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Digital Competencies and Academic Performance among Malaysian Graduating Business Students

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Abstract
Integrating digital competencies into the curriculum is currently a top issue in higher education. This study investigates the relationship between digital competencies and academic performance among final-year business students at a Malaysian public university. Using surveys, data were analysed through correlation and multiple regression. Findings revealed that all five dimensions of digital competencies —problem-solving, collaboration, device handling, information literacy, and digital security —were positively correlated with academic performance, but only overall digital competency significantly predicted outcomes. The results highlight the importance of digital skills as a holistic construct and provide implications for higher education to strengthen digital literacy for student success.

Keywords: Digital Competencies; Academic Performance; Information Literacy; Digital Security

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1.0 Introduction
Academic performance is a crucial indicator of student success and the overall effectiveness of the educational system, as it reflects students' mastery of knowledge and skills acquired through coursework, assessments, and extracurricular engagement (Alonso-García et al., 2024). In Malaysian universities, academic performance is typically quantified using the cumulative grade point average (CGPA), which serves as a benchmark for scholarships, internships, and employability outcomes (Ismail et al., 2024). In recent years, particularly following the shift to online and hybrid learning models brought about by the COVID-19 pandemic, digital competencies have become increasingly vital in shaping students' learning experiences and achievements (Dommett, 2024; Omoniyi & Ujir, 2025). While universities have invested substantially in digital infrastructure, questions remain regarding how effectively students leverage these digital competencies to enhance their academic performance.

Digital competencies encompass a broad range of cognitive, technical, and socio-emotional skills, including the ability to utilise digital tools, manage online information, ensure cybersecurity, and collaborate through virtual platforms (Süzer & Koç, 2024). These competencies are no longer supplementary but are essential attributes for academic and professional success in a digitally mediated learning environment (Braßler, 2024). Despite this growing importance, the relationship between digital competencies and academic performance remains under-researched, especially in developing contexts such as Malaysia (Omoniyi & Ujir, 2025). Understanding this relationship is vital for universities seeking to design curricula and support systems that prepare students for the digital demands of the

modern workforce. This study addresses this gap by examining the association between different dimensions of digital competencies and academic performance among graduating business students at a public university in Malaysia. Graduating students are expected to demonstrate high levels of digital competence, as they represent the emerging workforce equipped to navigate the evolving digital economy.

This study addresses the following research questions: (1) What is the level of digital competencies among graduating students in a Malaysian public university? (2) Is there a significant relationship between digital competencies and academic performance? (3) Which dimensions of digital competencies are the strongest predictors of academic performance? Through empirical analysis, this study aims to contribute to understanding how digital readiness influences academic outcomes and to provide relevant recommendations grounded in the evidence gathered.

2.0 Literature Review

Digital competencies have become indispensable for students navigating today's technology-driven learning environments. These competencies extend beyond basic computer literacy to encompass cognitive, technical, and socio-emotional skills required for effective participation in digital education. Although the European Commission's DigComp 2.1 framework remains influential, recent research emphasises expanded dimensions of digital competence relevant to higher education, including information literacy, communication and collaboration, digital content creation, safety, and problem-solving (Süzer & Koç, 2024; Braßler, 2024).

Information and data literacy involve the ability to locate, evaluate, and apply digital information critically, a skill that remains central to academic research and higher-order thinking. Recent validation studies confirm that students with strong information literacy and digital competence achieve superior academic outcomes (Mejías-Acosta et al., 2024). Similarly, digital problem-solving now encompasses informed decision-making, adaptability, and creative thinking in complex online environments. Evidence shows that digital autonomy and positive digital attitudes significantly strengthen problem-solving abilities (Blanc et al., 2025). Moreover, collaborative digital engagement—through communication, coordination, and co-creation—is increasingly essential in project-based learning. Empirical findings indicate that digital competence enhances students' self-efficacy, motivation, and ultimate academic performance (Omoniyi & Ujir, 2025; Romi, 2024). However, disparities in socioeconomic status, access to devices, and prior digital exposure continue to moderate these relationships (Dommett, 2024).

