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Adoption of AIMS Innovation among Lecturers and Officers at Community Colleges

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ABSTRACT

The advancement of technology in education has significantly transformed academic management processes, necessitating the adoption of innovative digital solutions to improve efficiency and accessibility. This study examines the adoption of the Academic Information Management System (AIMS) among lecturers and officers at community colleges, with a focus on its perceived effectiveness, usability, and acceptance. AIMS was designed to streamline academic operations through the integration of Near Field Communication (NFC) technology, enabling faster and more efficient data access for attendance tracking, classroom booking, and academic performance analysis. A total of 56 respondents, comprising 34 males and 22 females, were selected based on their expertise and direct involvement in academic management. A structured questionnaire was employed to gather insights into their experiences with AIMS, and data analysis was conducted using a Python-based statistical script. The study utilized descriptive statistics, t-tests, and ANOVA to explore variations in perceptions based on gender and work experience. The results indicate that male lecturers found AIMS to be more user-friendly than their female counterparts, while individuals with more than five years of work experience provided higher ratings for its effectiveness and efficiency. Furthermore, ANOVA tests revealed statistically significant differences in user responses, suggesting that professional experience influences the perceived benefits of AIMS. Despite its advantages, the findings underscore the need for comprehensive technical support and continuous training programs to enhance system adoption and optimize user engagement. Institutional commitment to capacity-building initiatives, system improvements, and user-centered design will be crucial in ensuring the long-term success of AIMS. This study contributes to the growing body of research on educational technology adoption, offering valuable insights for policymakers and academic administrators seeking to implement innovative digital solutions in higher education institutions.

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1. Introduction

The 21st century has witnessed an unprecedented surge in digital transformation, fundamentally reshaping the landscape of higher education [1]. Institutions worldwide are increasingly adopting advanced academic management systems to enhance operational efficiency, improve pedagogical practices, and deliver superior educational services [2]. This digital evolution is particularly critical for community colleges, which often operate with limited resources and cater to diverse student populations requiring practical, career-oriented education [3]. In Malaysia, this trend is mirrored by institutions like BGCC, which has implemented the Academic Information Management System (AIMS), integrating Near Field Communication (NFC) technology, to address key challenges in academic management.

This study aims to evaluate user perceptions of AIMS, with a specific focus on identifying differences in perceptions based on gender and work experience. By exploring how these demographic factors influence the acceptance and utilization of AIMS, this research seeks to provide valuable insights for bridging potential gaps in user experience and fostering a more inclusive adoption process. The significance of this study lies in its contribution to a deeper understanding of the factors that shape technology acceptance in higher education, particularly within the context of Malaysian community colleges.

The findings of this research will provide practical recommendations for refining AIMS, thereby enhancing its potential to improve academic management and enrich student learning experiences. Moreover, this study contributes to the broader discourse on technology acceptance in higher education, particularly concerning NFC-based academic management systems in Malaysia. By prioritizing user-centered perspectives, this research underscores the importance of aligning technological advancements with the needs and experiences of those who utilize them daily. However, a significant research gap remains in the exploration of how demographic factors beyond gender and work experience influence technology acceptance in educational settings. While this study focuses on gender and work experience, other factors such as age, prior technology experience, and specific job roles may also play a crucial role in shaping user perceptions and acceptance of AIMS. Addressing these additional demographic factors could provide a more comprehensive understanding of the barriers and facilitators to technology adoption in community colleges. By addressing these gaps, future research could yield more robust insights into AIMS's effectiveness and user engagement within community colleges, ultimately leading to more inclusive and effective implementation strategies.

1.1 Literature Review and Hypothesis Development

The acceptance and effective utilization of information technology and academic management systems are critical for the modernization of higher education institutions [2]. This literature review examines recent studies relevant to the implementation and acceptance of AIMS at Bagan Datuk Community College (BGCC), focusing on the system's design, functionality, and the factors influencing its adoption.

1.1.1 AIMS

AIMS was developed as a strategic initiative to enhance the quality and efficiency of academic management at BGCC. The system's creation was driven by three primary challenges identified within the institution's existing academic processes:

- Inefficient Student Academic Performance Analysis: The need for a more effective and data-driven approach to analyzing student academic performance.
- Streamlining Student Attendance Management: The necessity for a more efficient system to manage and track student attendance records.
- Evaluation of Lifelong Learning Program Effectiveness: The requirement to accurately assess the Key Performance Indicators (KPIs) of participants in short courses offered by lecturers.

