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The Relationship of BIM Training and BIM Knowledge Towards Employability of Architecture Graduates from Malaysian Polytechnics

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Abstract: Building information modelling (BIM) has become a significantly important skills demands by most Architectural, Engineering, and Construction (AEC) employers in recruiting new employees. Employed fresh graduates with the relevant skills and knowledge as employees benefit the employer in time and cost savings. The research aims to assess the BIM training and BIM knowledge acquired by polytechnic architecture graduates benefit them in acquiring job employment after graduation. A survey on 169 architecture graduates from six Polytechnic that offered architecture programmed in Malaysia. An online survey used Google form conducted to obtain the information from the graduates. Data obtained analyses using SPSS version 25.0 and descriptive statistics and correlation analysis to answer the research questions. The results show that the BIM training and BIM knowledge gained from their studies significantly helps them in employment after graduation. These findings can help improve the capacity of Malaysian polytechnic architecture graduates to consider skilled themselves in BIM that graduates should have to meet the demands of the industry for employment. Finally, research indicates that industry and educational institutions should collaborate to provide training to improve BIM skills.

Keywords: BIM training, BIM knowledge, architecture graduates, graduate's employability.

1.0 INTRODUCTION

Building information modelling (BIM) is the technology demands by organizations in the construction industry. BIM was introduced in Malaysia in 2009 by the Director of the Public Works Department (PWD). The government has many program initiatives to ensure that BIM implementation evolves through the technology, times, and demands in the construction industry. However, due to the workforce's lack of expertise and experience in BIM, high cost in terms of technology and maintenance to fully utilized BIM has affected the implementation of BIM in Malaysia (Ahmad Jamal et al., 2019; Sacks & Barak, 2010). The application of BIM necessitates a dependable set of tools, skills, experience, knowledge, training, and a high cost to enable efficient mentoring and coordinating project progress among construction participants (Nuzul Azam Haron et al., 2017). To assure the drive of BIM implementation in the construction sector, offering education and training at the tertiary level enables graduates to join the construction with dependable skills, knowledge, and understanding in BIM. Providing students with early education and training in preparation for future needs can improve BIM implementation in the Malaysian construction sector (Kugbeadjor et al., 2015). These early introductions could help increase students' awareness and readiness in BIM for future employment.

BIM is an interdisciplinary domain that encompasses all aspects of the AEC sector. As a result, there is a critical need for construction professionals to ensure that BIM practices are feasible. Therefore, the academic industry needs to ensure that the demands of this industry can be met. According to the findings by Lucena et al. (2015), it is a necessity for students in higher education to obtain BIM training to gain BIM knowledge and skills to train students to become semi-skilled workers to meet industry demands on BIM. Employers in the industry demand employee that are capable not only in the software but also individual equipped themselves with

BIM knowledge (Mojtaba & Ku, 2010). The knowledge in BIM technically enables to helps their skills and abilities throughout the working process.

Human capital is very important in maintaining the sustainability and growth of the country in the construction sector. To support the country's development, the industry needs a qualified workforce to meet the demands of the industry. However, added competencies are something that graduates should work on in order to stand out from the competition (Hossain et al., 2018). Most employers emphasized hiring individuals who already have the necessary skills, training, and knowledge and do not require extra training or guidance from supervisors or coworkers. As a result, graduates need to have specific relevant skills to work; this study was undertaken to determine the extent of graduates equipped with BIM training and BIM knowledge could affect their employability after graduation.

1.1 Research Objective

Overall, the objectives of this study are to determine the BIM training and BIM knowledge gained by architecture graduates enables them to be employed in the construction industry. This study's specific objective is to:

I. To determine the level of BIM knowledge acquired by polytechnic architecture graduates.
II. To study the relationship between BIM training and BIM knowledge towards employability of architecture graduates from polytechnic

1.2 Research Scope

The study focused on graduates' perspectives of how BIM knowledge and BIM training might help them acquire a career in the construction sector after graduation, from the perceptions of:

I. Diploma in Architecture graduates from six Malaysian Polytechnics
II. Graduates' BIM training and BIM knowledge
III. Employability in the construction industry

1.3 Research Limitation

The study focused on graduates from six Malaysian polytechnics that offered architecture courses. These individuals were chosen because they worked after graduating from polytechnic. This study was carried out to achieve the research aim and objectives in determining whether BIM training and knowledge may benefit graduates in securing jobs after graduation.

