Communications on Applied Nonlinear Analysis
ISSN: 1074-133X
Vol 32 No. 10s (2025)

Determinants of Actual Usage of BIM in the Construction Industry in Sabah

Nur-ul Balqes Md Zaid[1], Noraini Hamzah[1,2], Muhamad Azry Khoiry[1,2], Nelson Lajuni[3]

[1]Department of Civil Engineering, Faculty Engineering & Built Environment, Universiti Kebangsaan Malaysia, 43650, Bangi Malaysia.

[2]Smart and Sustainable Township Research Center, Faculty Engineering & Built Environment, Universiti Kebangsaan Malaysia, 43650, Bangi Malaysia.

[3]Faculty of Business, Economics and Accountancy, Universiti Malaysia Sabah, Kota Kinabalu, Malaysia
ainhamzah@ukm.edu.my

Article History:

Received: *10-01-2025*

Revised: *20-02-2025*

Accepted: *01-03-2025*

Abstract. The purpose of this study was to investigate the impact of perceived utility (PU) and perceived ease of use (PEOU) on actual utilization (AU) of Building Information Modeling (BIM) in the Sabah construction industry. Additionally, the study explored the potential mediating effect of PEOU and AU on AU. This study used quantitative methodology to survey 30 BIM practitioners working in Sabah’s construction sector. The hypothesized hypotheses were tested using partial least squares structural equation modeling (PLS-SEM) using reflective indicators. Actual usage (AU) of BIM was positively influenced by perceived utility (PU) (LLCI = 0.725, ULCI = 0.849), whereas PEOU had no significant effect on AU (LLCI = -0.642, ULCI = 0.048). Additionally, the analysis revealed that in Sabah's construction sector, the notion of PU served as an intermediary between the concept of PEOU and the implementation of BIM (LLCI = 0.400, ULCI = 0.988). The results of this study offer significant contributions to the knowledge base of stakeholders and decision-makers regarding the determinants that impact the implementation of BIM in Sabah. Moreover, they can serve as a guide for developing effective strategies to promote BIM usage in the construction industry.

Keywords: Building Information Modelling, Actual Usage, Construction Industry Sabah

1 Introduction

1.1 1. Building Information Modelling (BIM)

The concept of Building Information Modelling (BIM) has its roots in the early days of computer technology, dating back to 1962. Douglas C. Engelbart’s seminal work, *Augmenting Human Intelligence*, laid the groundwork for object-based design, parametric manipulation, and relational databases [1]. In the 1970s and 1980s, advancements such as Constructive Solid Geometry (CSG) introduced new methods for representing geometric information, which were crucial for architectural design involving space rejection and penetration considerations [2]. This period saw the emergence of human-computer interaction methods, including computer-aided drawing (CAD) and BIM technologies.

BIM is defined as a digital representation of a facility's functional and physical attributes, providing a reliable foundation for decision-making throughout its lifecycle [3]. It involves model technology and associated processes for generating, communicating, and analyse digital information models during construction projects [4]. This definition aligns with views that BIM is a methodology for designing and constructing with building information models, processes, and user collaboration [5].

1.2 BIM Adoption in Malaysia

Despite awareness of BIM among construction firms in Malaysia, the technology's adoption has been slow due to insufficient guidance, government support, and trained personnel [6]. Adoption rates remain low: civil and structural engineering firms at 15%, architecture firms at 14%, and quantity surveying firms at 7% [7] (see Fig. 1). This slow uptake, particularly in Sabah where BIM was utilized in only 4% of projects in 2019 [6], indicates limited use of BIM despite its recognized benefits [8].

