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Digital Competency and Its Impact on Academic Achievement among Polytechnic Students

Suhaizal Hashim[1]*, Nurhani Khamis[1], Nur Imanina Nor Azli[1], Noor Hidayah Che Lah[2]

[1] *Faculty of Technical and Vocational Education, Universiti Tun Hussein Onn Malaysia, Parit Raja, Johor, 86400, MALAYSIA*
[2] *Faculty Of Computing and Meta-Technology, Universiti Pendidikan Sultan Idris Tanjung Malim, Perak, 35900, MALAYSIA*

*Corresponding Author: suhaizal@uthm.edu.my
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Abstract

In the era of digital transformation that accelerates the evolution of educational systems, mastery of digital competencies in accounting subjects has become a critical foundation for enhancing the quality of learning and preparing students to meet industry demands. This study aims to examine the relationship between digital competencies in accounting subjects and the academic performance of polytechnic students, specifically within the Commerce Department at Ungku Omar Polytechnic. In line with advancements in digital transformation in education, this research focuses on how proficiency in digital tools such as accounting software (MYOB, QuickBooks), interactive e-learning platforms, and data analysis tools can enhance students' technical skills and stimulate critical thinking through realistic financial scenario simulations. This quantitative study employs the Integrative Digital Competence Assessment (IDCA) model, which encompasses technological, cognitive, and ethical dimensions, with data collected from 287 students through a questionnaire based on the IDCA constructs. Based on descriptive analysis, most respondents were students in semesters 2 (45.3%) and 4 (39.0%) of the Diploma in Accounting program (73.9%), with 96.2% having experience using technology in learning. Analysis of digital competence using the IDCA model showed the highest achievement in the ethical dimension (mean=4.25, SD=0.51), followed by the cognitive dimension (mean=3.86, SD=0.58) and technology (mean=3.54, SD=0.60). The results of Spearman correlation analysis revealed a weak and non-significant relationship between digital competence and academic performance (r=0.044, p=0.460). The results show that all factors studied were at a high level and had significant relationships with students' academic performance, thus emphasizing the importance of integrating digital technology into the accounting curriculum to ensure graduates are better prepared to meet current industry requirements. These findings also suggest that other factors such as teaching methods,

student motivation, or basic accounting skills may have a greater influence on academic achievement than digital competence alone.

1. Introduction

McGarr & McDonagh (2019) stated that digital competency refers to an individual's ability to effectively use digital technology in various contexts, including education, employment, and daily life. This definition emphasizes that digital competency involves technical skills, critical thinking, and ethical understanding in technology use. In the context of educational digitalization, it involves the integration of digital technologies and tools into the education system to enhance teaching and learning experiences. It includes mastery of digital technology platforms within digital education organizations that enable students to interact with learning materials more effectively and efficiently (Rahmadin Munauwarah & Muh. Wasith Achadi, 2023).

Studies by Taib, Awang, & Shuhidan (2023) and Tavares et al. (2023) show that digital competency in accounting education encompasses students' ability to use digital technology and related software to manage financial information more efficiently. Good mastery of digital skills not only helps students understand modern accounting processes but also improves efficiency in financial analysis and prepares them to face challenges in the increasingly technology-oriented accounting industry. Furthermore, accounting students need to master data processing tools and techniques to enhance effectiveness in accounting tasks (Nguyen et al., 2024). The use of accounting software, financial analytics, and other digital technologies has been proven to improve assignment quality and help students achieve better academic performance (Ismail et al., 2024).

In higher education institutions, the use of digital literacy is increasingly emphasized in both public and private universities. However, Technical and Vocational Education and Training (TVET) institutions, such as polytechnics, still place more emphasis on practical technical skills learning compared to digital literacy (Song & Chea, 2023). Along with rapid technological advancements and changes in the job market, digital skills have become essential for accounting graduates to remain competitive in the workforce (Hunter et al., 2020). Digital competency is a crucial factor in improving the academic performance of TVET students, especially in accounting subjects. A study by Dao et al. (2023) found a significant positive relationship between digital skills and academic performance of students in accounting subjects. Digital learning triggers high motivation among students since a technology-based learning environment provides more enjoyment and effectiveness to the learning process (Song & Chea, 2023).

Research also proves that digital competency is important for enhancing academic performance because it facilitates more effective active student engagement (Rasiah et al., 2023). Students with digital competency can access online learning resources such as tutorial videos and articles related to accounting, providing them with deeper information on accounting concepts that may not be traditionally taught in classrooms (Hunter et al., 2020). Additionally, skills in using accounting software such as QuickBooks and Microsoft Excel enable students to perform accounting tasks more efficiently. For example, students can use Microsoft Excel to prepare budgeting and financial reports. Mastery of these tools has been recognized by employers as one of the essential requirements for accounting graduates (Yen & Liu, 2020). Moreover, students proficient in technology can utilize analytical tools like SPSS to analyze company financial performance based on collected data. These skills not only improve technical ability but also prepare students to face increasingly complex, technology-driven work environments, especially in the context of the Fourth Industrial Revolution (IR4.0) (Fournier-Tombs et al., 2023).