Despite growing interest, few empirical studies in the Malaysian context have comprehensively examined the relationship between digital competencies and academic performance among undergraduates. This study fills that gap by adopting a multidimensional approach to digital competencies and testing their associations with academic performance among final-year business students at a major public university. The conceptual framework for this study is grounded in the DigComp 2.1 model and extends it by positing that specific dimensions of digital competencies are associated with students' academic performance. Based on the reviewed literature and theoretical foundation, the following hypotheses are proposed:

* H1: There is a significant positive relationship between students' overall digital competencies and academic performance.
* H2: Problem-solving as a digital competency dimension is positively associated with academic performance.
* H3: Collaboration in digital environments is positively associated with academic performance.
* H4: Effective handling of digital devices contributes positively to academic performance.
* H5: Information literacy has a positive impact on academic performance.
* H6: Application of digital security practices is positively associated with academic performance.

3.0 Methodology

This study employed a quantitative, cross-sectional research design to examine the relationship between digital competencies and academic performance among graduating business students. A quantitative approach was selected because it allows for objective measurement of variables and statistical analysis of relationships among constructs (Creswell & Creswell, 2024). The cross-sectional design was deemed appropriate as it captures data at a single point in time, enabling the identification of patterns and correlations between students' digital skills and their academic outcomes without manipulating variables (Saunders et al., 2023).

The target population consisted of all final-year students enrolled in the Faculty of Business and Management at Universiti Teknologi MARA (UiTM), Selangor Branch, Puncak Alam Campus. This population was selected because graduating students are expected to have well-developed digital competencies as they transition into the workforce. Given time constraints and accessibility considerations, a convenience sampling technique was adopted. Although non-probabilistic, this method is widely used in exploratory educational studies that focus on understanding relationships within a specific student group rather than generalising to a larger population (Etikan, 2024). An online questionnaire link was distributed via institutional email and learning platforms, yielding 84 valid responses.

The research instrument was a structured questionnaire comprising seven sections: demographic information, academic performance, and five dimensions of digital competencies—problem-solving, collaboration, handling of digital devices, information literacy, and digital security. These dimensions were derived from the European Commission's DigComp 2.1 Framework and adapted to the Malaysian higher education context. Items measuring academic performance were adapted from Mehrvarz et al. (2021), while the digital competency items were modified from Roll (2021) to ensure contextual relevance. A 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree) was used to capture respondents' agreement levels, as it enhances measurement sensitivity and minimises response bias (Joshi et al., 2015).

Prior to analysis, data screening was performed to identify outliers, missing values, and inconsistencies. This step ensured data accuracy and reliability for subsequent analysis. Descriptive statistics were employed to summarise demographic characteristics and provide an overview of variable distributions. To assess internal consistency, Cronbach's alpha coefficients were calculated; values above 0.70 indicate acceptable reliability (Hair et al., 2023). For inferential analysis, Pearson's correlation was used to assess the strength and direction of the linear relationship between digital competency dimensions and academic performance. This test was chosen because it is suitable for normally distributed interval data and helps identify statistically significant associations (Field, 2022). Subsequently, a multiple regression analysis was conducted to determine the predictive power of each digital competency dimension for academic performance, while controlling for overlapping effects. Data were analysed using IBM SPSS version 25.0, which provides robust statistical analysis tools and ensures reproducibility of results.

4.0 Findings

Participants were mainly female (81%) and aged 24-26 years (60%). Table 1 presents the descriptive statistics and reliability coefficients for the study's main variables, including Academic Performance and Digital Competencies, the latter measured across five sub-dimensions. The overall mean score for Academic Performance was 3.27 (SD = 0.55), indicating a moderate level of academic achievement among the respondents. Meanwhile, the overall Digital Competencies score was higher, with a mean of 3.62 (SD = 0.51), suggesting that participants generally perceived themselves as digitally competent.