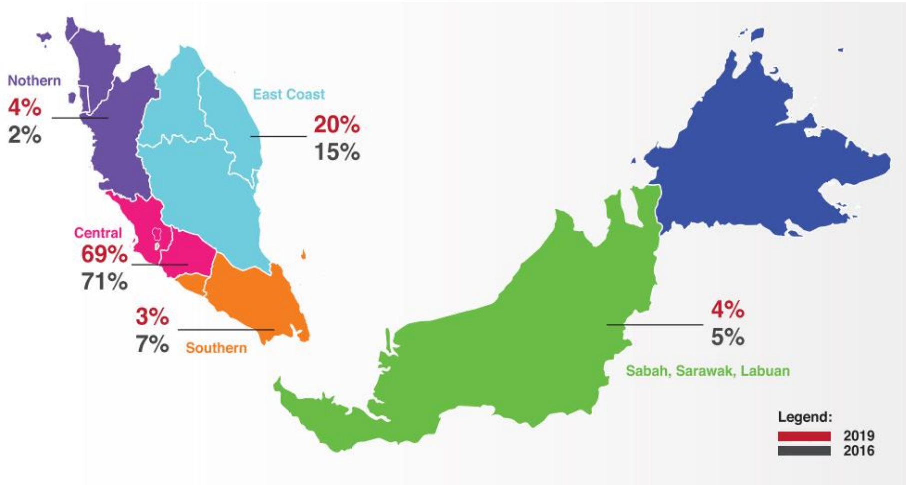

Fig. 1. Percentage of BIM technology use per state

1.3 Research Focus

This research explores the relationship between perceived ease of use (PEOU), perceived usefulness (PU), and actual usage (AU) of BIM in Sabah's BIM practitioner in construction sector. It specifically examines professionals actively using BIM techniques to understand how these factors influence BIM implementation in the region.

1.4 Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM), based on the Theory of Reasoned Action (TRA) [9], is widely used to study technology acceptance [10,11]. Introduced by [12] and refined over time, TAM predicts technology adoption through two main variables: perceived usefulness (PU) and perceived ease of use (PEOU) [13]. TAM provides a framework for understanding how attitudes towards technology impact adoption decisions [14].

1.5 Perceived Usefulness (PU)

Perceived usefulness (PU) is a key component of TAM, referring to the degree to which a system enhances job performance [15]. PU is linked to work productivity and performance [12] and influences technology adoption through its perceived advantages [16]. Research shows that PU and PEOU significantly impact the acceptance of learning technologies [17]. This study hypothesizes that PU significantly affects BIM usage in Sabah’s construction industry (H_1).

1.6 Perceived Ease of Use (PEOU)

Perceived ease of use (PEOU) reflects an individual's perception of a technology’s complexity, and the effort required to learn it [20]. PEOU, alongside PU, is a crucial determinant of technology acceptance [18]. Studies suggest that improved ease of use leads to more favourable perceptions of a technology’s utility, thereby enhancing its adoption [19,20]. This research hypothesizes that PEOU significantly impacts BIM usage in Sabah (H_2).

1.7 Actual System Use

In TAM, "actual system use" denotes the real application of technology, influenced by behavioural intention shaped by PU and PEOU [21]. Despite criticisms of TAM for its limited scope, it remains a valuable framework for understanding technology adoption [22]. This study examines how PU and PEOU affect BIM implementation, addressing gaps in existing research.

1.8 Hypotheses and Mediating Effects

This research tests several hypotheses: PU and PEOU (H_1) directly impact BIM usage in Sabah (H_2 & H_3), and PU mediates the relationship between PEOU and BIM usage (H_4). These hypotheses aim to explore how perceived usefulness and ease of use influence the practical adoption of BIM in the construction industry.

2 Methodology

This research employs quantitative methodology to comprehensively examine the impact of behavioral PEOU and PU on AU, as well as its mediation effect of PU between PEOU and AU. The study was conducted on predetermined participants, yielding a total of 30 responses from project managers, engineers, CAD/BIM managers, BIM modelers, managing directors, and managing directors. This study employed primary data collection through the administration of an online questionnaire. Instrument conceptual arrangement utilizing reflective variables derived from PEOU, PU, and AU. Additionally, SmartPLS 4.0 [24] was applied to the collected data to test the proposed hypotheses.

2.1 Data Collection Procedure, Variable Measurement, and Method of Data Analysis Figures and Tables

The respondents' information was gathered via a structured, self-administered questionnaire. The research cohort comprises BIM practitioners located in Sabah. Respondents fill out the questionnaire using a five-point Likert scale from strongly disagree to agree strongly. In contrast, the PEOU, a metric utilized to assess PU, was modified from work by [12]. The assessment of perceived usefulness comprised ten (10) items, while perceived ease of use comprised five (5) items, and actual system use comprised four (4) items. The responses were analyzed utilizing SPSS version 20 for descriptive analysis. Subsequently, SmartPLS was explicitly employed to assess the proposed hypotheses. Initially, 30 respondents from the state of Sabah were administered the questionnaires and no data cleansing because the Google Form was used which can be set as compulsory to answer each question. The research framework that was developed for this study (see Fig. 2).

