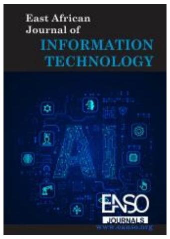

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Original Article

Analysing Electronic Gadget Usage and Makerere University Engineering Student Performance

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Electronic Gadgets, Academic Performance, Engineering Students, Uganda.

ABSTRACT

Purpose: This study aims to investigate the relationship between electronic gadget usage and academic performance among Makerere University engineering students in Uganda. **Methods:** A structured five-item Likert-scale 10-item questionnaire was used to collect data from 618 students at Makerere University School of Engineering. Smart PLS-SEM was employed to assess the measurement and structural models, including reliability, validity, and path analysis. **Results:** The findings indicate that electronic gadget usage has a statistically significant positive effect on engineering student performance ($\beta = 0.673$, $p < 0.001$), explaining 45.3% of the variance in academic performance at a 95% confidence interval. Convergent and discriminant validity were confirmed, and the model met acceptable thresholds for composite reliability. **Conclusion:** Electronic gadgets are essential tools that can enhance academic performance if used strategically. Their widespread use among engineering students offers both opportunities and challenges for academic success. Institutions should promote responsible use through structured digital literacy initiatives. This study contributes to the body of knowledge on the electronic gadget usage and student performance, offering practical recommendations for educators and policymakers to enhance academic outcomes.

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INTRODUCTION

Academic performance is a fundamental outcome in higher education, particularly for engineering students whose training demands continuous engagement with complex theoretical and practical tasks. The evolution of educational technology has led to the pervasive use of electronic gadgets such as smartphones, laptops, and tablets in academic settings. These gadgets provide access to online resources, digital textbooks, learning management systems, and collaborative tools, positioning them as vital assets in academic achievement.

In both developed and developing countries, electronic gadgets have increasingly become intertwined with students' study patterns and academic routines. However, their impact is not entirely positive. The dual role of electronic gadgets—serving as both academic enablers and sources of distraction—has been widely documented. While devices enhance access to educational content, they also expose students to distractions such as social media, gaming, and entertainment platforms, which may distract their academic focus and time management.

In Uganda, particularly at higher institutions of learning, the rising adoption of electronic gadgets among engineering students has created a dynamic learning environment. Yet, the unregulated and often indiscriminate use of these gadgets may compromise academic discipline. Prior studies have addressed electronic gadget usage in general student populations, but a focused analysis on engineering students remains limited. Furthermore, empirical insights using advanced statistical modelling such as PLS-SEM are still scarce in this context.

This study, therefore, investigates the relationship between electronic gadget usage and academic performance among engineering students in Uganda. The findings aim to inform university administrators, educators, and policymakers about how gadget use influences learning outcomes and identify strategies to guide students toward productive usage.

THEORETICAL FOUNDATIONS AND LITERATURE REVIEW

Electronic Gadget Usage and Preference for Usage

Electronic gadgets such as smartphones, laptops, and tablets have become indispensable tools in higher education (Johri et al., 2012). Among university students, preferences for particular electronic gadgets are often driven by functionality, convenience, and academic needs. Smartphones are frequently favoured due to their portability, internet access, and multifunctional apps, enabling students to browse academic content, communicate with peers and lecturers, and organise their schedules (Bayanova et al., 2019). Laptops are commonly used for completing assignments, conducting research, and using technical software, especially among engineering students (Maphosa et al., 2023).

Farooq et al. (2023) observed that students spend significant time daily on smartphones and laptops, using them for both academic and non-academic purposes. The preference for gadgets is also shaped by affordability, ease of use, battery life, and internet connectivity. In engineering disciplines, devices such as calculators and simulation tools are essential, while tablets and e-readers are less frequently used due to limited compatibility with technical software (Bragdon, 2016).

Studies by Bisen (2016) and Bayanova et al. (2019) emphasise that students prefer gadgets that support multitasking, speed, and flexibility. However, preference alone does not equate to effective

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academic use. The manner and context in which gadgets are used significantly influence their impact on learning. For instance, using a smartphone for accessing course materials may enhance academic performance, while using it for prolonged social media engagement during study time may yield adverse effects (Mabaroh & Sugianti, 2021).