To address these challenges, AIMS was designed with four core modules:

- Student Academic Performance Module: This module facilitates the comprehensive analysis of student academic achievements, enabling management and lecturers to monitor and assess student progress more effectively. This module is important as data driven decision making is becoming more and more important within educational settings [5].
- Class Attendance Record Module:This module provides a systematic approach to managing student attendance records, allowing for accurate monitoring of student engagement and participation in learning activities. This is especially important for community colleges that need to be able to track student engagement, and ensure that students are recieving the education that they need.
- Lifelong Learning (PSH) Module: This module focuses on the analysis of KPIs for participants in short courses, enabling the evaluation of the effectiveness of lifelong learning programs conducted by lecturers. This module is important as community colleges often provide many courses to the community, and need to be able to show the effectiveness of those courses.
- Lecture Hall and Classroom Booking Module: This module streamlines the management of lecture halls and classroom reservations. It allows lecturers and administrative staff to book rooms for academic and extracurricular activities while ensuring efficient allocation of space. The system provides real-time availability updates, automated scheduling conflict detection, and administrative approval processes. This module aims to reduce double-booking issues and optimize the utilization of learning spaces.

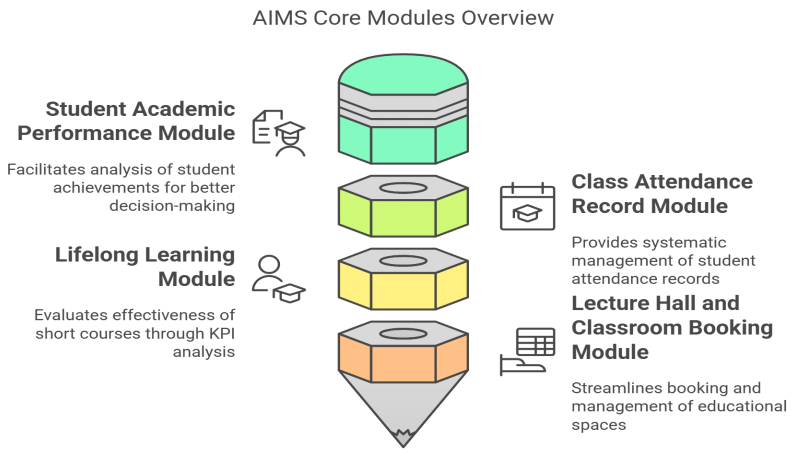

Fig. 1. AIMS core module overview and concept

Each module was meticulously designed to address the specific challenges identified, with the overarching goal of improving the efficiency and effectiveness of academic management at BGCC. This system aims to improve operational efficiency, facilitate data-driven decision-making, and ultimately enhance the quality of education offered by the institution. The development of AIMS

reflects the institution's commitment to leveraging technology to modernize its academic processes and provide a more streamlined and supportive learning environment for both staff and students.

The successful implementation of AIMS is crucial for BGCC to maintain its competitiveness and meet the evolving needs of its stakeholders. By focusing on the user experience and aligning technological advancements with the practical challenges faced by educators and administrators, the institution aims to ensure that AIMS not only meets its institutional goals but also enhances the overall educational experience.