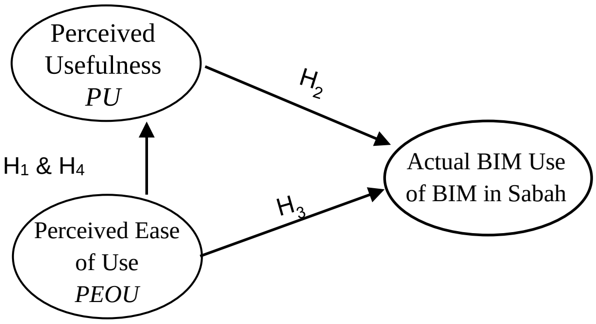

Fig.2. Proposed Research Framework

3 Results and Discussion

3.1 Descriptive Results

Company Service Background

The findings of the data collection conducted by 30 BIM practitioners in Sabah regarding the services provided by the company (see Table 1). As shown in the Table, ten (10) (18.2%) of the companies provide general contracting, 14 (25.5%) offer design and construction services, and 14 (25.5%) offer construction management services. The largest proportion of the services provided is represented by 17 companies, which account for 30.9%.

Table 1. Percentage of types of company services

Service	Feedback	
	N	Percentage
General Contracting	10	18.2%
Design and Construction Services	14	25.5%
Construction Management Services	14	25.5%
Design Services	17	30.9%
Total	55	100.0%

Position of the respondent in the organization

The positions held by 30 respondents from the five (5) companies that comprised the study sample (see Table 2). The aforementioned roles comprise the following: CAD/BIM managers, 8 (26.7%), BIM modellers, 3 (10%), managing directors, 5 (16.7%), project managers, 3 (10%), project engineers, and others, 8 (26.7%), of which 16 (16.7%) are material surveyors, two (2) architects, and one (1) sales department representative.

Table 2. Percentage of position in the organization

Position	Frequency	Percentage
CAD/BIM Managers	3	10.0
BIM modellers	8	26.7
Managing Directors	5	16.7
Project Managers	3	10.0
Project Engineers	3	10.0
Others	8	26.7
Total	30	100.0

Number of Employees in the Company

The percentage of the total number of employees inside the organization. The frequency for organizations with fewer than 20 employees was 9 (30%), for 20-99 employees it was 13 (43.3%), and for 100-500 employees it was 8 (26.7%) (see Table 3).

Table 3. Percentage number of employees in the Company

Number of Employees	Frequency	Percentage
Less then 20	9	30.0
20-99	13	43.3
100-500	8	26.7
Total	30	100.0

Level of Company Experience Using BIM Technology

Also incorporated into this research questionnaire is the organization's degree of proficiency with BIM technology. Both the beginner and intermediate levels contributed a percentage of 33.3% with a maximum frequency of 10. In addition, the proficient and expert levels documented an equivalent frequency and percentage, reaching 5 instances and 5%, respectively (see Table 4).

Table 4. Percentage Level of Company Experience Using BIM Technology

Level of BIM	Frequency	Percentage
Beginner	10	33.3
Intermediate	10	33.3
Skilled	5	16.7
Expert	5	16.7
Total	30	100.0

3.2 Descriptive Results

The statistical instrument utilised to evaluate the measurement model and structural model in this non-normally distributed survey research was SmartPLS 4.0 updated version [24]. Partial least squares structural equation modelling (PLS-SEM) was used in this version. As suggested by [25], the researcher first performed an analysis of entire collinearity to evaluate common method bias. In this process, bias from single-source data is removed if the variance inflation factor (VIF) is less than 3.3. All variables are regressed against a common variable. The obtained VIF, which was less than the bias from a single source, indicates that there aren't any significant issues with the data.

3.3 Measurement Model Assessment

Using the procedures described by [26] and [27], we conducted a measurement model test to evaluate the validity and reliability of the instrument. The structural model was then run to investigate the suggested theories. The loadings, composite reliability (CR), and average variance extracted (AVE) of the measurement model were assessed. It is advised that the CR ≥ 0.7, the AVE ≥ 0.5, and the loadings ≥ 0.5 (see Table 5). The AVE and CR are both higher than 0.5 and 0.7, respectively. Convergent validity is the degree to which one measure positively correlates with another measure of the same construct. To evaluate convergent validity, we examined the outer loadings of the indicators and the Average Variance Extracted (AVE). Since all indicators had an AVE above 0.5, we did not delete any indicator items.