In the Ugandan context, Johri et al. (2012) and Maphosa et al. (2023) noted that despite limited institutional infrastructure, students creatively leverage their personal gadgets to overcome academic challenges. This indicates that understanding gadget preference is essential for designing relevant interventions that support academic excellence while minimising potential misuse.

Relationship between Electronic Gadget Usage and Engineering Student Performance

Electronic gadgets have transformed educational experiences globally and in Uganda, influencing how students engage with academic content. Numerous studies present mixed outcomes on the relationship between electronic gadget use and engineering student performance. Johri et al. (2012) observed that devices like smartphones and laptops improve student engagement and collaboration. Similarly, Bayanova et al. (2019) found that students who strategically use electronic gadgets for academic purposes report better performance outcomes.

On the contrary, Bragdon (2016) and Limniou (2021) argue that excessive or recreational electronic gadget usage is correlated with decreased attention spans and poorer academic results. Mobile phones, while essential for learning and communication, can also foster social media distraction and reduced focus in classroom settings (Mabaroh & Sugianti, 2021). Multitasking on gadgets during lectures has also been associated with lower grades and increased cognitive load (Farooq et al. 2023).

In Uganda, Maphosa et al. (2023) highlighted that engineering students heavily rely on electronic gadgets due to the technical nature of their curriculum. Devices facilitate access to online resources, simulations, and collaborative tools. However, without structured institutional guidance, the risk of misuse remains high. The existing literature affirms both enabling and limiting roles of electronic gadgets, suggesting that their net effect depends on student intent, digital literacy, and institutional controls. This study contributes to this discourse by empirically examining these dynamics among engineering students using PLS-SEM. Following the discussion, the following hypothesis was suggested.

H1: The relationship between electronic gadget usage and academic performance is significant.

METHODOLOGY

Instrument

Primary data were collected through a structured questionnaire administered to engineering students at Makerere University. The instrument consisted of a Five-Point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The variable indicators used in the questionnaire were adapted from previous validated tools in related studies to ensure content validity and relevance to the context of electronic gadget usage and academic performance.

Data Collection

Data were gathered through self-administered questionnaires distributed to a sample of 618 students. Respondents were selected using a combination of purposive and convenience sampling techniques due to the logistical challenges of accessing all engineering cohorts. Of the 618 questionnaires distributed, 441 were returned and deemed usable for analysis, resulting in a high response rate of 71.4%. This large sample size enhances the generalizability and robustness of the results, providing enough data to support the

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reliability of the results and draw valid conclusions (Kothari, 2014).

Data Analysis

Data were analysed using Smart PLS-SEM version 4, which is recognised for its capability to assess complex models and is particularly effective with non-normal data distributions and formative constructs (Hair et al., 2017). PLS-SEM was chosen due to its flexibility in handling small sample sizes and high model complexity. The analysis involved two main stages: first, evaluation of the measurement model—examining content validity, internal consistency reliability, convergent validity, and discriminant validity; and assessment of the structural model—testing the hypothesised relationships through path coefficients, significance levels, and R^2 values (Ringle et al., 2020; Wong, 2013).

RESULTS

Common Methods of Bias

Prior to evaluating the measurement model, data were cleaned, and measures implemented to eliminate common method bias, which was assessed through a full collinearity test using the Variance Inflation Factor (VIF). VIF values were below the threshold of 3.333, indicating that the model is not influenced by common method bias (Kock, 2015).

Table 1: Variance Inflation Factor (VIF) Values for Common Method Bias Assessment

	VIF
GP1 - Electronic gadgets enhance general performance in the course.	1.548
GP2 - Electronic gadgets improve examination score.	1.561
GP3 - Electronic gadgets are essential in industrial training.	1.394
GP4 - Electronic gadgets ease projects (research) assignments.	1.471
PR1 - Smartphone	1.567
PR10 - Laptop	1.429
PR11 - Calculator	1.432
PR2 - Printer	1.523
PR8 - Tablet	1.271

Measurement Model Assessment

The measurement model was assessed to determine factor loadings, composite reliability (CR), and average variance extracted (AVE), as shown in Table 2. Factor loadings exceeded the acceptable threshold of 0.500 (Hair et al., 2011), confirming content validity.

