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Digital Competencies and Academic Performance among Malaysian Graduating Business Students

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Abstract
Integrating digital capabilities 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 analyzed through correlation and multiple regression. Findings revealed that while all five dimensions of digital competencies; problem-solving, collaboration, device handling, information literacy, and digital security, were positively correlated with academic performance, only overall digital competency significantly predicted outcomes. The results highlight the importance of digital skills as 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 effectiveness of the educational system. It reflects students' learning outcomes, including the knowledge and skills acquired through coursework, assessments, and extracurricular engagement. In Malaysian universities, academic performance is often quantified using cumulative grade point averages (CGPA), which serve as a benchmark for evaluating students' eligibility for scholarships, internships, and employment opportunities.

In recent years, particularly with the shift to online and hybrid learning models necessitated by the COVID-19 pandemic, digital competencies have become increasingly important in the academic domain. While institutions have invested heavily in digital infrastructure, it remains unclear to what extent students' digital competencies influence their academic performance. Digital competencies encompass a broad range of skills, including the ability to utilize digital tools, manage online content, ensure cybersecurity,

and collaborate effectively through digital platforms. These competencies are no longer optional; they are integral to the success of students in academic settings.

Despite this growing importance, the extent to which digital competencies impact academic performance remains under-researched, particularly in developing countries such as Malaysia. Understanding this relationship can help universities design curricula and support systems that better prepare students for the digital demands of modern education. This study addresses this gap by examining the association between various dimensions of digital competencies and academic performance among graduating business students at a public university in Malaysia. Graduating students are expected to possess high digital competencies, as they are the fresh supply for the career world that is now in the digital age.

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 the understanding of how digital readiness influences academic outcomes and to provide relevant recommendations based on the empirical evidence gathered in this research.

2.0 Literature Review

Digital competencies have emerged as essential tools for students operating in today's technology-driven academic environment. These competencies extend beyond basic computer literacy, encompassing a wide range of cognitive, technical, and socio-emotional skills necessary to participate meaningfully in digital learning environments. In 2017, the European Commission's Digital Competence Framework (DigComp 2.1) delineates digital competence into five dimensions: information and data literacy, communication and collaboration, digital content creation, safety, and problem solving.

Information and data literacy refers to the capacity to identify, locate, retrieve, store, organize, and analyze digital information, assessing its relevance and purpose. This skill is foundational in academic research and problem-solving, enabling students to engage critically with content. According to Fraillon et al. (2019), information literacy is predictive of higher-order learning outcomes. Problem-solving in the digital realm involves not only addressing technical issues but also making informed decisions in complex, evolving digital contexts. Roll (2021) asserts that digital problem-solving is central to adapting to dynamic online learning systems. Moreover, students must demonstrate collaboration skills using digital tools that involve communication, coordination, and co-creation of knowledge. These are vital in project-based learning and team assignments.

Academic performance is influenced by cognitive, social, and technological factors (Shahjahan et al., 2021). Research by Choonsalasin and Khampirat (2022) indicates that students with higher digital skills also exhibit higher levels of academic self-efficacy and motivation, which contribute positively to academic performance. Nevertheless, the relationship between digital competencies and academic performance is often moderated by external variables such as socioeconomic status, access to digital infrastructure, and prior exposure to technology.

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 research employed a quantitative, cross-sectional research design to investigate the relationship between digital competencies and academic performance. This approach is appropriate for assessing correlations among multiple variables across a defined population at a single point in time. The population targeted for this study comprised all graduating students from the Faculty of Business and Management at UiTM Selangor Branch, Puncak Alam campus. A convenience sampling technique was used to distribute online questionnaires to all final-year students. A total of 84 students responded and completed the questionnaire.

The primary data collection tool was a structured questionnaire divided into seven sections: demographics, academic performance, and five dimensions of digital competencies (problem-solving, collaboration, handling of digital devices, information literacy, and application of digital security). Items measuring academic performance were adapted from Mehrvarz et al. (2021), while the digital competency items were drawn from Roll (2021). All constructs were measured using a 5-point Likert scale (1 = Strongly Disagree to 5=Strongly Agree).