Table 5. Measurement Model Assessment

Construct	Item	Loading	Cronbach's Alpha	CR	AVE	Convergent Validity (AVE > 0.5)
Perceived Ease of Use	PEOU1	0.848	0.901	0.925	0.713	Yes
	PEOU2	0.909				
	PEOU3	0.805				
	PEOU4	0.791				
	PEOU5	0.863				
Perceived Usefulness	PU1	0.924	0.976	0.979	0.826	Yes
	PU10	0.931				
	PU2	0.954				
	PU3	0.957				
	PU4	0.869				
	PU5	0.924				
	PU6	0.837				
	PU7	0.950				
	PU8	0.865				
	PU9	0.868				
Use of BIM in	USE1	0.971	0.972	0.980	0.924	Yes

Sabah	USE2	0.931
	USE3	0.988
	USE4	0.953

In contrast, loadings below 0.708 are acceptable for retention of indicators, provided that a minimum AVE of 0.5 is attained [26] in the graphical measurement model evaluation (see Fig.3).

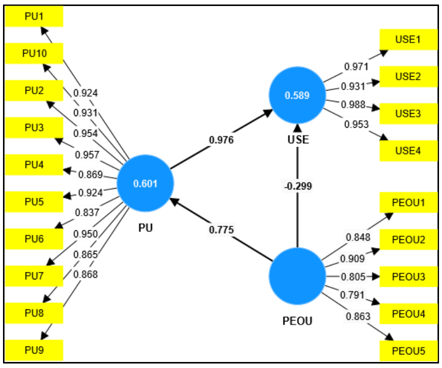

Fig.3. Measurement Model

As described by [26,28] the discriminant validity was then evaluated in step 2 using the Heterotrait-Monotrait (HTMT) criterion (see Table 6). To assess discriminant validity, [22] apply the HTMT ratio of correlations criterion. The results show that discriminant validity is well-defined at $HTMT_{0.85}$. Table 6 presents the data [22,28].

The results show that the $HTMT_{0.85}$ criterion [34] indicates that the correlation values accurately represent the corresponding constructs and meet the conservative criteria when discriminant validity is assessed using the Heterotrait-Monotrait ratio of correlations criterion [28]. Therefore, discriminant validity is unaffected. The results indicate that it is appropriate to move forward with the structural model assessment to test the study's hypotheses, as there is no evidence of multi-collinearity among items loaded on distinct constructs in the outer model.

Table 6. HTMT Criterion

	PEOU	PU	USE
PEOU			
PU	0.797		
USE	0.469	0.754	

3.4 Structural Model

5000 bootstrap samples were used to resample the data to test the hypotheses [30]. The hypothesized relationship (H_1) PEOU considerably affects PU based on the Beta values for each route coefficient. The investigation's findings (PEOU -> PU, = 0.775, p 0.0000, LLCI = 0.725, ULCI = 0.849) supported hypothesis 1. This finding is supported by [31] where the acceptance of students in e-learning during the implementation of the Movement Control Order (MOC) is dependent on the PU and PEOU of a system. This study also supported Hypothesis 3 (PU -> USE, = 0.976, p 0.0000, LLCI = 0.679, ULCI = 1.237) with evidence. With this inquiry, PEOU does not support USE (see Table **7**).

Table 7. Path Coefficient

Direct Effect	Beta	S.E.	t-value	p-value	LLCI	ULCI	Decision
H1: PEOU -> PU	**0.775**	**0.038**	**20.581**	**0.000**	**0.725**	**0.849**	**Supported**
H2: PEOU -> USE	-0.299	0.211	1.418	0.078	-0.642	0.048	Not Supported
H3: PU -> USE	**0.976**	**0.171**	**5.719**	**0.000**	**0.679**	**1.237**	**Supported**

Fig.4 shows the graphical depiction of the structural model evaluation illustration.

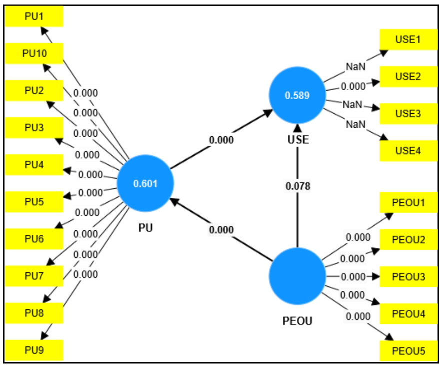

Fig.4. Structural Model

[32] claim that if each of the independent variables' inner Variance Inflation Factor (VIF) values is less than 5 or 3.3, then evaluating collinearity in the structural model is not a major factor to consider. After that, we examined the route coefficient discovered by bootstrapping to assess the importance and applicability of the structural model relationship. We also added the effects of exogenous and endogenous variables on the endogenous variable to compute the amount of R-Square (R^2), a coefficient used to predict the model's accuracy. R^2 is the total variance of the endogenous system when all related exogenous constructs are considered.