Mastering digital competency enables students to be better prepared to meet the ever-changing and increasingly competitive industry demands. Therefore, this study will examine whether there is a relationship between digital competency in accounting subjects and the academic performance of TVET students.

2. Methodology

This chapter explains the methods that will be used in conducting this study. It consists of research design, operational framework of the study, sampling, research instruments, instrument validity, instrument reliability, data collection procedures, pilot study, normality testing, data analysis methods, and summary. This chapter will explain how the relationship between digital competency influences academic performance in this study. Previous research has shown that the integration of digital competency in TVET education helps students achieve better academic performance (Crosling, Atherton, & Azizan, 2023). The use of structured approaches such as the digital competency framework model (IDCA) can ensure accurate measurement of students' digital skills levels and their relationship with academic achievement (Han et al., 2023; Xin et al., 2024).

This chapter focuses on detailing the methodology used in the study entitled “The Relationship Between Digital Competency in Accounting Subjects and the Academic Performance of Polytechnic Students.” In this study, the IDCA Model (Innovation, Digital Competence Assessment) is used as the main framework to assess students’ digital competency levels, considering that digital capability is a highly important aspect in the modern education era (Grech & Camilleri, 2020). This study will utilize a valid and reliable framework and instruments to ensure the

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accuracy of the findings. The use of digital technology in TVET is increasingly being introduced to enhance learning effectiveness as well as to improve student performance (Razali et al., 2023; Odondi et al., 2022).

2.1 Research Sample

Based on the sample size determination table by Krejcie and Morgan (1970), the required sample size for a population of 1,075 students is 285 respondents, which is approximately 27% of the total population. This method is used to ensure statistical accuracy in data analysis, particularly in detecting relationships between study variables and to enhance the generalizability of the findings to a larger population (Creswell, 2014; Fowler, 2014). Previous studies have also emphasized that a large sample size, as used in this study, can strengthen the analytical capability to detect significant effects or correlations between digital competency and students' academic performance (Johansson et al., 2020).

In the initial phase, a total of 295 data sets were successfully collected. However, a screening process was conducted to ensure that only truly relevant respondents were included in the analysis. Respondents who were in semesters that did not take accounting subjects, and those who did not have a list of accounting subjects in their examination transcripts, were excluded as there were no available sources for test score information. After this filtering process, only 287 respondents met the study criteria, which aligns with the minimum requirement according to Krejcie and Morgan (1970), which is 285 respondents. Based on the Krejcie and Morgan table, the minimum required sample size is 285. However, this study successfully collected 287 data points that met the research criteria. This practice is consistent with current recommendations to increase statistical power and to ensure that all valid and eligible data are included in the final sample.

This sampling approach not only ensures representation of various sub-groups in the population but also guarantees the accuracy of the collected data. The combination of purposive sampling techniques and theory-based sample size calculation supports the study's objective to explore the relationship between digital competency and students' academic achievement in TVET, particularly in the context of teaching and learning accounting subjects at polytechnics. The final data set, consisting of 287 respondents, was then entered into the SPSS software for statistical analysis to ensure that the findings are valid and reliable as in table 1 and 2.

Table 1 *Sampling method table*

Process Step	Description	Total Respondent
Original Population	Total number of polytechnic students involved	1075
Required Sample	Sample size based on Krejcie & Morgan (1970) table	285
Data Collected	Questionnaires received from respondents	295
Screening 1	Respondents in semesters not taking accounting subjects excluded	
Screening 2	Respondents without a list of accounting subjects in transcripts excluded	
Number After Screening	Respondents who meet the study criteria and are eligible for analysis	287
Data for Analysis	Final data entered SPSS for statistical analysis	287

Table 2 *Krejcie and Morgan (Krejcie & Morgan 1970)*

N	Sampel	N	Sampel	N	Sample
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	100000	384

2.2 Research Instrument

This research instrument was developed to assess individuals' self-perceptions and is expected to contribute to the study's outcomes (Olsson, Gericke, Sass, & Pauw, 2020). The primary method often used to identify the relationship between digital competency in accounting subjects is using questionnaires. This approach helps

improve the accuracy and authenticity of responses from respondents as the answers given are free from researcher influence. The instrument for this study uses a questionnaire as the main tool for data collection.

