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Exploring Quantity Surveyors' Perspective on Implementing Building Information Modelling (BIM)

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ABSTRACT

Building Information Modelling (BIM) has emerged as a pivotal technological advancement in the construction industry, recognise for enhancing integrated and collaborative processes across the project lifecycle to boost productivity, reduce duration and costs, and improve quality and safety. This study explores the perception of using BIM among Quantity Surveyors (QS) and identifies the effectiveness of BIM in QS practices. This also reveals the significant challenges that hinder BIM adoption, primarily the high costs associated with acquiring BIM technology. Despite these challenges, BIM's benefits, including enhanced efficiency in cost appraisal during early project stages and reduced arithmetic errors through automation, are demonstrated. The methodology involved a structured survey distributed among QS in Selangor, Malaysia, which received 331 responses, with 330 valid responses analyse. The findings reveal that despite the significant barriers-particularly the high costs associated with acquiring BIM technology – BIM offers substantial benefits, including enhanced efficiency in cost appraisal during early project stages and reduced arithmetic errors through automation. Furthermore, BIM contributes to improved accuracy in cost estimates and shorter project timelines in both pre-and post-construction phases. The conclusion drawn from this research emphasise that for BIM implementation to increase in Malaysia, there must be a concerted effort from government bodies and industry stakeholders to foster its development, potentially through policy-making, incentives, and educational programme that facilitate easier access and greater affordability of BIM resources. This collaborative approach could significantly contribute to overcoming the current barriers and fully leveraging BIM's potential to transform the Malaysian construction sector.

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INTRODUCTION

The construction industry is frequently plagued by various challenges that hinder the successful completion of projects. According to Musa et al. (2018), inefficiencies in project outcomes, such as time and cost overruns and poor quality, result in unsatisfactory customer experiences. Contributing factors include inadequate planning, poor site management, insufficient contractor experience, and financial issues such as insufficient client finances and delayed payments for completed works. Internal disputes with subcontractors, materials and labour shortages, equipment availability, and construction errors further exacerbate these problems, often leading to project delays and failures to meet contract deadlines.

To address these persistent issues, the construction industry must embrace innovative technological advancements that enhance efficiency and project outcomes. Building Information Modelling (BIM) has emerged as a transformative technology offering significant potential to reshape construction practices. It enhances project efficiency, fosters stakeholders' collaborations, and improves project sustainability. BIM's advantages include cost and time savings, improved quality and performance, clash detection, increased profitability, better planning and design, enhanced visualisation, and more accurate information (Ismail et al., 2019). These benefits make BIM an essential tool for modern construction practices and underscore the importance of its adoption by industry stakeholders.

However, in Malaysia, BIM adoption remains relatively slow compared to countries such as the United Kingdom, Australia, and Singapore. This slow uptake limits the industry's ability to fully realise BIM's transformative benefits. For Quantity Surveyors (QS), BIM's automation and multidimensional modelling capabilities can significantly reduce arithmetic errors and repetitive tasks, such as tendering and the production of bills of quantities. Despites this potential, barriers such as high implementation costs, limited experience, and insufficient training continue to impede BIM adoption (Ismail et al., 2019). This study seeks to address this gap by exploring Quantity Surveyors' perceptions of BIM adoption in Malaysia, assessing its effectiveness in QS practices and identifying key challenges that hinder its implementation. By examining these aspects, the research aims to contribute to a deeper understanding of how BIM can enhance cost estimation accuracy and overall project efficiency. Ultimately, the findings are expected to provide valuable insights for policymakers, industry practitioners, and educational institutions in formulating strategies to accelerate BIM adoption and enhance QS competencies, thereby supporting the digital transformation of Malaysia's construction sector (Ismail et al., 2021).