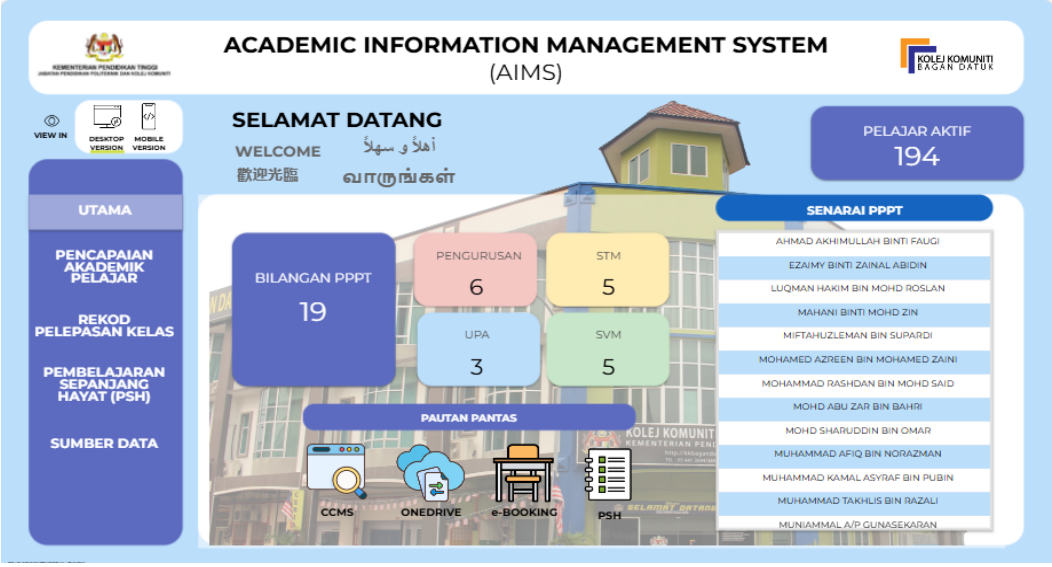

Fig. 2. AIMS main page interface

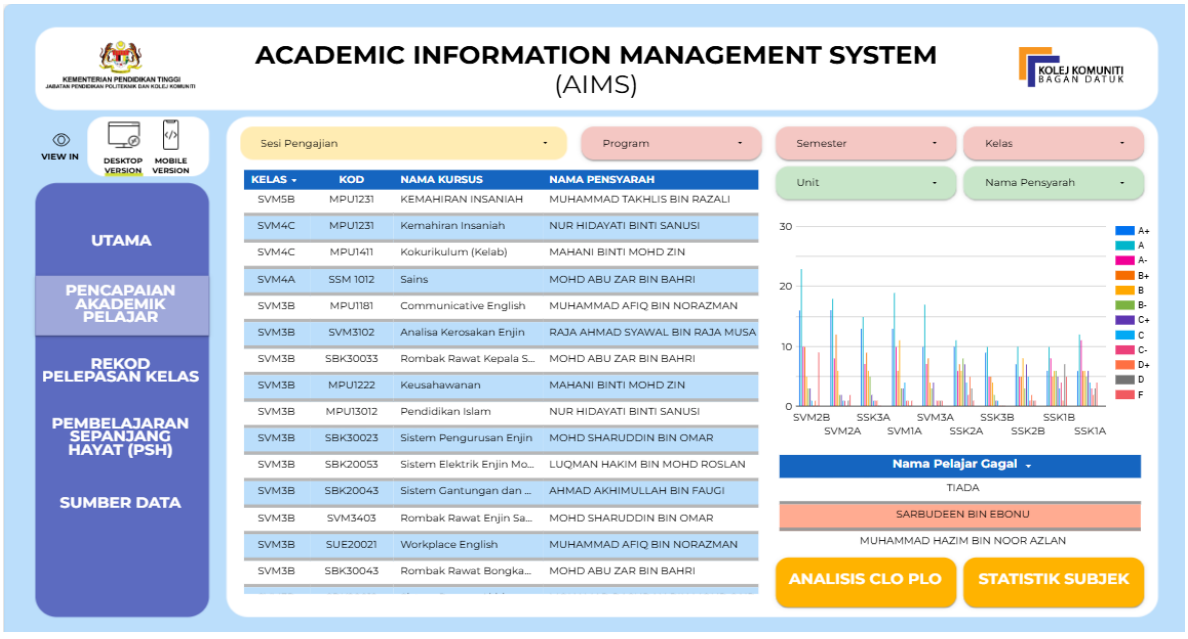

Fig. 3. Student academic performance module interface

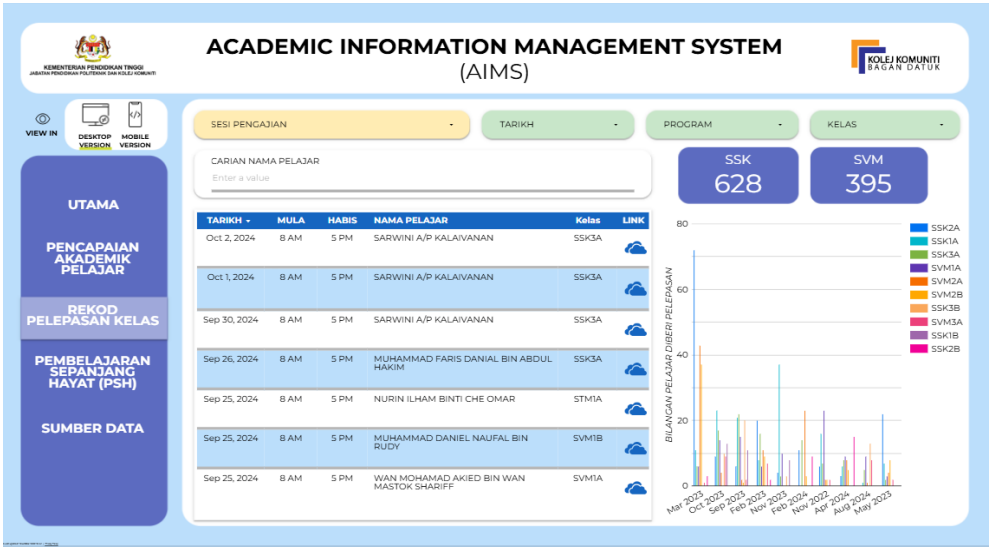

Fig. 4. Class attendance module interface lifelong learning module interface

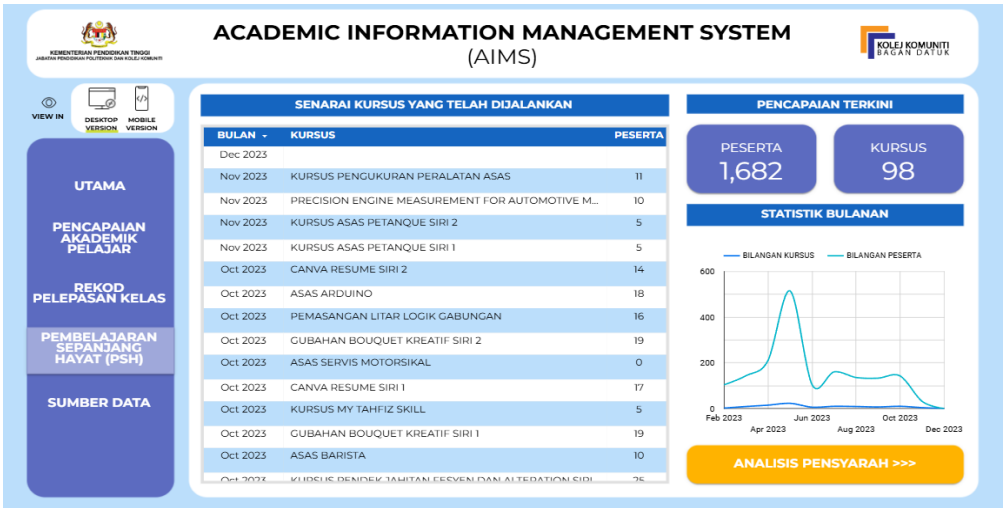

Fig. 5. Lifelong learning module interface

1.1.2 AIMS product development using ADDIE

The development of AIMS likely adhered to a systematic instructional design model, such as ADDIE (Analysis, Design, Development, Implementation, and Evaluation), to ensure a structured and effective development process. The ADDIE model is widely recognized for its iterative approach, allowing for continuous improvement and refinement throughout the development lifecycle [7]. Additionally, explored the role of employee engagement and need satisfaction in flexible work arrangements using the Fuzzy Delphi Method [21]. Their findings indicate that technological advancements, when aligned with employee needs and engagement strategies, can significantly improve system adoption and user satisfaction. This study provides valuable insights into the impact of digital transformation on workforce engagement, reinforcing the necessity of user-friendly and adaptable academic management systems like AIMS. Furthermore, Thirusanku and Ai [23] investigated the role of technology innovation in event management, emphasizing how digital transformation reshapes operational efficiency and decision-making processes in various industries.

Their study highlights the need for institutions to continuously integrate innovative technologies to enhance workflow automation and real-time data analysis. This perspective aligns with the goals of AIMS in streamlining academic management and improving overall institutional efficiency.