2.0 METHODOLOGY

A quantitative approach method was used in the study. The quantitative data was collected through the questionnaire survey *Google Form*. The purpose of this study is to determine the relationship between BIM training and BIM knowledge towards the employability of architecture graduates from Malaysian polytechnics. The descriptive and inferential statistical analysis was performed to

determine the degree of BIM training and BIM knowledge gain among architecture graduates affect graduates' employment after graduation.

2.1 Participant

The study involved 169 of the respondent from six Malaysian Polytechnics randomly selected as a sample for the research study. The six-polytechnic in Malaysia that offered Diploma in Architecture are listed below:

I. Politeknik Ungku Omar (PUO)
II. Politeknik Sultan Haji Ahmad Shah (POLISAS)
III. Politeknik Sultan Abdul Halim Mu'adzam Shah (POLIMAS)
IV. Politeknik Port Dickson (PPD)
V. Politeknik Merlimau Melaka (PMM)
VI. Politeknik Sultan Idris Shah (PSIS)

2.2 Instrument of Study

A questionnaire survey was undertaken as the study's research instrument. The surveys were created electronically using *Google Form* and distributed through *E-mail* and *WhatsApp* to the respondents. The questionnaire has three sections: Section A, Section B, and Section C. Section A contains the respondents' demographic profiles. Section B consists of two constructs which are BIM training and BIM knowledge. At the same time, Section C consists of graduates' employability information. Section A comprises the following items:

I. Gender
II. Race
III. Employment status
IV. CGPA
V. Polytechnic

Section B of the questionnaire included 10 items about the graduates' BIM training and BIM knowledge gained after completed their study, while Section C has 6 items on graduates' employability. Table 1 presents the distribution of this questionnaire based on the elements of the study.

Table 1. Distribution of Items Based on The Study Constructs.

No	Constructs	Items
Section B		
1	BIM Training	5
2	BIM Knowledge	5
Section C		
1	Graduates Employability	6
	Total Items	**16**

2.3 Instrument of Study

The mean score interpretation shown below is used to determine the graduate level of BIM knowledge and BIM training (Table 2). To answer the questions, 5 Likert scales were utilized (Table 3).

Table 2. Means Score Interpretation

Mean Score Range	Interpretation
1.00 – 2.33	Low
2.34 – 3.66	Medium
3.67 – 5.00	High

Table 3. Likert Scale Table

Interpretation	Scale
Very Disagree	1
Disagree	2
Neutral	3
Agree	4
Very Agree	5

2.4 Data Analysis

The questionnaire data were analyses using IBM Statistical Package for Social Sciences (SPSS) version 25.0. Table 4 shows the interpretation of the relationship and the coefficient value (*r*) based on the *Rule of Thumbs* (Mukaka, 2012).

Table 4. *Rule of Thumbs* for Interpreting Correlation Coefficient Value

Correlation Value *(r)*	Interpretation
0.90 - 1.00	Very strong positive relationship
0.70 – 0.90	Strong positive relationship
0.50 – 0.70	Moderate positive relationship
0.30 – 0.50	Weak positive relationship
0.00 – 0.30	Very weak positive relationship

The analysis of the data begins with determining the reliability of the instruments employed in the questionnaire. The reliability analysis serves as the foundation for determining data reliability. Cronbach Alpha was employed in the study to estimate the acceptable fit of the items. In Section A of the questionnaire, descriptive analysis was performed to obtain the percentages and frequencies of respondent demographics. Section B and C, on the other hand, employed descriptive and inferential statistical analysis to examine the mean, standard deviation, and correlation of variables.