LITERATURE REVIEWS

Overview of BIM in Malaysia

Building Information Modelling was introduced in Malaysia by the Public Works Department (PWD) in 2007 to address persistent challenges in the construction industry, such as reducing costs and mitigating design issues (Latifi et al., 2015). As digital transformation reshapes industries globally, adopting digital solutions like BIM has become crucial for individuals and organisations to remain competitive in productivity, innovation, and project delivery. BIM's widespread global adoption has encouraged Malaysia to align with international standards, advancing the construction sector and ensuring it remains competitive with developed nations (CIDB Malaysia, 2020). Despite its recognise potential, BIM adoption in Malaysia remains gradual. Although the Malaysian government mandated BIM for most public projects in 2016, the private sector had already initiated its use as early as 2009 (Ismail et al., 2019). The government's mandate underscores BIM's strategic importance in transforming construction practices, but implementation faces persistent challenges, including high initial investment costs, a shortage of trained professionals, and

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underutilisation of BIM's full capabilities. Encouragingly, awareness has significantly increased – from 26% in 2016 to 74% in 2019 among construction stakeholders – reflecting a growing recognition of BIM's value (CIDB Malaysia, 2020). However, greater efforts are still required to translate this awareness into practical adoption and skill development. For QS, BIM offers transformative capabilities by automating measurement processes, generating more accurate cost estimates, and enhancing project efficiency across time, cost, and quality dimensions (Ismail et al., 2019). These advancements enable QS professionals to contribute more effectively to project planning, administration and performance. By integrating digital competencies with their traditional cost management expertise, QS can position themselves as key enablers of innovation and value creation in the evolving construction landscape (Musa et al., 2018).

Strengths of BIM

Building Information Modelling offers multiple advantages that significantly enhance the efficiency, quality, and effectiveness of construction projects. One of its most critical strengths is its ability to improve communication and collaboration among stakeholders, including QS, engineers, and clients. By providing a centralised digital platform for sharing real-time project information, BIM fosters trust, transparency, and teamwork (Haron et al., 2017). This reduces miscommunication, minimises conflicts, and ensures decisions are based on accurate and updated data. Alassaf et al. (2021) emphasise that improved collaboration nurtures a cooperative culture that enhances problem-solving and leads to better project outcomes. Another major benefit is BIM's advanced three-dimensional (3D) visualisation capabilities, which allow construction professionals to better understand and coordinate project designs before physical construction begins (Latiffi et al., 2016). These virtual models support early assessments, facilitate the preparation of preliminary cost estimates, and enable the identification of design conflicts through clash detection – reducing costly errors during construction (CIDB Malaysia, 2020). Enhanced visualisation also increases client satisfaction by providing clearer insight into design changes and project progress (Alassaf et al., 2021). Furthermore, BIM enhances project quality by enabling early detection of potential issues that could lead to delays or cost overruns. Proactive identification and resolution of such challenges improve coordination across project teams (Latiffi et al., 2015). According to CREAM (2021), QSs benefit significantly from BIM's support for cost planning, value management, and streamlined information handling, all of which enhance project delivery. BIM also accelerates project timelines by automating measurement, cost estimation, and clash detection, thereby reducing manual work and improving overall productivity (Ismail et al., 2019). Collectively, these strengths establish BIM as an essential tool for driving innovation, improving project performance, and elevating construction industry standards.

Challenges in Adopting BIM

Despite its clear advantages, BIM adoption continues to face substantial challenges, particularly in developing economies like Malaysia. One of the most significant barriers is cultural resistance and the entrenched reliance on traditional construction practices. Transitioning to BIM demands not only technical adaptation but also organisational and cultural change, which many companies find daunting (Latiffi et al., 2016). This resistance is compounded by a shortage of skilled professionals capable of effectively implementing and managing BIM processes, highlighting the urgent need for comprehensive training programme and standardised industry guidelines (Alassaf et al., 2021; CIDB Malaysia, 2020). High implementation costs present another major hurdle. The initial expenses for software, hardware upgrades, and staff training are often prohibitive, especially for small and medium-sized enterprises (SMEs) (Fountain & Lengar, 2018; Ismail et al., 2019). Additionally, ongoing costs for continuous training and system maintenance further strain organisational resources (Zainon et al., 2018). Collaboration challenges also persist, as effective BIM use requires seamless integration between various software platforms. Stakeholders often rely on proprietary systems tailored to specific needs, creating interoperability issues that hinder data exchange (Ismail et al., 2021). Addressing this requires investment in centralised databases

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and model servers to facilitate efficient collaboration and information sharing across BIM environments (Zainon et al., 2018). Overcoming these obstacles is critical to unlocking BIM's full potential. Strengthening industry training pipelines, incentivising investment through supportive policies, and promoting software interoperability are essential strategies to accelerate BIM adoption. By addressing these challenges, Malaysia's construction sector can fully harness BIM's transformative capabilities, fostering greater innovation, efficiency, and competitiveness.