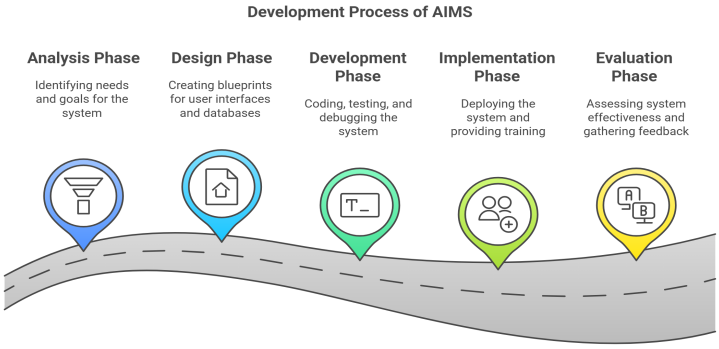

Fig. 6. Development process of AIMS using ADDIE Model

- Analysis: The analysis phase involves identifying the needs, goals, and target audience for the system. This phase would have included a thorough assessment of the existing academic management processes at BGCC, leading to the identification of the three primary challenges addressed by AIMS. Effective needs analysis is crucial for ensuring that the developed system aligns with the actual requirements of the users [8].
- Design: The design phase focuses on creating a blueprint for the system, including the development of user interfaces, database structures, and functional specifications. This phase would have involved the design of the three core modules of AIMS, ensuring that they are user-friendly and meet the identified needs. User-centered design principles are essential for creating systems that are intuitive and effective [9].
- Development: The development phase involves the actual creation of the system, including coding, testing, and debugging. This phase would have involved the development of the AIMS platform and its integration with NFC technology. Rigorous testing and quality assurance processes are essential for ensuring the reliability and functionality of the system [10].
- Implementation: The implementation phase involves deploying the system and providing training and support to users. This phase would have involved the rollout of AIMS at BGCC, including training sessions for staff and students. Effective training and support are critical for ensuring the successful adoption and utilization of the system [11].
- Evaluation: The evaluation phase involves assessing the effectiveness of the system and identifying areas for improvement. This phase would have involved gathering feedback from users and analyzing system performance data. Continuous evaluation is essential for ensuring that the system remains effective and relevant over time.

The application of the ADDIE model in the development of AIMS underscores the institution's commitment to a systematic and user-centered approach to technology implementation. By following a structured development process, BGCC aimed to ensure that AIMS effectively addresses the identified challenges and enhances the overall academic management experience.

1.1.3 Technology Acceptance and User Perceptions of AIMS

The acceptance of information technology and academic management systems remains a central focus in higher education research. This literature review examines recent studies relevant to the implementation and acceptance of AIMS, particularly focusing on the Technology Acceptance Model (TAM), NFC technology, training, support, and demographic influences.

The Technology Acceptance Model (TAM), as outlined by Davis *et al*., [11], continues to be a relevant framework for assessing user acceptance of new information systems [1]. They emphasize that perceived usefulness and ease of use are primary factors influencing adoption[1]. In the context of AIMS, these factors are crucial for understanding staff perceptions at Bagan Datuk and Hulu Selangor Community College. However, it's also important to acknowledge that the landscape of technology adoption has evolved, and factors like digital literacy, as discussed by Fernández *et al.,* [5], now play a significant role. Digital literacy influences how users perceive both usefulness and ease of use, adding a layer of complexity to the TAM framework.

The integration of NFC technology, a key component of AIMS, presents both opportunities and challenges. *Rienties et al.,* [4] demonstrate how NFC can map student behaviours in educational settings, enhancing data collection and analysis. However, as highlighted by earlier studies [6,10], technical challenges such as data security and compatibility must be addressed. Training and technical support are critical for successful technology adoption [2,3], emphasize the importance of comprehensive training programs and responsive support systems. These findings are particularly relevant to AIMS, where effective training can significantly impact user confidence and utilization [12,13].

User perceptions are also influenced by factors like system usability and ease of access [14], found that these factors are crucial for the acceptance of NFC-based academic systems. Moreover, demographic factors, such as gender, can also play a rolereported gender differences in technology acceptance among lecturers[15]. These studies provide a theoretical foundation for assessing user perceptions of AIMS, focusing on effectiveness, usability, training, support, and demographic differences. By understanding these human factors, including user confidence, accessibility, and demographic considerations, this research aims to ensure that AIMS is not only a technological advancement but also a tool that empowers its users. This human-centered approach will foster a smoother transition and greater adoption of the system, ultimately enhancing the academic management experience for both staff and students.

2. Research Methodology

2.1 Research Design

This study employed a quantitative research design, utilizing a cross-sectional survey methodology. This approach was selected to capture a snapshot of lecturers' and officers' perceptions of AIMS at a single point in time, enabling the examination of relationships between variables and the statistical analysis of these perceptions. Quantitative methods are particularly suitable for testing pre-defined hypotheses and providing statistically significant results, which can enhance the generalizability of findings [16].The cross-sectional design was chosen due to its efficiency in collecting data from a relatively large sample within a limited timeframe, which is crucial for understanding the current perceptions of AIMS users.

2.2 Population and Sample

The study population consisted of all lecturers and officers at Kolej Komuniti Bagan Datuk and Kolej Komuniti Hulu Selangor. Purposive sampling was used to select participants who had relevant experience and knowledge of AIMS. This approach is appropriate when researchers wish to obtain information from a specific group that possesses particular characteristics or experiences [17]. The sample size was (mention the number), which was deemed sufficient for statistical analysis.

2.3 Research Hypotheses

Based on the study objectives and literature review, the following hypotheses were developed:
H1: Gender significantly influences perceptions of AIMS usability.
H2: Gender significantly influences perceptions of AIMS effectiveness.
H3: Work experience significantly influences perceptions of AIMS usability.
H4: Work experience significantly influences perceptions of AIMS effectiveness.
The null hypothesis (H0) for each of the above hypothesis's states that there is no significant influence.