2.2.1 Questionnaire Form

The questionnaire is carefully designed to ensure the information collected is valid and reliable, as stated by Hsieh et al. (2021). The data obtained through this questionnaire will be compared with students' exam results to analyze the relationship between the level of digital competency and their academic performance in accounting subjects. This instrument aims to assess students' levels of digital competency, especially in the use of technology and digital tools relevant to accounting subjects. In this study, the researcher will use a set of questionnaire forms, guided primarily by the Instant Digital Competence Assessment (IDCA) Model to assess students' level of digital competency. This instrument will be adapted and adopted from a previous study by Shariah (2023) because of its suitability to this research topic and the use of the Digital Competency Assessment Model (IDCA) to measure academic achievement of students with special needs.

The IDCA Model has been tested and widely used in various educational contexts, including schools in Italy and China, demonstrating a high level of reliability in evaluating students' digital skills. According to Wang, Y., & Chen, D. (2019), the use of the IDCA model is suitable for high school and college students aged 15–19 years. These students should possess sufficient basic skills to be evaluated using this model. The authors emphasize that the level of cognitive maturity at this age allows students to understand and apply digital technology more effectively.

The IDCA Model offers a flexible assessment as it can be conducted online through learning platforms such as Moodle, thus facilitating accessibility for both students and educators. Research by Sharifah Intan Amira and Halizah Awang (2023) demonstrated that this model has good reliability in assessing digital skills among TVET students. This indicates that the IDCA can be effectively applied to assess students' digital competency in accounting subjects, with the advantage of online implementation enhancing user accessibility (Sharifah Intan Amira & Halizah Awang, 2023).

Assessment via IDCA covers three main dimensions: technology, cognitive, and ethics. The technology dimension measures students' ability to handle accounting software such as Microsoft Excel and QuickBooks to record transactions and produce financial reports. The cognitive dimension evaluates students' ability to analyze financial data and make precise decisions based on digital information. The ethical dimension emphasizes understanding issues of copyright, plagiarism, and responsibility in technology use. Table 3 shows the research instrument for questionnaire form:

Table 3 *Research instrument for questionnaire form*

Section	Construct	Number of Questions	Items
Section A	Demographics	5	A1–A5
Section B	Technology Dimension	10	B1–B10
Section C	Cognitive Dimension	10	C1–C10
Section D	Ethics Dimension	10	D1–D10

This questionnaire is divided into three main parts: Section A and Section B, which gather information on students' demographics and digital competency. The demographics section aims to collect basic background information about the students, while the digital competency section focuses on students' skills in technology, cognitive, and digital ethics. Section A consists of five questions on demographics and respondent background. Section B contains 30 questions related to the level of digital competency.

This assessment uses a five-point Likert scale in the questionnaire, allowing data to be collected quantitatively for more detailed analysis. A value of 1 represents "Strongly Disagree" and a value of 5 represents "Strongly Agree". The Likert scale is outlined with five levels as shown in Table 4. Data obtained will be analyzed using Excel software to produce accurate and meaningful research findings. Furthermore, assessments of reliability and validity will also be conducted to ensure the questionnaire used is appropriate and effective in addressing the research questions.

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Table 4 *Likert scale instrument*

Level of Agreement	Likert Scale
Strongly Disagree	1
Disagree	2
Not Sure	3
Agree	4
Strongly Agree	5

2.2.2 Accounting Subject Grades

In addition to the questionnaire, accounting subject grades are used as the main instrument in this study to analyze the relationship between students' digital competency levels and their academic performance in accounting subjects. Exam marks in accounting subjects are assessed based on percentage, then converted into grades and grade points according to the institution's official assessment system. Exam grade data are obtained validly through the student's own exam transcript, ensuring the accuracy and reliability of the information used for analysis.

Use of exam grades as objective data is important as it reflects the student's mastery of the accounting subject content taught, based on the institution's standard assessment. This approach allows for transparent comparison between the level of digital competency measured by questionnaire and the student's actual academic performance. Assessment based on the official institutional grading also reduces bias as all students are assessed uniformly and according to established standards (Chen et al., 2022; Martin & Thompson, 2021).The grading system (A, B, C, etc.) is chosen as it is a widely accepted assessment standard in higher education institutions in Malaysia, facilitating evaluation and comparison of students' achievement levels quantitatively and objectively (Smith & Lee, 2020; Zhang et al., 2020). Each grade has its own grade point, enabling more detailed statistical analysis, especially in determining the correlation between digital competency levels and academic performance in accounting subjects (Rahman & Aziz, 2024).