Table 1. Descriptive and reliability analyses

Variables	No. of Item	Mean	Standard Deviation	Skewness	Kurtosis	Cronbach's Alpha
Academic Performance	4	3.27	0.55	-0.79	2.85	0.880
Digital Competencies	55	3.62	0.51	-0.05	-0.48	0.958
• Problem-Solving	10	3.49	0.77	-0.34	-0.35	0.886
• Collaboration	5	3.63	0.57	-0.29	-0.16	0.682
• Handling of Digital Devices	10	3.65	0.73	-0.24	-0.60	0.883
• Information Literacy	15	3.54	0.50	-0.11	-0.41	0.887
• Application of Digital Security	15	3.89	0.69	-0.73	1.33	0.940

As shown in Table 1, among the five sub-dimensions of Digital Competencies, the highest mean was recorded for the Application of Digital Security (M = 3.89, SD = 0.69), indicating that students are particularly confident in their ability to manage digital security practices. This was followed by Collaboration (M = 3.63, SD = 0.57), Handling of Digital Devices (M = 3.65, SD = 0.73), and Problem-Solving (M = 3.49, SD = 0.77). Information Literacy had a slightly lower mean of 3.54 (SD = 0.50), although it still reflected a positive self-assessment. The standard deviation values for all variables ranged from 0.50 to 0.77, indicating a moderate spread of responses and no extreme variability in the data. In terms of distribution characteristics, the skewness and kurtosis values for all variables fell within acceptable ranges (between -1 and +1), suggesting that the data were approximately normally distributed. Notably, Academic Performance showed a slightly more peaked distribution (kurtosis = 2.85) and moderate negative skewness (-0.79), implying that more students rated themselves toward the higher end of the scale.

The internal consistency of the scales was assessed using Cronbach's alpha. The overall Digital Competencies scale demonstrated excellent reliability (alpha = 0.958). Most sub-dimensions also showed high internal consistency, including Problem-Solving (α = 0.886), Handling of Digital Devices (α = 0.883), Information Literacy (α = 0.887), and Application of Digital Security (α = 0.940). Academic Performance also displayed strong reliability (α = 0.880). However, the Collaboration subscale showed a relatively low alpha value of 0.682, which, while still acceptable, suggests the need to refine the items measuring this construct. Overall, the findings suggest that the measurement instruments used in this study are both reliable and valid, with acceptable psychometric properties. The results also indicate that students possess moderately high digital competencies, particularly in digital security, though there may be room for improvement in collaborative digital skills.

Table 2 presents the Pearson correlation coefficients between Academic Performance and Digital Competencies, including their five sub-dimensions. As shown, Academic Performance is significantly and positively correlated with the overall Digital Competencies score (r = .515, p < .01), indicating that students with higher digital competencies tend to report better academic performance. Among the five sub-dimensions of Digital Competencies, Problem-Solving demonstrated a moderate positive correlation with Academic Performance (r = .397, p < .01), suggesting that students who are more adept at solving digital-related problems tend to perform better academically. Information Literacy (r = .396, p < .01) and Application of Digital Security (r = .377, p < .01) also showed moderately strong positive relationships with Academic Performance. Meanwhile, Handling of Digital Devices (r = .344, p < .01) and Collaboration (r = .345, p < .01) were positively correlated as well, although with slightly lower coefficients.

Table 2. Correlation analysis

	Academic Performance	Digital Competencies	Problem-Solving	Collaboration	Handling of Digital Devices	Information Literacy	Application of Digital Security
Academic Performance	1						

Digital Competencies	.52**	1					
• Problem-Solving	.40**	.77**	1				
• Collaboration	.35**	.67**	.44**	1			
• Handling of Digital Devices	.34**	.87**	.67**	.63**	1		
• Information Literacy	.40**	.85**	.56**	.60**	.66**	1	
• Application of Digital Security	.38**	.83**	.48**	.43**	.63**	.64**	1

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

The internal correlations among the sub-dimensions of Digital Competencies were also notably strong. For instance, Problem-Solving was strongly associated with Information Literacy (r = .797, p < .01) and Handling of Digital Devices (r = .596, p < .01), reflecting their conceptual overlap and interdependence in digital tasks. Similarly, the strongest correlation was observed between Information Literacy and the overall Digital Competencies score (r = .832, p < .01), indicating the central role of Information Literacy within the broader construct of Digital Competencies. Overall, these results suggest that digital competencies—particularly information literacy, problem-solving, and the application of digital security—are meaningful predictors of students' academic performance. The statistically significant, positive relationships highlight the importance of integrating digital skills development into educational curricula to support academic achievement.