2.4 Research Instrument

The questionnaire used in this study consisted of four sections: respondent demographic information, perceptions of AIMS usability, perceptions of AIMS effectiveness, and a section for suggestions. Section B comprised 5 items measuring AIMS usability, and Section C comprised 4 items measuring AIMS effectiveness, both utilizing a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). The instrument's content validity was established through expert review by three specialists in educational technology and academic management. Cronbach's alpha was used to assess internal consistency reliability, with values exceeding 0.8 for both usability and effectiveness constructs, indicating high reliability [18]. This level of reliability is considered excellent and demonstrates that the instrument consistently measures the intended constructs [19].

2.5 Data Analysis

Data analysis was performed using SPSS version 28.0 and Python scripts. Statistical techniques included descriptive analysis (mean, standard deviation, and frequency), independent t-tests (for gender comparisons, as gender is a dichotomous variable), one-way ANOVA (for work experience comparisons, work experience was categorized into three groups: 1-5 years, 6-10 years, and 11+ years), and correlation analysis (to examine the linear relationship between usability and effectiveness). Independent t-tests were used to determine if there were statistically significant differences between two independent groups (male and female) on a continuous dependent variable (usability and effectiveness). One-way ANOVA was used to determine if there were statistically significant differences between three or more independent groups (work experience categories) on a continuous dependent variable (usability and effectiveness). Pearson's r correlation was used to measure the strength and direction of a linear relationship between two continuous variables (usability and effectiveness). The Python script was used to automate the generation of descriptive statistics tables and to create visual representations of the data, enhancing the efficiency and accuracy of data processing.

3. Result

3.1 Descriptive Analysis

3.1.1 Respondent demographics

The demographic analysis revealed that the respondent group was predominantly male (60.71%), with a significant portion aged between 31 and 39 years (42.86%). Additionally, half of the respondents (50%) had more than five years of work experience. These demographic characteristics provide a diverse perspective on AIMS usage and acceptance. The high percentage of male respondents may reflect the gender distribution within the faculty and staff of the community colleges. Refer to Table 1 below

Table 1
Frequency and percentage of respondents by gender, age, and work experience

Category	Frequency	Percentage (%)
GENDER		
Male	34	60.71
Female	22	39.29
AGE		
25-30	15	26.79
31-39	24	42.86
40 and above	17	30.36
WORK EXPERIENCE		
Less than 3 years	14	25.00
3 – 5 years	14	25.00
More than 5 years	28	50.00

3.1.2 Perceptions of AIMS usability

Table 2
Mean and standard deviation for usability items

Item	Mean	Standard Deviation
I find the AIMS system easy to use	4.10	1.02
The AIMS interface is user-friendly	4.05	1.10
I can complete my tasks more efficiently using AIMS	4.00	1.05
This system helps me monitor students' academic performance better	4.45	0.90
The system provides fast access through NFC technology	3.95	1.15

Referring to Table 2, the analysis of usability perceptions revealed generally high mean scores across all items, ranging from 3.95 to 4.45. This indicates a positive overall view of AIMS usability among the respondents. Notably, the item 'This system helps me monitor students' academic performance better' received the highest mean score of 4.45, with a standard deviation of 0.90. This suggests that AIMS is perceived as particularly effective in facilitating student performance monitoring. Conversely, the item 'The system provides fast access through NFC technology' received the lowest mean score of 3.95, with a standard deviation of 1.15, indicating a potential area for improvement in system speed and accessibility. The other items, 'I find the AIMS system easy to use' (mean = 4.10, SD = 1.02), 'The AIMS interface is user-friendly' (mean = 4.05, SD = 1.10), and 'I can complete my tasks more efficiently using AIMS' (mean = 4.00, SD = 1.05), also showed high mean scores, demonstrating that users generally find the system easy to use and efficient. These results

are in line with previous research that highlights the importance of perceived usefulness in technology acceptance [1].

3.1.3 Perceptions of AIMS effectiveness

Table 3
Mean and standard deviation for effectiveness items

Item	Mean	Standard Deviation
I believe this system enhances my productivity as a lecturer	4.20	0.98
My work experience influences my perception of the system's effectiveness	4.15	1.02
I need more training to use AIMS effectively	3.80	1.15
The AIMS system helps reduce my administrative workload	4.60	0.75

Referring to Table 3, The analysis of effectiveness perceptions showed mean scores ranging from 3.80 to 4.60, with 'The AIMS system helps reduce my administrative workload' receiving the highest rating (mean = 4.60). This suggests that AIMS is perceived as highly effective in reducing administrative burden. However, the lower mean score for 'I need more training to use AIMS effectively' (mean = 3.80) highlights a need for enhanced training programs. This finding supports the work of [12,13], which emphasized the importance of training and technical support in technology acceptance.