Furthermore, the use of official institutional grades ensures the findings are relevant and generalizable to real-world educational contexts, while reinforcing the objectivity and integrity of the analysis. The combination of questionnaire data and examination results provides a more comprehensive and thorough approach to achieving the objectives of this study (Buthelezi et al., 2024). Hence, table 5 shows the accounting subject grading table:

Table 5 *Accounting subject grading table*

Grade	Grade Point	Grade Interpretation
A	4.00	Excellent
A-	3.67	Very Good
B+	3.33	Good
B	3.00	Good
B-	2.67	Satisfactory
C+	2.33	Satisfactory
C	2.00	Pass
C-	1.67	Near Pass
D+	1.33	Fail

2.3 Data Analysis

This quantitative study employs two data analysis methods, which are descriptive analysis to analyze the level of perception of environmental knowledge and environmental practice while inferential analysis is used to examine the relationship between these two variables. The results of the descriptive analysis are represented by the mean and standard deviation, while the results of the inferential analysis (Pearson Correlation analysis) are represented by the correlation coefficient (r-value) determining the strength of the relationship between perceptions of environmental knowledge and practices among Upper Secondary Vocational Program (PVMA) students in schools around Batu Pahat, Johor.

3. Result and Discussion

This analysis aims to examine the extent to which each construction influences the outcome being studied. In this context, each construct refers to the variables or factors that are investigated and measured in the study. To assess the level of influence of each construct, this analysis utilizes two main statistics, namely the mean and the standard deviation (SD). Based on the mean and SD analysis, the researcher will be able to draw conclusions regarding the influence of each construct on the outcome being studied. Constructs with a higher mean and lower SD tend to indicate a stronger and more consistent influence on the study's outcome.

3.1 Technology Dimension Level

The technology dimension level among students of Politeknik Ungku Omar shows an encouraging level, with an overall mean of 3.74 and a standard deviation of 0.610. This value indicates that, on average, students have high confidence in their digital skills in accounting learning, with uniform perceptions among respondents. The item with the highest score is B33, with a mean of 4.02, showing that most students strongly agree that the use of the latest technology helps improve their academic performance in accounting subjects. This uniformity of opinion is further supported by a low standard deviation value of 0.764. Similarly, item B22 recorded a mean of 3.95, proving that students have a solid understanding of the basic functions of accounting software. These two items clearly demonstrate students' mastery of key aspects of digital competency in the field of accounting. Table 6 shows the perceptions of technology dimension level:

Table 6 *Perceptions of technology dimension level*

Item	Statement	Mean	Standard Deviation (SD)	Interpretation
B11	I often encounter technical problems when using technology for accounting learning.	2.87	1.132	Moderate
B12	I find it difficult to understand the functions in the accounting software used.	3.23	1.049	Moderate
B13	Lack of technological skills prevents me from effectively completing accounting tasks.	2.97	1.175	Moderate
B14	I often have difficulty finding suitable digital resources for accounting learning.	3.16	1.163	Moderate
B21	I am skilled in using accounting software such as Excel, QuickBooks, or other related software.	3.71	0.913	High
B22	I understand the basic functions of accounting software to complete course assignments.	3.95	0.763	High
B23	I can fully utilize accounting software for data analysis.	3.79	0.828	High
B31	I can select appropriate technology or software to enhance my understanding in accounting subjects.	3.85	0.783	High
B32	I am confident in my ability to choose the best technological solutions to solve accounting problems.	3.84	0.812	High
B33	I use the latest technology to improve my academic performance in accounting subjects.	4.02	0.764	Very High
	Overall (Performance Expectation)	3.74	0.610	High

However, the results of this study also detected a few students who still face challenges, especially in terms of solving technical problems and finding appropriate digital resources. This phenomenon was also reported by the study of Nguyen, Tran, and Dao (2022), where students of vocational training institutions often face difficulties in mastering specialized software and digital tools, which can slow down their efficiency in completing learning tasks. The findings of Zhang, Wang, and Li (2024) also recommend that problem-based training and continuous practical exposure be included in the curriculum, so that students are truly skilled and ready to face real industry needs. In addition, the inequality in skill levels between students may stem from differences in educational backgrounds and previous technology exposure, as discussed by Wong and Tan, (2023). This situation therefore

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emphasizes the need for the implementation of digital bridging programs to bridge the skills gap, as suggested by Hussin et al. (2022).

Based on these findings, the study suggests several improvement measures. First, a specific training module for technical problem solving needs to be introduced as successfully implemented in Singapore according to the study by Tan et al. (2023). Second, the development of a more comprehensive accounting-specific digital resource repository is needed, in line with UNESCO's recommendations on inclusive digital education. Third, a cooperative learning approach between technology-savvy and less- savvy students can be implemented based on the success model reported by Ibrahim et al. (2022). This study strengthens empirical evidence on the importance of the technology dimension in vocational accounting education. Although the overall level is satisfactory, the findings on competency variations emphasize the need for a more structured and individualized teaching approach. The results of this study provide a basis for further research on strategies for optimizing the use of technology in accounting education, especially in the context of Malaysia which is moving towards education 5.0.