Table 5. Reliability Analysis

Constructs	Cronbach Alpha (<0.06)
BIM Training	0.935
BIM Knowledge	0.961
Graduate Employability	0.867

The results of the reliability analyses are shown in Table 5. Cronbach's Alpha values for BIM training (0.935), BIM knowledge (0.961), and graduate employability (0.867) are shown in the tables above. The Cronbach Alpha value was utilized in the study to assess the reliability of the research instrument (Nunnally, 1978). The Alpha value is highly reliable if more than 0.70. The analysis findings reveal that the Cronbach's Alpha value for the study constructs is greater than 0.70, indicating that the questionnaire set is reliable and applicable for the study.

3.0 RESULTS AND DISCUSSION

3.1 Demographic Respondents' Profiles

A total of 169 graduates responded to the questionnaire survey. The respondents involve Diploma Architecture graduates from Malaysian Polytechnics. Table 6 shows the total number and percentage of responses based on gender, race, CGPA, job status, and polytechnic of graduates.

Table 6. Respondent Demographics Profiles

Measure	Gender	Frequency	Percent (%)
Gender	Male	85	50.3
	Female	84	49.7
Race	Malay	156	92.3
	Chinese	5	3.0
	Indian	4	2.4
	Siamese	3	1.8
	Indian Muslim	1	0.6
Employment Status	Full-time Job	97	57.4
	Contract Worker	72	42.6
CGPA	2.00 – 2.49	2	1.2
	2.50 – 2.99	65	38.5
	3.00 – 3.49	86	50.9
	3.50 – 4.00	16	9.5
Polytechnic	PUO	36	21.3

	POLISAS	28	16.6
	POLIMAS	34	20.1
	PPD	21	12.4
	PMM	30	17.8
	PSIS	20	11.8
		169	100

The survey comprised 169 architecture graduates as respondents, involving males (n=85, 50.3%) and females (n=84, 49.7%). While the majority of respondents are Malay (n=156, 92.3 percent), Chinese (n=5, 3.0 percent), Indian (n=4, 2.4 percent), Siamese (n=3, 1.8 percent), and Indian Muslim (n=1, 0.6 percent). Malay students make up a sizable proportion of polytechnic students. In terms of employment status, 97 (57.4 percent) of respondents are full-time employees, while the remaining 72 (42.6 percent) are part-time employees. For the CGPA, 16 of the graduates (9.5 percent) score 3.50-4.00, 86 (50.9 percent) get 3.00-3.49, 65 (38.5 percent) get 2.50-2.99, and 2 (1.2 percent) score 2.00-2.49 for their CGPA. For the institutions, 36 (21.3 percent) of respondents are from PUO, 28 (16.6 percent) are from POLISAS, 34 (20.1 percent) are from POLIMAS, 21 (12.4 percent) are from PPD, PMM (n=30, 17.8 percent) and PSIS (n=20, 11.8 percent).

3.2 Level of Architecture Graduates BIM Knowledge

Table 7. BIM Training, BIM Knowledge and Graduate Employability Interpretation

Items	Means	SD	Interpretation
BIM Training	3.28	0.881	Moderate
BIM Knowledge	3.58	0.897	Moderate
Graduate Employability	3.31	0.871	Moderate

Table 7 illustrates the level of BIM training, BIM knowledge, and graduate employability among architecture graduates from Malaysian Polytechnics. The results indicate that the graduate level in BIM training, BIM knowledge, and employability is moderate. The outcome is consistent with the empirical finding from Hanapi et al.(2014), that most graduates have moderate skills that do not match or fulfill the employer's requirements. However, according to Hashamuddin Yaakob et al. (2018), employers are generally satisfied with the skills of polytechnic graduates. Polytechnic graduates are mostly exposed to technology and meet industry demands as semi-skilled workers who can save employers time and cost to ensure they can work independently.