Convergent validity—how closely the items relate to their respective constructs—was established using AVE and CR. The AVE values ranged from 0.541 to 0.621, exceeding the 0.500 threshold (Hair et al., 2017). Composite reliability values ranged from 0.705 to 0.814, surpassing the 0.700 threshold (Hair et al., 2020). Reliability was further confirmed by Cronbach's alpha and rhoa values.

Discriminant validity was assessed using the Fornell-Larcker Criterion and the Heterotrait-Monotrait Ratio (HTMT). HTMT values were below the conservative 0.85 threshold (Henseler et al., 2015). Fornell-Larcker analysis showed that the square root of AVE values exceeded inter-construct correlations, confirming discriminant validity.

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Table 2: Reliability and Validity Results

Construct	Item	Loadings	Cronbach's Alpha	rho_a	CR	AVE
Academic Performance	AP1	0.791	0.698	0.705	0.831	0.621
	AP2	0.810				
	AP3	0.762				
Gadget Usage	GU1	0.738	0.795	0.814	0.855	0.541
	GU2	0.742				
	GU3	0.723				
	GU4	0.761				
	GU5	0.712				

Structural Model Assessment

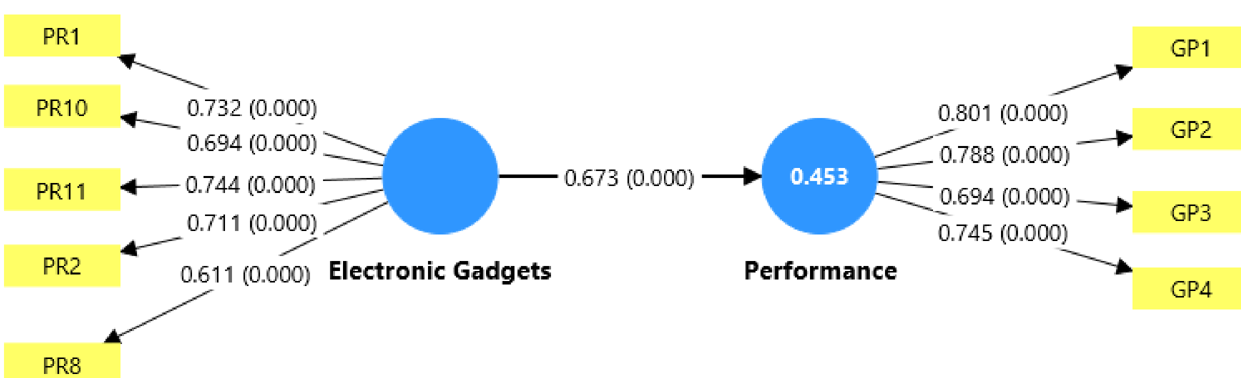
The structural model was evaluated to determine the statistical path coefficient (β), its significance level (p-value), t-statistics, and the model's coefficient of determination (R^2), following the guidelines of Hair et al. (2020). Table 3 summarises the path analysis results.

The findings revealed a statistically significant and positive relationship between electronic gadget usage and engineering student performance (β = 0.673, t = 21.946, $p < 0.001$), providing support for Hypothesis 1 (H1). This suggests that increased and structured use of electronic gadgets leads to improved academic outcomes for engineering students. The R^2 value of 0.453 indicates that electronic gadget usage accounts for 45.3% of the variance in academic performance. According to Cohen (1988), this represents a moderate to substantial explanatory power, highlighting the practical significance of the results.

Table 3: Structural Model Results

Hypothesis	Path coefficient (β)	Sample Mean (M)	Standard Deviation (STDEV)	t-value	p-value	R^2	Result
H1: Gadget Usage → Performance	0.673	0.677	0.031	21.946	<0.001	0.453	Supported

Figure 1: Structural Model Results



The R^2 value signifies the model's in-sample predictive accuracy by explaining how much variance in the dependent construct (student performance) is accounted for by the independent construct (gadget usage). Based on Cohen's (1988) thresholds—0.02 (weak), 0.13 (moderate), and 0.26

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(substantial)—the R^2 of 0.453 suggests that electronic gadget usage is a key factor influencing academic success.