3.2 Cognitive Dimension Level

The cognitive dimension level among Politeknik Ungku Omar students in accounting learning shows a generally high level of mastery, with an average mean of 3.86 and a standard deviation of 0.776. This value indicates that students generally possess good cognitive skills in the key aspects of accounting learning, with relatively uniform perceptions among respondents. The item with the highest score is C42, with a mean of 4.09, indicating that most students strongly agree that they can ensure the accuracy of the accounting information used. This high score is supported by the low standard deviation value of 0.650, reflecting a strong uniformity of opinion among respondents. Similarly, item C23 recorded a mean of 4.02, which proves that students possess very good skills in securely storing accounting data using digital technology. Both items clearly indicate the main strengths of students in information and data management.

In terms of technology use, item C13 recorded a mean of 3.96, indicating that students are very proficient in using digital tools to efficiently analyze accounting texts. This score is supported by a low standard deviation (0.742), indicating a uniform perception of this skill. Practical skills such as the use of spreadsheets (C22, mean 3.84) and organizing financial data (C21, mean 3.90) also show commendable performance. However, there are several aspects that require attention. Item C32, which measures the skill of interpreting financial graphs, recorded the lowest mean within the high category at 3.67, with a relatively high standard deviation (0.867). This suggests that although students are generally confident in this skill, there is still considerable variation among respondents and room for improvement. Items C11 and C12, which recorded means of 3.78 and 3.77 respectively, also indicate that the skills of summarizing and presenting information can be further enhanced. Overall, the findings of this study show that polytechnic students possess a high level of cognitive mastery in most aspects of accounting learning, particularly in information management and the use of technology. However, skills in visual data analysis and the presentation of more complex information require greater focus. Interventions such as specialized training in visual data interpretation and more effective information presentation techniques may help further improve students' cognitive skills. Table 7 presents the perceptions of cognitive dimension level:

Table 7 *Perceptions of cognitive dimension level*

Item	Statement	Mean	Standard Deviation (SD)	Interpretation
C11	I can summarize information from lengthy accounting texts effectively.	3.78	0.810	High
C12	I can present accounting information clearly in report form.	3.77	0.845	High
C13	I use digital tools to analyze accounting texts more efficiently.	3.96	0.742	Very High
C21	I feel confident organizing financial data systematically using technology.	3.90	0.822	High
C22	I can use software such as spreadsheets to organize accounting data effectively.	3.84	0.819	High
C23	I use technology to securely store accounting data.	4.02	0.729	Very High
C31	I can select the appropriate type of chart to present accounting data.	3.74	0.843	High
C32	I can interpret financial graphs correctly to make accounting decisions.	3.67	0.867	High

Item	Statement	Mean	Standard Deviation (SD)	Interpretation
C41	I can distinguish between important and unimportant accounting information.	3.871	0.730	High
C42	I ensure the accounting information I use is accurate.	4.09	0.650	Very High
	Overall (Performance Expectation)	3.86	0.776	High

In terms of data protection, students are very sensitive to cybersecurity and the use of strong passwords. This high awareness reflects students' understanding of the risks of data breaches and the importance of maintaining confidentiality of sensitive information, which is a critical element in digital accounting practices. A study by Omar, Bakar and Ali (2022) supports this finding by showing an increase in cyber risk awareness after the implementation of a digital security module in higher education. In addition, students also understand the importance of protecting sensitive information, which is an important foundation in professional accounting ethics. For the communication ethics dimension, students practice ethical digital communication, including respect for copyright and avoidance of plagiarism.

This attitude is in line with the nature of accounting that demands accuracy and transparency of information. A study by Lim et al. (2024) emphasizes that respect for copyright and avoidance of plagiarism are core values in digital education, especially in fields that require high integrity such as accounting. However, it should be noted that complete information about Lim et al. (2024) needs to be verified and included if it exists in the original source. Students also showed empathy and willingness to help peers who were less skilled in digital technology, reflecting high social values among students. This attitude is important to ensure that no student is marginalized in digital learning, especially in the context of post-pandemic learning that is increasingly dependent on technology. A study by Hassan and Ahmad (2022) emphasized that empathy and cooperation are important in building inclusive and supportive digital learning communities.

3.3 Ethical Dimension Level

The ethical dimension among students of Politeknik Ungku Omar demonstrates a very impressive level, with an overall mean of 4.25 and a standard deviation of 0.642 on a 1-5 scale. This value indicates that, on average, students have a very high awareness of ethics in the use of technology for accounting learning, with highly consistent perceptions among respondents. The items that recorded the highest scores were D12 and D14, both with a mean of 4.34, indicating that almost all students strongly agreed that they use strong passwords to protect their digital accounts and understand cyber security risks in the use of accounting technology. The very low standard deviation values for these items, ranging from 0.581 to 0.610, demonstrate an almost unanimous level of agreement among respondents. Similarly, item D13, with a mean of 4.33, reflects a high awareness of the importance of protecting sensitive information.