Impact ratings range from 0 to 1, with higher numbers denoting forecasts with higher accuracy. Thus, this research employs R^2, which translates to significant (0.26), moderate (0.13), and low (0.02) levels of predictive precision, respectively, following [32] guidelines (see Table 8). This study computed the coefficient of determination (R^2) and effect size (f^2) of exogenous factors on the endogenous variable. Both constructs PEOU and PU have a significant effect size of f^2 [33] on the actual use of BIM. However, there are also notable effects seen in the R^2 coefficient of determination, which indicates how much PU and PEOU can affect the actual use of BIM [26].

PEOU -> USE has an R^2 value of 0.589, whereas PEOU -> 0.601 is the number for PEOU. The multicollinearity of the indicators was also evaluated. Given that their readings continuously decrease below the predicted collinearity issues of 5.0 [22] and 3.3 [25] both indicators satisfy the VIF requirements.

Table 8. Model Quality Assessment

Direct Effect	f^2	R^2	VIF
H1: PEOU -> PU	1.508	0.601	1.000
H2: PEOU -> USE	0.087	0.589	2.508
H3: PU -> USE	0.924		2.508

3.5 Mediation Assessment

To examine the mediation relationship, the interaction term, which is the product of the predictor and mediator variables, is evaluated for its impact. The assessment of multi-way interactions, including the three-way interaction, is possible with SmartPLS 4.0. Incorporating the mediator construct into the PLS path model and adding a relationship from the mediator to the path relationship between two constructs to be mediated constitutes the mediator model generation. SmartPLS 4.0 incorporates an automatic relationship between the dependent variable and the mediator that is mediated when computing outcomes. Hypothesis 4 was supported explicitly by the investigation results (PEOU -> PU -> USE, = 0.757, p 0.0000, LLCI = 0.400, ULCI = 0.988). In research by [34] when users see BIM as useful and easy to use, they tend to directly use it in an industrial contes or research situation. Therefore, the mediation effect of PU is supported by this analysis (see Table 9).

Table 9. Mediation Assessment

Mediation Effect	Beta	S.E.	t-value	p-value	LLCI	ULCI	Decision
H4: PEOU -> PU -> USE	0.757	0.142	5.332	0.000	0.400	0.988	Supported

4 Discussion

Upon analysis of the data, it was discovered that there were positive influences on adopting and utilizing BIM in Sabah. The likelihood of BIM being utilized increases when the user perceives its benefits more positively [35]. The discovery holds importance for pertinent stakeholders in the construction industry as it could bolster the positive perception of the benefits associated with BIM implementation. Acknowledging the long-term benefits of BIM, encouraging successful BIM implementation cases, and training initiatives can all contribute to advancing BIM adoption in Sabah, which will benefit the economy and industry. This statement aligns with [8] stating that subsidies should also be granted for sending staff to attend related training at the MyBIM centre. Constantly exposing staff to valuable training may increase competency and improve productivity.

The research results suggest that the perception of ease of use concerning Building Information Modelling (BIM) does not positively impact the perception of utility. Previous research has found that the predictor power of the nation of utility is generally higher than that of the nation of ease of use [31]. The statement's analysis leads one to the conclusion that there is a relationship between the perception of Building Information Modelling's (BIM) utility and ease of use and the BIM's actual application in the Sabah building industry. Numerous studies that support this conclusion are found in the search results. For instance, one examines the adoption behaviour mechanism of Building Information Modelling (BIM) from the proprietors' standpoint using an integrated model that combines the TAM and the Critical Factors Affecting the BIM adoption framework and structural equation modelling [36].

6 Conclusion

In brief, the examination of data on the implementation of Building Information Modelling (BIM) in Sabah demonstrates a favourable connection between the perceived utility and the tangible utilization of the technology. This suggests that the likelihood that users will implement BIM in their construction projects increases with the degree to which they perceive its benefits favourably. This discovery highlights the significance of emphasizing the advantages of Building Information Modelling (BIM) to promote its greater acceptance and utilization across the industry. Efforts such as organizing training programs, exhibiting instances of effective BIM implementation, and emphasizing its enduring benefits can collectively promote a more favourable perception of BIM and stimulate its broader adoption within the construction sector of Sabah. This, in turn, would yield economic and industry benefits.