Future structural models could incorporate additional variables such as digital literacy, time management, and socioeconomic status as mediators or moderators to expand the explanatory power and enrich the understanding of academic performance drivers.

DISCUSSION

The findings of this study reveal that electronic gadget usage has a statistically significant and positive influence on engineering student performance ($\beta = 0.673$, $p < 0.001$). The R^2 value of 0.453 indicates that electronic gadget usage explains 45.3% of the variance in academic performance, demonstrating moderate-to-substantial explanatory power (Cohen, 1988). These findings suggest that electronic gadgets are not only pervasive in academic life but also impactful when used constructively by students.

This result aligns with previous research, which underscores the academic benefits of strategic gadget use. Johri et al. (2012) highlighted how digital devices facilitate engagement and collaboration among students. Similarly, Bayanova et al. (2019) reported that structured use of gadgets supports learning outcomes, especially when gadgets are used for accessing educational resources and completing assignments. In the context of engineering education, where simulation tools, online textbooks, and collaborative platforms are integral, electronic gadgets enhance both accessibility and productivity.

The statistically significant relationship in this study corroborates findings from Bisen (2016), who noted that engineering students who used smartphones and laptops effectively showed higher academic performance. Bragdon (2016) also observed that student familiarity with learning applications and technology-mediated study environments boosts performance in technical disciplines. These findings are further supported by Maphosa et al. (2023), who studied the Ugandan engineering education context and found that students actively leverage gadgets to overcome infrastructure and resource challenges, especially in low-resource academic environments.

Despite the positive relationship, the use of electronic gadgets in academic settings is not without challenges. Limniou (2021) and Farooq et al. (2023) caution that unregulated and excessive usage—particularly for entertainment and social media—can undermine academic outcomes by distracting students and consuming study time. However, the high path coefficient ($\beta = 0.673$) in this study suggests that when used intentionally for learning purposes, gadgets are not merely neutral tools but active contributors to academic success.

Students perceive gadgets as useful and easy to use, which increases their intention and frequency of use for academic activities. This aligns with Hair et al. (2014), who emphasised that technology adoption is driven by perceived utility and accessibility, both of which were evident in the study context.

The strength of the model ($R^2 = 0.453$) indicates that other variables, such as digital literacy, self-regulation, and time management, might further explain academic performance. Future research should explore these factors, possibly including mediation or moderation analysis. There is also a need to examine potential differences in gadget usage effectiveness across gender, academic year, or access to internet infrastructure.

In conclusion, this study confirms that electronic gadget usage has a significant and positive effect on engineering student performance. The findings contribute to a growing body of literature and provide empirical evidence from a Sub-Saharan African context—specifically Uganda—where such research is still emerging. Universities and policymakers should focus on reinforcing structured, academically driven electronic gadget usage and minimising distractions through awareness campaigns, training sessions, and the integration of digital literacy programs.

IMPLICATIONS

Theoretical Implications

This study contributes to the growing academic discourse on the relationship between digital technology and academic performance, particularly in engineering education within Sub-Saharan Africa. By empirically validating this relationship using Smart PLS-SEM (Hair et al., 2020), the study supports earlier findings that structured use of electronic gadgets enhances academic outcomes (Bisen, 2016; Bayanova et al., 2019). Moreover, it addresses a regional gap by providing localised insight into how Ugandan engineering students use technology to navigate academic demands, reinforcing contextual studies like Maphosa et al. (2023) and Johri et al. (2012), who examined device use in technical education settings.

Practical Implications

The findings offer practical guidance to university administrators, lecturers, and policymakers. Structured digital literacy programs should be prioritised to train students on effective academic gadget use and minimise distractions such as social media overuse (Bragdon, 2016; Limniou, 2021). The results highlight the potential of smartphones and laptops—widely preferred among engineering students (Maphosa et al., 2023)—to support academic engagement when intentionally applied. Institutions should also focus on equitable access to reliable internet and digital infrastructure to foster inclusive, technology-supported learning environments (Farooq et al., 2023).