Table 3. Multiple regression analysis

Independent Variables	Unstandardized Coefficient		Standardised Coefficient	t	Sig.
	B	Std. Error	Beta		
Constant	1.25	.37		3.34	<.001
Digital Competencies	.56	.10	.52	5.45	<.001
F-Value: 29.65 (Sig. <.001), R-Square: 0.27					
Constant	1.36	.43		3.14	.002
Problem-Solving	.18	.10	.25	1.83	.071
Collaboration	.15	.13	.16	1.16	.251
Handling of Digital Devices	-.09	.13	-.12	-.69	.491
Information Literacy	.14	.17	.12	.80	.426
Application of Digital Security	.15	.11	.19	1.35	.180
F-Value: 4.70 (Sig. <.001), R-Square: 0.23					

Table 3 presents the results of two multiple regression analyses examining the influence of digital competencies and their components on a dependent variable. In the first model, Digital Competencies as a single predictor significantly predicted the outcome variable, with a standardised beta coefficient of 0.52 (t = 5.45, p < .001), indicating a strong, statistically significant positive relationship. The model explains 27% of the variance (R^2 = 0.27), and the overall model is statistically significant (F = 29.65, p < .001). In the second model, Digital Competencies are broken down into five components: Problem-Solving, Collaboration, Handling of Digital Devices, Information Literacy, and Application of Digital Security. While the overall model remains significant (F = 4.70, p < .001) and explains 23% of the variance (R^2 = 0.23), none of the individual components are statistically significant predictors at the conventional p < .05 level. The closest is Problem-Solving (p = .071), suggesting a possible trend but not strong enough to be considered significant. This indicates that while digital competencies are a significant predictor, their individual dimensions may not independently explain the outcome in this model, possibly due to multicollinearity or overlapping variance among them.

5.0 Discussion

The findings from this study provide empirical support for the hypothesis that digital competencies are positively associated with academic performance among university students. Although the correlation was relatively low, the associations were statistically significant across all five dimensions. This suggests that while digital competencies alone do not guarantee academic success, they make a meaningful contribution to it. The weak correlations may be due to external factors, such as unequal access to reliable internet or digital devices, or prior exposure to digital platforms, which can moderate the efficacy of these competencies. Moreover, student motivation, cognitive ability, and self-regulated learning strategies may mediate the relationship between digital skills and academic performance.

The results are consistent with previous findings by Roll (2021) and Martzoukou et al. (2022), indicating that information literacy and digital problem-solving are crucial for navigating academic tasks in digital environments. However, the relatively lower correlations for collaboration and device handling suggest that students may be using these competencies more peripherally. From a pedagogical perspective, this study highlights the importance of integrating digital literacy training into undergraduate curricula. Universities should offer targeted workshops, digital boot camps, and support services to enhance students' digital preparedness.

The findings from the regression analysis suggest that overall digital competencies have a significant predictive value for the dependent variable, aligning with previous research that emphasises the importance of digital skills in influencing performance-related outcomes. For instance, Ilomäki et al. (2016) and Van Laar et al. (2017) have argued that digital competence is a key driver of effectiveness and adaptability in educational and professional settings. The significant result ($\beta = .52$, $p < .001$) supports these claims, showing that individuals with higher digital competencies tend to perform better in the targeted outcome, which could relate to academic achievement, digital task performance, or workplace efficiency, depending on the study context.

However, when digital competencies are broken down into their sub-components—Problem-Solving, Collaboration, Handling of Digital Devices, Information Literacy, and Application of Digital Security—none were individually significant predictors at the $p < .05$ level. This result is somewhat inconsistent with studies that highlight the unique contributions of individual digital skills. For example, Ferrari (2012) identified information literacy and problem-solving as critical components of digital competence that directly contribute to knowledge building and task success. Similarly, Ng (2012) emphasised that handling digital devices is foundational to digital engagement and learning outcomes.