Furthermore, prior studies have hypothesized that the predictive power of the Perceived usefulness is generally lower than that of the perceived ease of use. Nonetheless, the research's conclusions show a strong relationship between the three variables: the real use of BIM, its perceived usefulness, and its perceived simplicity. This suggests that the intention to utilize BIM is significantly influenced by perceived utility and simplicity of use, which calls for additional mediating variables.

7. Acknowledgement

The researchers of this study would like to thank the Malaysian Ministry of Higher Education and the National University of Malaysia for the opportunity and financial support through the Fundamental Research Grant Scheme (FRGS) FRGS/1/2024/SSI12/UKM/02/3 in conducting this study.

5 References

1. Varghese P.: Influence and Adoption of BIM within the AEC Industry. Internship Research Paper. Bouwkunde, Technische Universiteit Delit, 1–32. (2019).
2. Wahab A.F.: Pemodelan Geometri Menggunakan Teori Set Kabur. (2008).
3. Davis D.: National Building Information Model Standard NBIMS. Infosystems. (2007)
4. CIDB.: BIM Guide 1 : Awareness. Constr Ind Dev Board Malaysia, (2016).
5. Eastman C., Teicholz P., Sacks R. & Liston K.: BIM Handbook, a Guide to Building Information Modelling 2nd ed. John Wiley & Sons, Inc, Hoboken (2011).
6. Ismail N. A. A., Zulkifli M. Z. A., Baharuddin H. E. A., Ismail W. N. W. & Mustapha A. A.: Challenges of Adopting Building Information Modelling (BIM) Technology amongst SME’s Contractors in Malaysia. IOP Conference Series Earth & Environment Science, 1-7 (2022)
7. CIDB. Malaysia Building Information Modelling Report. (2020).
8. Syed Jamaludin S. Z. H., Ismail N. A. A., Ibrahim I. H. & Japlun N.: The Emerging Challenges of Adopting BIM in the Construction Industry: Evidence from Sabah, Malaysia. Journal Smart Science & Technology, 1-14 (2022).
9. Fishbein M. & Azjen I.: Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research. Reading, 2nd ed. Sage, American (1975).
10. Pibriana D.: Technology Acceptance Model (TAM) untuk Menganalisis Penerimaan Pengguna Terhadap Penggunaan Aplikasi Belanja Online XYZ. JATISI (Jurnal Teknologi Informasi dan Sistem Informasi), 580–592 (2020).
11. Pratama A, S. Z., Wulandari D. L. & Indyastuti.: Analisis Technology Acceptance Model (TAM) Pada Penggunaan Aplikasi PLN Daily (Studi Empiris Pada Pegawai PLN UP3 Tegal). Jurnal Inovasi Bisnis dan Manaj Indones, 355–368 (2022).
12. Davis F. D.: A Technology Acceptance Model for Empirically Testing New End-User Information Systems: Theory and Results. Ph. D., Management, Massachusetts Institute of Technology (1986).
13. Bujanov S. & Maier-Speredelozzi V.: Technology acceptance for partially automated vehicles in the United States and Germany. Master, Science, University of Rhode Island (2020).
14. Musa H. G., Fatmawati I., Nuryakin N. & Suyanto M.: Marketing Research Trends Using Technology Acceptance Model (TAM): A Comprehensive Review of Researches (2002–2022). Cogent Business & Management, 1-17 (2024).
15. Pdxscholar P. & Rahman N.: Toward Understanding PU and PEOU of Technology Toward Understanding PU and PEOU of Technology Acceptance Model Acceptance Model. The 6th Student Research Symposium. Portland State University, pp. 1-20 (2018).