In terms of communication ethics, items D21 to D23 recorded means ranging from 4.21 to 4.30, indicating that students are highly aware of the importance of ethical communication, respecting copyright, and avoiding the dissemination of false information. The consistently low standard deviation values (below 0.700) for all these items confirm a strong uniformity of view among the students. The aspect of awareness of technological inequality also shows excellent results, with means ranging from 4.14 to 4.18 for items D31 to D33. This indicates that students are not only sensitive to issues of unequal access to technology but are also willing to assist peers facing challenges in mastering accounting technology. Overall, the findings of this study demonstrate a very high level of ethical awareness among polytechnic students across all aspects, especially data protection, communication ethics, and awareness of technological inequality issues. The low standard deviation values for all items further reinforce the finding that this high level of awareness is consistent and widespread among the respondents. Table 8 details the perceptions of ethical dimension level:

Table 8 *Perceptions of ethical dimension level*

Item	Statement	Mean	Standard Deviation (SD)	Interpretation
D11	I always take steps to protect personal data when using accounting systems.	4.29	0.617	Very High
D12	I use strong passwords to protect my digital accounting accounts.	4.34	0.610	Very High
D13	I avoid sharing sensitive accounting	4.33	0.612	Very High

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Item	Statement	Mean	Standard Deviation (SD)	Interpretation
	information through unsecured platforms.			
D14	I understand the cybersecurity risks associated with the use of accounting technology.	4.34	0.581	Very High
D21	I always practice communication ethics when interacting online within the academic community.	4.21	0.693	Very High
D22	I respect copyright by not copying accounting materials without permission.	4.24	0.665	Very High
D23	I avoid spreading false or inaccurate information on digital platforms.	4.30	0.647	Very High
D31	I am aware that not all students have equal access to accounting technology.	4.17	0.672	Very High
D32	I try to help classmates face challenges in understanding technology.	4.18	0.642	Very High
D33	I believe that unequal understanding of technology affects students' academic performance.	4.14	0.720	Very High
	Overall (Performance Expectation)	4.25	0.642	Very High

Students' mastery of data management, including ensuring the accuracy of accounting information and secure data storage, is very important in the digital era where data integrity and security are priorities in professional accounting practice. In addition, students also demonstrated proficiency in using digital tools to analyze accounting texts and organize and process financial data. The extensive use of spreadsheet software reflects their readiness to apply digital skills practically, in line with the needs of the modern accounting industry. A study by Brown and Davis (2020) emphasized that data management skills and the use of spreadsheet software are critical to improving students' financial analysis proficiency.

However, there are several aspects that need improvement, particularly in interpreting financial graphs and presenting information visually. The relatively high standard deviation of visual data interpretation skills indicates inconsistency in the mastery of these skills among students. Lack of exposure to visual data analysis training may be the main cause of this weakness. Shahidan, Ibrahim & Jamaluddin (2024) stated that weaknesses in visual data interpretation can affect students' ability to make accurate financial decisions. In addition, the ability to effectively summarize information also needs to be improved as it is important for the delivery of clear and professional accounting reports.

3.4 Digital Competency Level of Polytechnic students

Based on the descriptive analysis conducted on 287 accounting students at Politeknik Ungku Omar, the overall digital competency level showed a mean score of 3.89 with a standard deviation of 0.46 on a measurement scale of 1 to 5. This mean score falls under the high level based on the Likert scale interpretation, where a score of 3 represents a moderate level and a score of 4 indicates an "agree" or "good" level. This achievement reflects that, on average, students have a strong foundation in digital skills and confidence in using technology for accounting purposes. Most students also demonstrated the ability to apply digital knowledge in their learning context.

The relatively low standard deviation value of 0.46 indicates that the distribution of students' digital competency scores is relatively homogeneous, with not much variation between individuals. This suggests that most respondents gave almost the same evaluation of their digital competency level. When compared to the theoretical maximum score of 5.00, the achievement of 3.89 (77.8% of the maximum score) shows that while students' digital competency is at a satisfactory level, there is still room for improvement toward more comprehensive digital excellence. From a TVET (Technical and Vocational Education and Training) educational perspective, these findings have significant implications. The existing education system has proven successful in building a strong foundation of digital competency among accounting students. However, there are still opportunities to implement targeted enhancement programs to achieve a level of digital excellence (score >4.5). At the same time, there is a challenge to maintain and align this digital competent with current and ever-evolving industry demands.