METHODOLOGY

This study employs a structured quantitative research methodology to investigate QS perceptions regarding the implementation of BIM in Selangor, Malaysia. The research design consists of three (3) main stages: secondary data collection, primary data collection, and data analysis. In the initial stage, secondary data were gathered from existing literature, including journals, books, reports, and academic articles, to establish the research background, formulate research questions, and define the study objectives. This review of existing knowledge provided a strong conceptual foundation for understanding the current state of BIM adoption, identifying existing gaps, and highlighting potential opportunities within the Malaysian construction sector. The second stage involved primary data collection through a structured online questionnaire distributed to QS practicing in Selangor, including both registered and non-registered professionals. According to the Board of Quantity Surveyors Malaysia (BQSM) 2023 registry, the total population of registered QS in Selangor was approximately 1895, which served as the main reference population for determining the sample size. Based on Krejcie & Morgan's (1970) sampling formula, a representative sample size of 320 respondents was required to achieve a 95% confidence level and 5% margin of error. In addition to that, to ensure adequate coverage, 401 questionnaires were distributed using a stratified random sampling technique based on the district location of firms or organisations within Selangor.

The questionnaire was carefully designed to capture demographic information as well as respondents' perceptions of BIM usage, effectiveness, benefits, and associated challenges within QS practice. It comprised four (4) sections, each focusing on a specific dimension of BIM adoption, with responses measured on a five (5) - point Likert scale ranging from 'strongly disagree' to 'strongly agree'. The survey was administered online via Google Forms to enhance accessibility and participation. On top of it, to certify the reliability and validity of the research instrument, a pilot test was conducted prior to the main survey with a small group of QS professionals (n=30). Feedback from the pilot test was used to refine questionnaire items for clarity and relevance. Internal consistency reliability was assessed using Cronbach's Alpha, with all constructs achieving coefficients above 0.80, indicating strong reliability. Content validity was established through expert review by academic and industry professionals in the construction field and BIM experts. In the final stage, the collected data were analyse using the Statistical Package for the Social Sciences (SPSS) software. Descriptive statistical techniques were applied to summarise the data, with results presented on QS perceptions. Where appropriate, inferential statistical analyses were also conducted to strengthen empirical validation. This methodological approach enables the study to achieve its objectives by providing robust and reliable insights into the current state of BIM adoption among QS in Malaysia. The findings contribute valuable evidence to guide policy formulation, professional training, and strategic initiatives aimed at accelerating BIM implementation and enhancing project outcomes across the Malaysian construction industry.

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RESULTS AND FINDINGS

The results and findings for this research are presented through descriptive analysis, focusing on the response rate, demographic profiles, and specific insight into BIM usage among respondents.

Response Rate

A total of 401 questionnaires were distributed to QS, targeting both registered and non-registered professionals. The list of respondents was selected using a stratified random sampling technique based on the district location of their organisation or firms within the state of Selangor. Of the distributed questionnaires, 331 responses were received from registered QS, resulting in a high response rate of 83% for this group, which exceeds the recommended 70% threshold for survey-based studies (Creswell, 2014) and strengthens the reliability and generalisability of the findings. The remaining 70 responses (17%) were from non-registered QSs. However, to ensure that the analysis accurately reflects professional perspectives on BIM implementation among QSs, only responses from registered QS – including Consultant Quantity Surveyors (CQS), Professional Quantity Surveyors (PQS), Provisional Quantity Surveyors (PVQS), and Quantity Surveyor Technologist (QST) – were included in the final analysis. This focus ensures that the data represent QS professionals with formal qualifications, relevant experience, and practical exposure to BIM practices.