Before analysis, the dataset was screened for outliers and missing values. Descriptive statistics were used to summarize the demographic data and describe the distributions of variables. Reliability was assessed using Cronbach's alpha to ensure internal

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consistency of the scales. Pearson correlation analysis was conducted to determine the strength and direction of relationships between the independent variables (digital competency dimensions) and the dependent variable (academic performance). Data analysis was conducted using SPSS version 25.0. Descriptive statistics summarized demographic information and the distributions of variables. Multiple regression analysis was employed to evaluate the predictive value of digital competency dimensions on academic performance.

4.0 Findings

Participants were mainly female (81%), aged between 24 and 26 years (60%). Table 1 presents the descriptive statistics and reliability coefficients for the study's main variables, which include Academic Performance and Digital Competencies, the latter being 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 between 0.50 and 0.77, indicating a moderate spread of responses and no extreme variability within 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 with an alpha value of 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 lower alpha value of 0.682, which, while still acceptable, suggests the need for potential refinement of 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 areas related to digital security, though there may be room for improvement in collaborative digital skills.

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).

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.

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 in the broader construct of digital competencies. Overall, these results suggest that digital competencies—particularly information literacy, problem-solving, and digital security application—are meaningful predictors of students' academic performance. The statistically significant and positive relationships highlight the importance of integrating digital skills development in 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 standardized beta coefficient of 0.52, t = 5.45, and p < .001, indicating a strong and 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 as a whole 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. While the magnitude of 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, 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 emphasizes 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 (β = .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 found to be individually significant predictors at the

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$p < .05$ 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) emphasized 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, where the independent variables are highly interrelated and thus dilute each other's individual 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 modeling or hierarchical regression to explore these dynamics further.

6.0 Conclusion & Recommendations

This study concludes that digital competencies, particularly problem-solving, information literacy, and digital security, have a modest but significant association with academic performance. These findings are especially relevant in the post-pandemic educational landscape, where hybrid and online learning are becoming the norm. To better prepare students for digitally mediated academic environments, universities should integrate digital skills training into core courses and develop institutional policies promoting digital equity. Future studies should employ longitudinal designs and explore potential mediators such as self-efficacy and digital informal learning behaviours. Moreover, qualitative insights from students could help unpack the nuances behind their digital practices and how these relate to academic performance. Overall, the evidence suggests that improving digital competencies can enhance not only academic outcomes but also graduates' readiness for digitally intensive workplaces.

The findings of this study recommend that higher education institutions in Malaysia and similar contexts embed digital competency development as a core component of their curricula. While students in this study demonstrated moderate to high levels of digital competence, the evidence shows that overall digital skills, rather than isolated components, significantly predict academic performance. Universities should therefore adopt a holistic approach by integrating digital literacy training across courses, rather than confining it to standalone modules. Initiatives such as digital boot camps, problem-based learning projects, and collaborative online platforms can help students apply these competencies in authentic academic settings. Furthermore, policymakers should strengthen national digital education frameworks to ensure that graduates are equipped not only for academic success but also for the demands of digitally intensive workplaces.

Beyond curriculum design, universities should consider implementing structured support systems to reduce inequalities in digital readiness. Access to reliable devices, high-speed internet, and digital support services remains uneven, particularly for students from lower socioeconomic backgrounds. Targeted interventions, such as digital mentoring programs, peer-to-peer learning initiatives, and faculty training in digital pedagogy, could enhance students' digital preparedness. Importantly, institutions should also regularly assess digital competencies using validated tools to monitor progress and identify areas for improvement. By aligning digital education strategies with academic performance outcomes, higher education can better prepare students to thrive in technology-driven environments while simultaneously contributing to national human capital development.

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Paper Contribution to 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 emphasizes 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 for academic success. By adopting a multidimensional framework of digital competencies, including 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 as 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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