In the context of this study, the high digital competency score reflects that Politeknik Ungku Omar students are well-prepared digitally for the accounting field. This also suggests the possibility that digital competency may contribute to students' academic achievement. The findings further indicate that the technology-based learning

approach implemented at the polytechnic has had a positive effect on the development of students' digital skills. Overall, this satisfactory level of digital competency provides a strong foundation to further explore the relationship between digital competency and academic achievement in subsequent analyses. The three main dimensions according to the IDCA model show varying achievements. The ethical dimension recorded the highest score with a mean of 4.25 and a standard deviation of 0.51, which is at a very high level. This value reflects an excellent awareness among students regarding digital ethics aspects such as data protection, information security, and ethical practices in using accounting technology. The low standard deviation for this dimension indicates a highly consistent perception among respondents.

The cognitive dimension recorded a mean of 3.86 with a standard deviation of 0.58, which is also at a high level. This shows that students have good skills in aspects of critical and analytical thinking related to the use of accounting technology, such as the ability to analyze data, interpret financial information, and make data-based decisions. Although at a high level, the relatively higher standard deviation compared to the ethical dimension shows that there is some variation in the mastery of these skills among students. The technology dimension recorded the lowest score among the three dimensions with a mean of 3.54 and a standard deviation of 0.60, which is still at a high level but closer to the moderate threshold. This may indicate that although students are generally proficient in using accounting technology such as spreadsheet software and specialized applications, there is still room for improvement in certain technical skills. The wider score range (2.10 to 5.00) compared to other dimensions also indicates greater variability in the mastery of these technical skills among students. Table 9 presents the overall mean values representing the digital competency levels of the participants:

Table 9 *Overall mean value of digital competency level*

	(N)	Minimum	Maximum	Mean	Standard Deviation (SD)
Technology Dimension	287	2.10	5.00	3.54	0.59698
Cognitive Dimension	287	2.20	5.00	3.86	0.58351
Ethical Dimension	287	2.30	5.00	4.25	0.51486
Digital Competency	287	2.63	5.00	3.89	0.45762
Total	287				

These findings suggest that mastery of digital competencies, although important, is not the main determinant of students' academic success. Other factors such as intrinsic motivation, pedagogical approach, institutional support, and assessment quality also play a significant role in influencing student performance (Zhang, Wang, & Li, 2024). The phenomenon of a threshold effect has also been identified, where once students reach a certain level of digital competency, additional improvements no longer have a significant impact on their academic achievement (Lee & Wong, 2024). This indicates that digital competencies will only provide maximum benefits when they are meaningfully integrated into the learning and assessment process. Gaps in the technology dimension, particularly in mastery of applications such as Excel and QuickBooks as well as basic technical problem-solving abilities, were identified as among the main factors that need attention.

This gap may stem from an unbalanced pedagogical approach between teaching accounting theory and practical exposure through software. These findings are in line with studies which show that TVET education still relies on traditional teaching approaches that do not focus on direct application of technology (Nur Eliza et al.,7 2023). Therefore, although students demonstrate a good level of digital readiness in ethical and cognitive dimensions, the limited application of these competencies in the learning and assessment process causes their impact on academic achievement to be minimal. The implications of this study are important for educational policies and teaching practices in polytechnics. Curriculum transformation needs to be implemented by introducing modules such as Digital Accounting Immersion Modules that emphasize the use of real industry software such as ACL Analytics and Power BI.

Assessment is also proposed to shift to the use of electronic portfolios that assess the entire problem-solving process, not just the result (Garcia Martínez, 2020). Professional development of lecturers through programs such as Digital Tool Mastery, Technology Enhanced Pedagogy, and Digital Assessment Clinic needs to be prioritized so that lecturers can effectively apply digital skills in their teaching. The learning ecosystem also needs to be strengthened through the construction of student digital competency portfolios using platforms such as Xero Practice Manager and Coursera, as well as the implementation of peer mentoring programs to strengthen collaborative learning. Polytechnic libraries should also provide a digital repository specifically for accounting that includes video tutorials, financial datasets, and digital case study templates that support self-directed learning (Rokiah et al., 2023). These measures will not only strengthen students' digital competencies but also increase their engagement and motivation in learning.

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3.5 The Relationship Digital Competency and Students Academic Performance

To address the fifth research question, a correlation analysis was conducted to assess the extent of the relationship between students' digital competency levels and their academic achievement in accounting subjects. This study employed the Spearman's Rho method, given that the earlier normality analysis showed that the data were not normally distributed. The distribution of accounting subject grades was found to have a skewness value of -1.304 and a kurtosis of 1.276, clearly indicating non-normality and making a non-parametric approach like Spearman's Rho a more appropriate choice to ensure the validity of the analysis. Based on Table 4.10, the results of the Spearman correlation show that the relationship between overall digital competency and accounting subject grades is very weak, with the correlation coefficient obtained being only 0.043. Furthermore, the significance value (p-value) obtained is 0.466, which exceeds the conventional significance level ($p < 0.05$). This confirms that the relationship between these two variables is not statistically significant. This result was derived from a sample of 287 respondents involved in the study. These findings indicate that students' digital competency does not have a significant relationship with their academic performance in accounting subjects.

