclusion, BIM has significant potential to empower QS students by equipping them with the digital competencies and professional confidence required in the era of Education 5.0. By addressing the barriers to adoption, higher education institutions can bridge the gap between academic training and industry expectations, thereby producing graduates who are better equipped to meet the demands of modern construction practice.

Future research could extend this study by adopting longitudinal approaches to track students' BIM learning progression across multiple semesters, or by comparing perceptions between QS students and those from other built environment disciplines. Additionally, exploring the impact of emerging technologies, such as artificial intelligence (AI) and digital twins, on QS education could provide further insights into the evolving role of BIM in supporting digital transformation in higher education.

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