Limitations

This study is not without limitations. First, the cross-sectional design limits the understanding of long-term gadget use effects (Farooq et al., 2023). Second, the sample was limited to engineering students at Makerere University, constraining generalizability. Third, reliance on self-reported data introduces potential response biases. Lastly, the study investigated only the direct effects of gadget usage on performance. Future research should examine mediating or moderating variables such as digital literacy, time management, or motivation (Bayanova et al., 2019). Additionally, qualitative studies could complement this research by offering deeper insights into user behaviour, preferences, and institutional digital culture.

CONCLUSION

This study examined the relationship between electronic gadget usage and academic performance among engineering students at Makerere University in Uganda. Utilising a validated Smart PLS-SEM structural model, the results revealed a statistically significant and positive direct effect of gadget usage on student performance. Specifically, electronic gadget usage accounted for 45.3% of the variance in academic performance, providing substantial empirical support for the role of digital tools in higher education.

These findings affirm that when used with academic intent, electronic gadgets can enhance learning engagement, accessibility, and productivity among engineering students. The study concludes that responsible and strategic use of gadgets is a significant determinant of academic success in technical disciplines.

Although constrained by a cross-sectional design and institutional scope, the validated relationships and comprehensive review of relevant literature lay a strong foundation for future comparative and longitudinal research. Further studies could expand the model by exploring moderating factors such as digital literacy, motivation, and institutional support mechanisms to deepen understanding of the gadget–performance dynamic in diverse academic settings.

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Declarations

Consent for Publication

All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

Availability of Data and Materials

Reasonable requests to access de-identified data can be made in writing to the corresponding author and are subject to further ethics and organisational approvals.

Competing Interests

The authors have no conflict of interest to declare.

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Authors' Contributions

- DT conceived and designed the study, conducted research, provided research materials, collected and organised data, interpreted data, and wrote initial drafts and the final version of the article. 2. JK supervised the research, participated in the review, and revised the final version of the article.

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REFERENCES

Bayanova, A. R., Kuznetsov, V. V, Merculova, L. V, Larisa, N., Pervozvanskaya, O. A., Shalamova, O. O., & Vorobyova, C. I. (2019). Student Performance Interrelation with Gadget Use at Lessons. 7(3), 432–437.

Bisen, S. (2016). An Analytical Study of Smartphone Addiction among Engineering Students: A Gender Differences. 4(1).

Bragdon, R. A. (2016). College Student Technology Use and Academic Performance. 6(1), 12–22.

Cohen, J. (1988). Statistical power analysis for the behavioral sciences (2nd ed.). Lawrence Erlbaum Associates.

Farooq, M., Ahmad, T. I., & Jahan, M. (2023). An Empirical Investigation of the Relationship Between Students' Digital Consumption Time and Their Academic Outcome. 4(1), 1–9.

Hair, J. F., Sarstedt, M., Hopkins, L., & Kuppelwieser, V. G. (2014). Partial least squares structural equation modeling (PLS-SEM): An emerging tool in business research. European Business Review, 26(2), 106–121.

Ringle, C. M., Wende, S., & Becker, J.-M. (2020). Boenningstedt: SmartPLS GmbH. Retrieved from https://www.smartpls.com

Wong, K.-K. K. (2013). Marketing Bulletin, 24(1), 1– 32. https://marketing- bulletin.massey.ac.nz /V24/MB_V24_A01_Wong.pdf

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. Journal of the Academy of Marketing Science, 43(1), 115–135. https://doi.org/10.1007/s11747-014-0403-8

Article DOI: https://doi.org/10.37284/eajit.8.1.3339

Johri, A., Tech, V., Teo, H. J., Tech, V., Tech, V., Schram, A. B., Tech, V., & Tech, V. (2012). AC 2012-3924 : Digital Engineers : Results Of A Survey Study Documenting Digital Media And Device Use Among Fresh- Digital Engineers: Results of a Survey Study Documenting Digital Media and Device Use Among Freshmen Engineering Students.

Mabaroh, B., & Sugianti, L. (2021). Gadget Addiction and the Students' Achievement. 1(August), 321–332.

Maphosa, M., Doorsamy, W., Member, S., & Paul, B. S. (2023). Student Performance Patterns in Engineering at the University of Johannesburg: An Exploratory Data Analysis. IEEE Access, 11(May), 48977–48987.