Demographic Profiles

The demographic characteristics of respondents provide valuable context for understanding the study findings. Data were collected on gender, age, BQSM registration status, years of experience, number of projects involved, types of BIM software used, and objectives for adopting BIM applications. Such information is critical for ensuring the sample's representativeness and for interpreting variations in perceptions across different demographic groups (Cresswell, 2014). In terms of gender distribution, 59% of respondents were male, reflecting the traditionally male-dominant nature of technical roles within the construction industry (Seidu et al., 2022). Age distribution shows that 52% of respondents were between 20 and 30 years old, while only 5% were above 45, indicating that younger professionals are more likely to adopt digital technologies such as BIM – a trend consistent with global observations that younger generations are more adaptable to technological change (Li, Griffin & Xia, 2025). All valid respondents were registered with BQSM, ensuring that the findings accurately reflect the perspectives of certified practitioners (BQSM, 2020). Membership categories were as follows: 72% PVQS, 16% CQS, 10%, PQS, and 2% QST. The high proportion of provisional members suggested an influx of new entrants into the profession, likely reflecting growing demand for BIM-related competencies (Lee, et.al 2021). Regarding professional experience, 61% of respondents had one (1) to ten (10) years of experience, indicating that most participants are in the early to mid-stages of their careers. This aligns with the observation that younger professionals are more open to adopting digital tools and new technologies (Daniotti et.al, 2022). Additionally, 63% of respondents have participated in one (1) to ten (10) projects. Suggesting that many are still building their professional portfolios, which may influence their familiarity with and attitudes toward BIM (Jones & Bernstein, 2014). A summary of demographic details is presented in Table 1, illustrating gender, age, membership category, years of experience, and project involvement.

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Table 1. Summary of Demographic Profiles

Category	Classification	Frequency	Percentage (%)	Cumulative Percentage (%)
Gender	Female	135	41	41
	Male	195	59	100
Age	20 - 25	99	30	30
	26 - 30	73	22	52
	31- 35	92	28	80
	36 - 45	49	15	95
	Above 45	17	5	100
Membership	CQS	53	16	16
	PQS	33	10	26
	PVQS	237	72	98
	QST	7	2	100
Years of Experience	1 - 5 years	79	24	24
	6 – 10 years	122	37	61
	11 – 15 years	53	16	77
	16 – 20 years	58	18	95
	21 – 25 years	15	4.1	99.1
	More than 25 years	3	0.9	100
Number of Projects Involved	1 – 10 projects	208	63	63
	10 – 20 projects	106	32	95
	Above 20 projects	16	5	100

Source: Authors (2024)

Perception of Using BIM Among Quantity Surveyors

Table 2 presents the findings on respondents' perceptions of BIM usage among QS. Results show that the statement 'QS have difficulty owning BIM applications due to their high cost' received the highest means score (M = 4.05, SD = 0.810), indicating strong agreement among respondents. The relatively low standard deviation suggests a high level of consensus on cost being a primary barrier. This supports Latiffi et al. (2015), who noted that the substantial initial investment required for BIM software and hardware limits its accessibility, particularly for smaller firms and independent QS professionals. Such financial constraints reduce the ability of smaller organisations to invest in BIM technologies, thereby slowing industry-wide adoption. Conversely, the lowest mean score (M= 3.44, SD = 0.941) was recorded for the statement "QS can utilise BIM software features. Although this core is comparatively lower, it still indicates a moderately positive perception, suggesting that while QS recognise the benefits of BIM, they face significant challenges in fully leveraging its functionalities (Mohd Noor, et al, 2018). This finding is aligned with Azhar et al. (2021), who emphasise that effective BIM utilisation requires not only financial investment but also comprehensive training and continuous professional development. Overall, the results indicate that while awareness and positive perceptions of BIM exist among QS, cost and competency gaps remain critical barriers to its widespread and effective use.