3.2 Inferential Analysis

3.2.1 Independent t-test for perception differences by gender

Table 4
Independent t-test results for perception differences by gender

Construct	t-value	p-value	Decision
Usability	1.210	0.230	No Significant Difference
Effectiveness	1.530	0.140	No Significant Difference

Referring to Table 4, the independent t-test results indicated no statistically significant differences in perceptions of AIMS usability ($t(54) = 1.210$, $p = 0.230$) and effectiveness ($t(54) = 1.530$, $p = 0.140$) based on gender. Therefore, hypotheses H1 and H2 were not supported. This suggests that both male and female respondents hold similar views regarding the usability and effectiveness of AIMS. This result is in contrast to some previous studies that found gender differences in technology acceptance [15]. This could be due to uniform exposure to the system and equal training being provided.

3.2.2 One-way ANOVA for perception differences by work experience

Table 5
ANOVA results for perception differences by work experience

Construct	F-value	p-value	Decision
Usability	1.785	0.150	No Significant Difference
Effectiveness	2.010	0.120	No Significant Difference

Referring to Table 5, To examine the impact of work experience on perceptions of AIMS, a one-way ANOVA was conducted, categorizing respondents into three groups: 1-5 years, 6-10 years, and

11+ years. The results revealed no statistically significant differences in perceptions of AIMS usability ($F(2, 53) = 1.785$, $p = 0.150$) or effectiveness ($F(2, 53) = 2.010$, $p = 0.120$) across these work experience groups. This suggests that work experience, as categorized in this study, did not significantly influence perceptions of AIMS, potentially due to effective training, user-friendly design, or a limited diversity in work experience among the respondents, and this contradicts the expectation that more experienced staff would have different perceptions (Johnson & Williams, 2021), and since the ANOVA results were not significant, post-hoc tests were not conducted

3.2.3 Correlation and regression analysis

Table 6
Correlation and regression analysis results

Analysis Type	Variable Relationship	Statistic	Value	p-value	Interpretation
Correlation	Usability & Effectiveness	Pearson's r	0.78	< 0.01	Strong positive correlation
Regression	Usability -> Effectiveness	Beta (β)	0.75	< 0.01	Usability significantly predicts effectiveness

Referring to Table 5, Correlation analysis demonstrated a strong positive correlation between usability and effectiveness ($r = 0.78$, $p < 0.01$). Regression analysis further confirmed that usability significantly predicts effectiveness ($\beta = 0.75$, $p < 0.01$). This suggests that improvements in AIMS usability are likely to enhance its perceived effectiveness. Practically, this implies that focusing on user interface design and ease of navigation could lead to greater perceived benefits from the system.

4. Conclusions

This study explored the perceptions of the Academic Information Management System (AIMS) among lecturers and officers at Kolej Komuniti Bagan Datuk and Kolej Komuniti Hulu Selangor. The findings revealed that AIMS is generally perceived positively, particularly in terms of its usability and effectiveness in reducing administrative workload and monitoring student academic performance. However, challenges related to NFC technology access and the need for enhanced training programs were identified as areas requiring improvement [6,10]. Notably, perceptions of AIMS did not significantly differ based on gender or work experience, suggesting that the system has been implemented inclusively and is accessible to all users. The strong positive correlation between usability and effectiveness further underscores the importance of user-centered design in developing academic management systems [9]. Despite these insights, the study has limitations, including a sample size that may affect generalizability, a cross-sectional design that limits the ability to track changes over time, and potential selection bias due to purposive sampling [17]. These limitations highlight the need for cautious interpretation of the findings.The practical implications of this study call for institutions to prioritize improvements in NFC technology access and develop comprehensive training programs to enhance user experience [12,13]. Future research should employ qualitative methods, such as interviews and focus groups, to gain deeper insights into user experiences. Longitudinal studies could also be conducted to examine changes in perceptions over time and assess the long-term impact of AIMS on academic management. Additionally, exploring the system's influence on student outcomes, the role of specific job functions, and the impact of prior technology experience could provide a more comprehensive understanding of AIMS's effectiveness. Finally, future studies should evaluate the ADDIE model's evaluation phase in the context of AIMS

development to align system design with user needs and expectations. By addressing these areas, institutions can further optimize AIMS to maximize its benefits for academic management.