16. Yilmaz H., Maxutov S., Baitekov A. & Balta N.: Student Attitudes towards Chat GPT: A Technology Acceptance Model Survey. International Education Review, 57–83 (2023).
17. Klingelhöfer S. Rogers (1962): Diffusion of Innovations. Construction Management and Economic, 2106, 489-493 (2019).
18. Saka A.B., Chan D. W. M. & Siu F. M. F.: Drivers of Sustainable Adoption of Building Information Modelling (BIM) in the Nigerian Construction Small and Medium-Sized Enterprises (SMEs). Sustainability, 1-23 (2020).
19. Won J. & Lee G.: How to Tell if a BIM Project is Successful: A Goal-Driven Approach. Automation in Construction, 34-43 (2016).
20. Liu J.Y, Sun D. L. & Hong R. Y.: Effect of Organo-Functionalized Silica Particles on the Mechanical Properties of PU. 5th International Conference on Environment, Materials, Chemistry and Power Electronics (EMCPE 2016), 557-565 (2016).
21. McCord M.: Technology Acceptance Model. Handbook Res Electron Surv Meas, 306-308 (2006).
22. Sarstedt M., Ringle C. M. & Hair J.F.: Partial Least Squares Structural Equation Modeling. Handb Mark Res, 587–632 (2021).
23. Edeh E., Lo W. J. & Khojasteh J.: Review of Partial Least Squares Structural Equation Modeling (PLS-SEM) Using R: A Workbook. Structure Equation Model A Multidisciplinary Journal, 165-167 (2023).
24. Kock N. & Hadaya P.: Minimum Sample Size Estimation in PLS-SEM: The Inverse Square Root And Gamma-Exponential Methods. Information System Journal, 227-267 (2018).
25. Hair J. F., Risher J. J., Sarstedt M. & Ringle C. M.: When to Use and How to Report the Results of PLS-SEM. European Business Review, 2-24 (2019).
26. Rigdon E. E.: Choosing PLS Path Modeling as Analytical Method in European Management Research: A Realist Perspective. European Management Journal, 596-605 (2016).
27. Henseler J., Ringle C. M. & Sarstedt M.: A New Criterion for Assessing Discriminant Validity in Variance-Based Structural Equation Modeling. Journal of the Acad Mark Science, 115-135 (2015).
28. Diamantopoulos A., Sarstedt M., Fuchs C., Wilczynski P. & Kaiser S.: Guidelines for Choosing Between Multi-Item and Single-Item Scales for Construct Measurement: A Predictive Validity Perspective. Jornal of the Acad Mark Science, 434-449 (2012).
29. Diamantopoulos A. & Siguaw J.A.: Formative Versus Reflective Indicators in Organizational Measure Development: A Comparison and Empirical Illustration. Br Journal Management, 263-282 (2006).

Communications on Applied Nonlinear Analysis
ISSN: 1074-133X
Vol 32 No. 4s (2025)

30. Chin W. W.: Issues and Opinion on Structural Equation Modeling. MIS Q Managing Information System, 1-4 (1998).

31. Mohd Arshad N., Zulkurnain Hassan. & Siti Hajar Moh Noh.: Faktor-Faktor yang Mempengaruhi Penerimaan e-Pembelajaran dalam Kalangan Pelajar di Politeknik Port Dickson: Kajian Kes Semester 4 Diploma Kejuruteraan Mekanikal Pembuatan. International Journal of Humanities Technology Civilization, 69-80 (2021).

32. Vinzi, Chin H. & W.: Handbook of Partial Least Squares. Handb Partial Least Squares, 487-514 (2010).

33. Hair J., Anderson R., Babin B. & Black W.: Multivariate Data Analysis. Vol. 7 , 1st ed, Australia, Cengage (2014).

34. Al-Adwan A. A. S., Li N., Al-Adwan A. A. S., Abbasi G. A., Albelbisi N. A. & Habibi A.: Extending the Technology Acceptance Model (TAM) to Predict University Students' Intentions to Use Metaverse-Based Learning Platforms. Education Information Technology, 15381-15413 (2023).

35. Acquah R., Eyiah A. K. & Oteng D.: Acceptance of Building Information Modelling: A Survey of Professionals in the Construction Industry in Ghana. Journal of the Information Technology Construction, 75-91 (2018).

36. Batarseh S. & Kamardeen I.: The Impact of Individual Beliefs and Expectations on BIM Adoption in the AEC Industry. EPiC Series in Education Science. Volume 1, pp. 466–475 (2018).

Turnitin Report:

Determinants of Actual Usage of BIM in the Construction Industry in Sabah

ORIGINALITY REPORT

12%	12%	%	%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	hrmars.com Internet Source	3%
2	www.majcafe.com Internet Source	1%
3	www.openaccessojs.com Internet Source	1%
4	journal-gabs.org Internet Source	1%
5	stmlportal.net Internet Source	1%

1.

2.