3.3 Relationship between BIM Training and BIM Knowledge

Table 8. Pearson Correlation between BIM Training and BIM Knowledge

	BIM Training	BIM Knowledge
Correlation Coefficient	1.000	0.843**

Sig. (2-tailed)		0.000
N	169	169

***Correlation is significant at the level 0.01 (2-tailed)*

Table 8 above illustrates the Pearson correlation relationship between BIM training and BIM knowledge. According to the *Rule of Thumbs* table, the correlation analysis results in a significant relationship between BIM training and BIM knowledge (r=0.843, p=0.000; p<0.05). BIM training has a significant and strong positive relationship with BIM knowledge. According to the findings of the relationship study, BIM training has a significant impact on graduates' knowledge in BIM. Students who obtain training during education mostly gain basic BIM knowledge and skills in BIM tools (Kolarić et al., 2018). The training benefits students to improve their skills and knowledge throughout the educational process in the institutions.

3.4 Relationship between BIM Training and Graduates Employability

Table 9. Pearson Correlation between BIM Training and Graduate Employability

	BIM Training	Graduate Employability
Correlation Coefficient	1.000	0.970**
Sig. (2-tailed)		0.000
N	169	169

***Correlation is significant at the level 0.01 (2-tailed)*

According to the *Rule of Thumbs* table, the results of the correlation analysis in Table 9 show a significant relationship between BIM training and graduate employability (r=0.970, p=0.000; p<0.05). BIM training and graduate employability have a significant very strong relationship. The relationship analysis results show that BIM training for graduates has a significant impact on their employment. Graduates who have received technical training in BIM have a better chance of being hired. The results align with Lucena et al. (2015) finding that BIM training helps individuals cater to the needs for industrial practices in the construction industry.

3.5 Relationship between BIM Knowledge and Graduates Employability

Table 10. Pearson Correlation between BIM Knowledge and Graduate Employability

	BIM Knowledge	Graduate Employability
Correlation Coefficient	1.000	0.839**
Sig. (2-tailed)		0.000
N	169	169

*** Correlation is significant at the level 0.01 (2-tailed)*

The results of the correlation analysis between BIM knowledge and graduate employability can be seen in Table 10. According to the *Rule of Thumbs* table, there is a significant strong relationship between BIM knowledge and graduate employability (r=0.839, p=0.000; p<0.05). BIM knowledge

and graduate employability have a significant and strong positive relationship impacts towards graduate employability after graduation. The result aligns with the finding from Mojtaba & Ku (2010), concluding that most employers look up individuals with BIM knowledge as extra skills to be employed.

4.0 CONCLUSION

Overall, in terms of the graduates' level of BIM training, BIM knowledge and employability of architecture graduates are still at a moderate level. That explains that BIM is still new to the education in Polytechnic, which is there are still lots of improvements in terms of teaching and learning techniques that need to be provided to students according to current demands. The results also show a significant and strong relationship between BIM training and BIM knowledge towards graduate employability among architecture graduates from Malaysian Polytechnics.

The study's findings from the aspects of BIM training, BIM knowledge, and graduate employability can be concluded that graduates who have training experience in BIM will basically have basic knowledge in BIM. This is very helpful for graduates, and usually, these graduates have more benefits in terms of their skills to be employed after graduation. The study findings are in accordance with Hasan Saleh and Hendrik Lamsali (2019), who discovered a correlation between graduate abilities and their employment. Graduates with training and knowledge have more potential to be recruit by the employer in the construction industry.

Lecturers also need to play an important role in ensuring that the students are exposed to the latest technology to meet the needs of employers and the construction industry. Thus, initiatives by lecturers and institutions are being taken to ensure that polytechnic graduates, particularly architecture, are highly competent and fulfill the expectations of employers in the construction sector. Collaboration between institutions and industry will aid in determining needed skills and providing early education in BIM skills and knowledge to develop semi-skilled employees to fulfill the expectations of employers in the construction sector (Lee & Yun, 2015).

Furthermore, students must contribute to the diversification of skills and knowledge in BIM so that employers may expect graduates to be proficient in BIM skills upon graduation. Students also need to ensure that they have the appropriate basic skills and training according to the demands of the industry to ensure that they have good self-qualifications to be employed to work compared to others. In ensuring that architecture graduates get work placements after graduation, various efforts, techniques, and skills need to be improved by lecturers to ensure that these graduates are flexible, skilled, and competitive.

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