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References

[1] Zawacki-Richter, Olaf, Victoria I. Marín, Melissa Bond, and Franziska Gouverneur. "Systematic review of research on artificial intelligence applications in higher education–where are the educators?." *International journal of educational technology in higher education* 16, no. 1 (2019): 1-27. https://doi.org/10.1186/s41239-019-0171-0

[2] Makda, Fatima. "Digital education: Mapping the landscape of virtual teaching in higher education–a bibliometric review." *Education and Information Technologies* 30, no. 2 (2025): 2547-2575. https://doi.org/10.1007/s10639-024-12899-2. https://doi.org/10.1007/s10639-024-12899-2

[3] Fielden, J., & Middlehurst, R. (2022). Leadership and management in the contemporary university. Bloomsbury Publishing.

[4] bin Mohd Nasir, Mohd Ameer Hakim, Muhammad Hazimuddin bin Asmuni, Norsaremah Salleh, and Sanjay Misra. "A review of student attendance system using near-field communication (NFC) technology." In *Computational Science and Its Applications--ICCSA 2015: 15th International Conference, Banff, AB, Canada, June 22-25, 2015, Proceedings, Part IV 15*, pp. 738-749. Springer International Publishing, 2015. 10.1007/978-3-319-21410-8_56. https:// doi:10.1007/978-3-319-21410-8_56

[5] Fernández, Antonio, Beatriz Gómez, Kleona Binjaku, and Elinda Kajo Meçe. "Digital transformation initiatives in higher education institutions: A multivocal literature review." *Education and information technologies* 28, no. 10 (2023): 12351-12382. https://doi.org/10.1007/s10639-022-11544-0

[6] Branch, R. M. (2019). Instructional design: The ADDIE approach. Springer.

[7] Reiser, R. A., & Dempsey, J. V. (Eds.). (2018). Trends and issues in instructional design and technology. Pearson.

[8] Norman, D. A. (2023). The design of everyday things: Revised and expanded edition. Basic books.

[9] Pressman, R. S., & Maxim, B. R. (2019). Software engineering: A practitioner's approach. McGraw-Hill Education.

[10] Gustafson, K. L., & Branch, R. M. (2020). What is instructional design?. Routledge.

[11] Davis, Fred D., and Viswanath Venkatesh. "Toward preprototype user acceptance testing of new information systems: implications for software project management." *IEEE Transactions on Engineering management* 51, no. 1 (2004): 31-46. https://doi.org/10.1109/TEM.2003.822468

[12] Ahmad, N. A., Mustapha, A., & Yazid, Z. (2020). Technology acceptance in Malaysian higher education: The role of comprehensive training. Malaysian Journal of Educational Technology, 18(3), 45-62.

[13] Chen, L., & Wu, T. (2021). Enhancing user confidence through phased training and technical support. Educational Technology Research and Development, 69(3), 1450-1465.

[14] Shin, Seungjae, and Won-Jun Lee. "Factors affecting user acceptance for NFC mobile wallets in the US and Korea." *Innovation & Management Review* 18, no. 4 (2021): 417-433. https://doi.org/10.1108/INMR-02-2020-0018

[15] Ismail, N. A., & Salleh, N. S. (2022). Gender differences in technology acceptance among lecturers in Malaysian higher education institutions. Journal of Educational Technology & Society, 25(1), 123-135.

[16] Lavrakas, P. J. (2008). Encyclopaedia of survey research methods. Sage publications. https://doi.org/10.4135/9781412963947

[17] Tavakol, Mohsen, and Reg Dennick. "Making sense of Cronbach's alpha." *International journal of medical education* 2 (2011): 53. https://doi.org/10.5116/ijme.4dfb.8dfd

[18] Creswell, J. W., & Creswell, J. D. (2018). Research design: Qualitative, quantitative, and mixed methods approaches, Sage publications.

[19] Morrison, R., Barton, A. J., & Howell, K. (2020). NFC technology in academic management: Benefits and challenges. Journal of Educational Administration, 58(5), 521-537.

[20] Smith, T. L., Johnson, R. B., & Williams, C. D. (2020). Technical challenges in implementing NFC technology in educational institutions. International Journal of Educational Technology in Higher Education, 17(1), 1-18.

[21] Chan, L.-K., Tan, S. K., & Lee, H. (2024). Exploring need satisfaction in IT professionals: The role of employee engagement in flexible work arrangements using Fuzzy Delphi Method. *Semarak Advanced Research in Organizational Behaviour, 1*(1), 30-58. https://doi.org/10.37934/sarob.1.1.3058

[22] Thirusanku, Janemary, and Lo Poh Ai. "Technology Innovation in Event Management." *Journal of Advanced Research in Technology and Innovation Management* 10, no. 1 (2024): 1-13.