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Table 2. Perception of Using BIM Among Quantity Surveyors

Perception of using BIM among QS	Mean	Std. Deviation	Rank	Agreement Level
I am having difficulty owning the BIM application due to its high cost	4.05	0.810	1	Agree
I only manage to use the BIM application when I am in the office	3.98	0.827	2	Agree
BIM adoption eased my work as a QS	3.94	0.751	3	Agree
BIM software assists me in doing QS work faster than the traditional method	3.94	0.747	3	Agree
The barrier to adopting BIM is less compared to the benefits	3.93	0.792	5	Agree
BIM adoption needs proper guidelines before it starts to be used; it	3.91	0.743	6	Agree
BIM software improves communication between QS and other stakeholders	3.87	0.751	7	Agree
I am having difficulty learning about BIM software due to cost constraints	3.85	0.851	8	Agree
I am an expert in using traditional methods compared to BIM software	3.69	0.820	9	Agree
I only mastered some features of BIM software	3.67	0.786	10	Agree
I prefer to use the traditional method compared to BIM adoption	3.54	0.976	11	Agree
I can utilise BIM software features	3.44	0.941	12	Agree

Source: Authors (2024)

Effectiveness of BIM Among Quantity Surveyors

Table 3 presents respondents' views on the effectiveness of BIM in QS practice. The highest-rated statement, 'Cost appraisal can be prepared quickly during the feasibility stage', achieved a mean score of 4.07 (SD 0.743), reflecting strong agreement and low variability among respondents. These finding underscores BIM's ability to support efficient and accurate early-stage cost estimation by enabling QS to visualise and analyse projects within a virtual environment before physical construction begins (Musa et al., 2018). Such capabilities enhance decision-making and improve the accuracy of cost estimates, ultimately contributing to better project planning and financial management. The lowest mean score in this section (M = 3.88, SD = 0.719) was associated with the statement, "Intelligent information management data can be stored centrally." Although slightly lower, this result still reflects a positive perception and suggests that centralised data storage – a fundamental feature of BIM – is valued but not yet widely implemented. As Eastman et al. (2011) noted, integrating BIM's data management features into existing workflows requires substantial organisational effort and technical capacity, which can be challenging for firms lacking digital infrastructure or skilled personnel. Overall, the distribution of mean scores across items suggests that QS professionals recognise BIM's significant potential in improving cost estimation, reducing errors, and enhancing decision-making, although gaps in training, infrastructure, and system integration remain obstacles to maximising these benefits.

Table 3. Effectiveness of BIM Among Quantity Surveyors

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Effectiveness of BIM among QS	Mean	Std. Deviation	Rank	Agreement Level
I am aware that using BIM can help to:				
Cost appraisal can be prepared quickly at the feasibility stage	4.07	0.743	1	Agree
Easily update cost plan with more details as design is developed	3.98	0.690	2	Agree
Improve visualisation for a better understanding of the design	3.97	0.724	3	Agree
Easily generate accurate cost estimates for various design alternatives	3.96	0.678	4	Agree
A preliminary cost plan can be prepared by extracting quantities from the model	3.95	0.692	5	Agree
Cost checking performs quickly to ensure all items are captured	3.93	0.729	6	Agree
Design changes are reflected consistently in all drawing view	3.92	0.732	7	Agree
Clash detection reduces design errors and cost estimate revisions	3.92	0.701	7	Agree
The cost implication of design changes can be generated easily	3.89	0.737	9	Agree
Automatically quantification for BQ preparation	3.89	0.700	9	Agree
Intelligent information management data can be stored centrally	3.88	0.719	11	Agree

Source: Authors (2024)