The lack of significance in the sub-components might be attributed to multicollinearity, in which the independent variables are highly interrelated and thus dilute each other's predictive power when included in the same model (Tabachnick & Fidell, 2013). Another plausible explanation is that the synergy of these components—rather than their isolated effects—is what truly drives performance, a view supported by Claro et al. (2012), who argued that digital competence should be seen as a holistic construct rather than a sum of discrete skills. In summary, this study reinforces the importance of overall digital competence but raises questions about the distinct contribution of each component when assessed simultaneously. Future research should consider employing structural equation modelling or hierarchical regression to further explore these dynamics.

6.0 Conclusion & Recommendations

This study concludes that digital competencies —particularly problem-solving, information literacy, and digital security —show a modest but significant association with academic performance. These findings are highly relevant in the post-pandemic educational context, where hybrid and online learning have become the norm. Nonetheless, several limitations must be acknowledged when interpreting the results. The study employed a cross-sectional design, which restricts the ability to infer causality between digital competencies and academic performance, as data were collected at a single point in time. Furthermore, the relatively small sample size of 84 respondents and the use of a convenience sampling method limit the representativeness of the findings, reducing their generalisability to other student populations and institutions. The reliance on self-reported data may also introduce response bias, as participants might have overestimated their digital skills. Future research is therefore encouraged to employ longitudinal designs involving larger, more diverse samples across multiple universities to validate these findings and capture changes in digital competence over time. Incorporating qualitative approaches could also provide deeper insights into students' lived experiences and digital learning practices.

The findings of this study provide practical implications for policymakers and higher education leaders. It is recommended that the results be shared with the Ministry of Higher Education (MOHE) and relevant agencies to guide the development of nationwide digital literacy and competency frameworks. By embedding these findings into curriculum planning, universities across Malaysia can adopt a consistent, holistic approach to integrating digital competencies into core academic programmes. While students in this study exhibited moderate to high digital competence, the results indicate that overall digital skills—rather than individual components—are stronger predictors of academic success. Hence, curriculum designers should embed digital competencies throughout core courses rather than offering them as stand-alone modules, ensuring all students gain these essential capabilities.

Beyond curriculum design, universities should strengthen institutional support systems to address inequalities in digital readiness and access. Differences in infrastructure, faculty digital preparedness, and students' access to devices and internet connectivity continue to be ongoing challenges. Targeted initiatives such as digital mentoring programmes, peer-assisted learning, and staff upskilling workshops can help improve institutional capacity. Regular assessments of digital competencies using validated tools should also be conducted to monitor progress and guide continuous improvement. By aligning institutional strategies with national digital transformation goals and sharing empirical findings with the Ministry of Higher Education, Malaysian universities can collectively enhance digital readiness, learning outcomes, and academic excellence across the higher education landscape.

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Paper Contribution to the Related Field of Study

This study contributes to the field of educational research and human resource development by providing empirical evidence on the role of digital competencies in shaping academic performance within the Malaysian higher education context. While much of the existing literature emphasises digital literacy in developed countries, this study extends the discourse to a developing economy, offering insights into how students in resource-constrained environments leverage digital skills to achieve academic success. By adopting a multidimensional framework of digital competencies—problem-solving, collaboration, device handling, information literacy, and digital

security —the study demonstrates that digital competence operates most effectively as a holistic construct rather than a set of isolated skills. This finding refines theoretical perspectives by supporting the view that the synergy of digital skills is more predictive of academic outcomes than individual components. Methodologically, the study adds value by combining correlation and regression analyses to distinguish between overall and component-level effects. Practically, the results underscore the need for universities to integrate comprehensive digital literacy training into their curricula, ensuring that graduates are not only academically successful but also workforce-ready in an increasingly digital economy. Thus, this research bridges a critical gap between digital education policies and student performance outcomes.

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