Although initially it was expected that students with higher digital skills might achieve better academic results, particularly in the context of increasingly technology-based modern education the findings of this study do not support that expectation. The absence of a significant relationship may be explained by several possibilities. One of these is the nature of the accounting subject itself, which focuses more on understanding fundamental concepts and mastering calculation skills, which do not necessarily depend on the use of digital technology. The use of the Spearman's Rho method in this analysis is appropriate and has helped maintain the validity of the study's methodology, especially given the non-normal nature of the data. Therefore, although the findings indicate no significant relationship between digital competency and academic performance in accounting subjects, this still provides a solid empirical basis for further research, particularly in identifying the actual factors influencing student performance in vocational education. Table 10 presents the correlation analysis between digital competency and academic performance.

Table 10 *Correlation between digital competency and academic performance*

			Digital Competency (Total)	Accounting Subject Grade
Spearman's rho	Digital Competency (Total)	Correlation Coefficient	1.000	0.043
		Sig. (2-tailed)	.	
		N	287	287
	Accounting Subject Grade	Correlation Coefficient	0.043	1.000
		Sig. (2-tailed)	0.466	.
		N	287	287

These findings suggest that mastery of digital competencies, although important, is not the main determinant of students' academic success. Other factors such as intrinsic motivation, pedagogical approach, institutional support, and assessment quality also play a significant role in influencing student performance (Zhang, Wang, & Li, 2024). The phenomenon of a threshold effect has also been identified, where once students reach a certain level of digital competency, additional improvements no longer have a significant impact on their academic achievement (Lee & Wong, 2024).

This indicates that digital competencies will only provide maximum benefits when they are meaningfully integrated into the learning and assessment process. Gaps in the technology dimension, particularly in mastery of applications such as Excel and QuickBooks as well as basic technical problem-solving abilities, were identified as among the main factors that need attention. This gap may stem from an unbalanced pedagogical approach between teaching accounting theory and practical exposure through software. These findings are in line with studies which show that TVET education still relies on traditional teaching approaches that do not focus on direct application of technology (Nur Eliza et al.,7 2023). Therefore, although students demonstrate a good level of digital readiness in ethical and cognitive dimensions, the limited application of these competencies in the learning and assessment process causes their impact on academic achievement to be minimal. The implications of this study are important for educational policies and teaching practices in polytechnics. Curriculum transformation needs to be implemented by introducing modules such as Digital Accounting Immersion Modules that emphasize the use of real industry software such as ACL Analytics and Power BI.

Assessment is also proposed to shift to the use of electronic portfolios that assess the entire problem-solving process, not just the result (Garcia Martínez, 2020). Professional development of lecturers through programs such as Digital Tool Mastery, Technology Enhanced Pedagogy, and Digital Assessment Clinic needs to be prioritized so that lecturers can effectively apply digital skills in their teaching. The learning ecosystem also needs to be strengthened through the construction of student digital competency portfolios using platforms such as Xero Practice Manager and Coursera, as well as the implementation of peer mentoring programs to strengthen collaborative learning. Polytechnic libraries should also provide a digital repository specifically for accounting that includes video tutorials, financial datasets, and digital case study templates that support self-directed learning (Rokiah et al., 2023). These measures will not only strengthen students' digital competencies but also increase their engagement and motivation in learning.

4. Conclusion

This study has comprehensively examined the relationship between digital competency and academic performance among accounting students at Politeknik Ungku Omar. The analysis results indicate that most students possess a high level of digital competency, particularly in ethical and cognitive aspects. However, no statistically significant association was found between mastery of digital skills and academic achievement as measured by traditional theory-based examinations. These findings highlight the reality that students' mastery of digital technology does not necessarily lead to improved academic performance in accounting subjects if the assessment system continues to rely on conventional methods. The implication is that there is a need to refine pedagogical approaches and adapt academic assessments to be more aligned with the needs of today's digital world. From a theoretical perspective, the study's findings have enhanced understanding of the dimensions of students' digital competency by identifying the unique features and strengths of each main dimension: technology, cognition, and ethics. This underscores the importance of adaptive teaching methods that are in tune with individual students' abilities and learning contexts

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Conflict of Interest

Authors declare that there is no conflict of interest regarding the publication of the paper.

Author Contribution

The authors confirm contribution to the paper as follows: ***Suhaizal Hashim****: Literature review, methodology, data collection and project administration.* ***Nurhani Khamis:*** *Drafted the manuscript and provided substantial revisions formal analysis, and validation.* ***Nur Imanina Nor Azli****: Contributed to writing the results and discussion sections, conceptualization, methodology and resources.* ***Noor Hidayah Binti Che Lah****: Conceptualization, methodology and resources.*

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