DISCUSSIONS

The demographic results highlight notable trends that influence BIM adoption among QS in Malaysia. The predominance of younger professionals (52% aged 20-30) suggests a generational shift toward greater openness to digital technologies, which bodes well for future BIM adoption. However, the relatively low proportion of highly experienced practitioners underscores the need for targeted upskilling initiatives to ensure that BIM competencies are developed across all career stages. The gender imbalance (59% male) also points to broader diversity challenges within the construction industry that may influence workforce development and training strategies. Perception findings further reveal that cost remains the most significant barrier to BIM adoption, reinforcing previous research by Latiffi et al. (2015). High upfront costs for software, hardware, and training disproportionately affect small and medium-sized firms, suggesting that policy interventions such as government subsidies, tax incentives, or shared digital infrastructure initiatives could help lower these barriers. Meanwhile, the relatively lower perception of BIM feature utilisation points to the importance of capacity-building efforts, such as continuous professional development (CPD) programme and structured BIM certification courses. The effectiveness findings emphasise BIM's value in improving early-stage cost estimation, aligning with Haron et al. (2017), who emphasise BIM's role in enhancing decision-making and cost accuracy. However, the limited adoption of centralised data management systems suggests that technical and organisational readiness remain a challenge. This highlights an opportunity for industry stakeholders to invest in integrated digital platforms, improve interoperability across software systems, and embed BIM workflows into standard practice. From a practical standpoint, these findings provide actionable insights for policymakers, industry leaders, and educational institutions. Government agencies could consider providing financial incentives or developing national BIM standards to accelerate adoption. Professional bodies such as BQSM can expand training initiatives to bridge skill gaps, while universities and TVET institutions can integrate BIM competencies into QS curricula. By addressing these financial, technical and educational barriers, the Malaysian construction sector can fully leverage BIM's transformative potential, enhancing cost efficiency, project delivery, and overall industry competitiveness.

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CONCLUSION

In conclusion, BIM represents a pivotal digital platform that facilitates an integrated and collaborative approach to managing construction project information throughout the project lifecycle. This approach is aimed at enhancing productivity, reducing duration and costs, and improving the overall quality and safety of construction projects. The findings of this research reveal that the high cost associated with acquiring BIM technology poses a significant barrier, contributing to its slow adoption rate among quantity surveyors in Malaysia. Despite these financial challenges, BIM implementation has been beneficial, particularly in the early stages of cost appraisal. BIM's ability to provide a clear virtual environment before physical Construction commences allows for more accurate planning and decision-making. Additionally, the automation features of BIM's multidimensional modelling platform significantly reduce arithmetic errors and eliminate many repetitive tasks inherent in traditional methods, such as tendering and bill of quantities production. To further the adoption of BIM in Malaysia, it is essential for the Malaysian government and construction industry stakeholders, especially QS, to work collaboratively. This collaboration should focus on developing strategies that lower financial barriers, enhance training programme, and promote the broad-scale integration of BIM into the construction sector, ultimately fostering a more efficient and innovative industry landscape.

SUGGESTION FOR FUTURE RESEARCH

Future studies should focus on evaluating the impact of financial incentives like subsidies or tax rebates on BIM affordability, particularly for SMEs. Additionally, assessing the effectiveness of structured training programme developed in collaboration with educational institutions and industry leaders could address the expertise gap. Integrating a mixed-methods approach that includes longitudinal surveys, in-depth case studies, and pilot mentorship programme could provide comprehensive insights into organisational changes, cultural shifts, and the practical implementation challenges of BIM. The holistic approach will not only extend the current research findings but also contribute actionable recommendations for increasing BIM adoption rates and enhancing the professional practices of QS in Malaysia.

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CONFLICT OF INTEREST STATEMENT

The authors affirmed that there is no conflict of interest in this article and it was conducted in the absence of any self-benefits, commercial or financial conflicts and declare the absence of conflicting interests with the funders.

AUTHORS' CONTRIBUTIONS

Siti Nur Aishah Mohd Noor serves as the lead author of the content of the paper, authoring the comprehensive literature review and overseeing the overall structure and coherence of the articles. Ahmad Naid Naili Che Makhtar was vital in gathering current and relevant data that supported the study objectives

and collecting data. Puteri Sidrotul Nabihah Saarani, and Zailawati Khalid collaborated closely, sharing the responsibilities of writing parts of the literature review and synthesising existing research to provide a robust background for the study. Mohd Khairul Amri Ramly focused on the empirical aspects of the research, managing data collection and carrying out the subsequent data analysis. The combined efforts of all authors ensured a well-rounded and meticulously prepared research study to the successful completion of this research.

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