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ARTÍCULO DE INVESTIGACIÓN

Sinergizar el rendimiento académico con la competencia comunicativa y la adopción de tecnología

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Resumen. En el contexto de la educación del siglo XXI, la integración de la tecnología y el desarrollo de la competencia comunicativa son fundamentales para mejorar el rendimiento académico de los estudiantes universitarios. El artículo plantea la relación entre las competencias comunicativas, la adopción de tecnología y el rendimiento académico, centrándose en el papel mediador de la motivación de los estudiantes en la educación superior de Malasia. El objetivo es proporcionar una comprensión integral de cómo estos factores interactúan para influir en los resultados del aprendizaje en un panorama educativo en rápida evolución. El estudio empleó un diseño de investigación cuantitativo para analizar el impacto de la competencia comunicativa, la adopción de tecnología y la mediación de la motivación en el rendimiento académico de 129 estudiantes de una universidad malaya mediante cuestionarios estructurados y análisis de factores confirmatorio (CFA) con Smart PLS 4. Este diseño permite un examen exhaustivo de la relación entre las variables. Los hallazgos indican que tanto la adopción de tecnología como la competencia comunicativa impactan significativamente el rendimiento académico, pero sus efectos se magnifican cuando se combinan con altos niveles de motivación de los estudiantes. Los datos revelan que los estudiantes que utilizan eficazmente herramientas y plataformas digitales tienden a obtener mejores resultados académicos, siempre que también posean fuertes habilidades comunicativas que faciliten la interacción efectiva y el intercambio de conocimientos.

Palabras clave: rendimiento académico, competencia comunicativa, tecnología, motivación, educación superior.

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Synergizing academic achievement with communicative competence and technology adoption

Abstract. In the context of twenty-first century education, the integration of technology and the development of communicative competence are essential to improve the academic performance of university students. The article discusses the relationship between communicative competence, technology adoption, and academic performance, focusing on the mediating role of student motivation in Malaysian higher education. The goal is to provide a comprehensive understanding of how these factors interact to influence learning outcomes in a rapidly evolving educational landscape. The study employed a quantitative research design to analyze the impact of communicative competence, technology adoption, and motivation mediation on the academic performance of 129 students at a Malaysian university using structured questionnaires and confirmatory factor analysis (CFA) with Smart PLS 4. This design allows for a thorough examination of the relationship between variables. The findings indicate that both technology adoption and communicative competence significantly impact academic performance, but their effects are magnified when combined with high levels of student motivation. The data reveal that students who effectively use digital tools and platforms tend to obtain better academic results, provided that they also possess strong communication skills that facilitate effective interaction and knowledge sharing.

Keywords: academic performance, communicative competence, technology, motivation, higher education.

INTRODUCTION

Academic achievement of university undergraduates in the past centuries differ from those in the 21st century. Academic achievement in the 21st century depends a lot on mastering the 21st century digital knowledge and competencies (James, Talin & Bikar, 2022) that are complex, cross-disciplinary and are much more demanding than rote memorization-based skills (Saavedra & Opfer, 2012).

To compete and to achieve academically, university undergraduates in the 21st-century are expected to be able to communicate well with others, acquire new skills and information independently, and adapt to rapidly changing conditions (Lavi et al., 2021; Gewertz, 2008) and concept mapping strategies (Manas, 2023). Malaysia being a developing country has always aimed to produce students who are not only well balanced, but also competent communicators (MOE, 2014). Since 21st century education is inseparable from technology, like it or not, university undergraduates who want to obtain better results must master the platform used (Wardoyo et al., 2021).

Apart from communicative competence and technology adoption, motivation in digital education has been receiving attention in recent years (Li & Tsai, 2017; Kyewski & Kramer, 2018; Özhan & Kocadere, 2020) since students have the tendency to participate less (Kyewski & Krämer, 2018) and the alarming completion and dropout rates (Xavier & Meneses, 2020; Lee, Choi, & Kim, 2013; Park & Choi, 2009). Murday et al. (2008) study concluded that keeping motivation at a desired level is tough in online courses.

As there are various factors influencing academic achievement, it is crucial to understand how the communicative competence and technology adoption influence academic achievement while motivation mediates these among undergraduates in Malaysia.

LITERATURE REVIEW

Academic achievement is a multi-faceted, complex equation. It is the barometer of students' competence (Idris et al., 2020; Yağci & Çevik, 2019; Kleijn, Ploeg & Topman, 1994). It measures the knowledge, skills and abilities gained by the students (Sanchez et al., 2021). However, in recent years, low academic achievement has been observed among various university undergraduates across the globe (Chowdhury, Rahman. & McCray, 2024; Manas, 2023; Tadese, Yeshaneh & Mulu, 2022; Realyvásquez-Vargas et al., 2020; Adnan & Anwar, 2020; Wan Maziah et al., 2019; Yigermal, 2017). This is caused by a variety of determinants. This study aims to contribute to the investigation of low academic achievement by looking into determinants like communicative competence, technology adoption and motivation.

Empirically, many of the researchers in the world applied the GPA to assess the academic achievement of the students (Tadese, 2022; Zheng & Mustappha, 2022; Jan et al., 2020; Steinmayr et al., 2014; Al-Rofo, 2010; Hijaz & Naqvi, 2006; Applegate & Daly, 2006; Stephan & Schaban, 2002; Naser & Peel, 1998). GPA is one of the best predictors of college achievement in academic activities (Moore & Shulock, 2009). The supremacy of GPA among other measures may be attributed to the readily and conveniently available data about students' achievement in HEIs.

Communicative Competence

Communicative competence refers to the syntactic, morphological, phonological, that is, linguistic knowledge of the language user as well as the social, cultural, discourse and strategic knowledge of how and when to use the language appropriately (Geçkin, 2022).

Many previous studies have investigated communicative competence and have proposed it as an important predictor of academic achievement (Bo et al., 2023; Al Awaji et al., 2022; Martirosyan et al., 2015; Opoola & Fatiloro, 2014; Othman & Nordin, 2013; Yen & Kuzma, 2009; Light et al., 1987).

Communicative competence is measured using various standardized test scores. MUET is a test of English language proficiency that is used specifically in Malaysia and is required for admission to many Malaysian universities. MUET assesses the ability of test-takers to use English effectively for academic purposes and includes a variety of tasks, including listening, speaking, reading, and writing (Baharum et. al., 2021). In Malaysia, several studies demonstrated the significant relationship between MUET scores and academic achievement (Malik et al., 2022; Baharum et al., 2021; Hamid, Ismail & Tapsir, 2019; Krishnan, Yaacob & Veloo, 2019; Buniyamin, Kassim & Mat, 2015; Othman & Nordin, 2013; Nopiah et al., 2011). All these studies engaged MUET as a common indicator of academic achievement. By collecting data from 300 undergraduates from four public universities in Malaysia, Malik et al. (2022) discovered significant effect of MUET on academic achievement (GPA).

Technology Adoption

Technology adoption describes how users adopt new technologies, influenced by a variety of factors, such as perceived usefulness and ease of use (Kirwa & Zhiyong, 2020). The successful in-

tegration of new technology into an organization is referred to as technology adoption. Adoption entails more than simply using technology. When new technology is adopted, it will be employed to its maximum capacity and to reap the benefits of the new system.

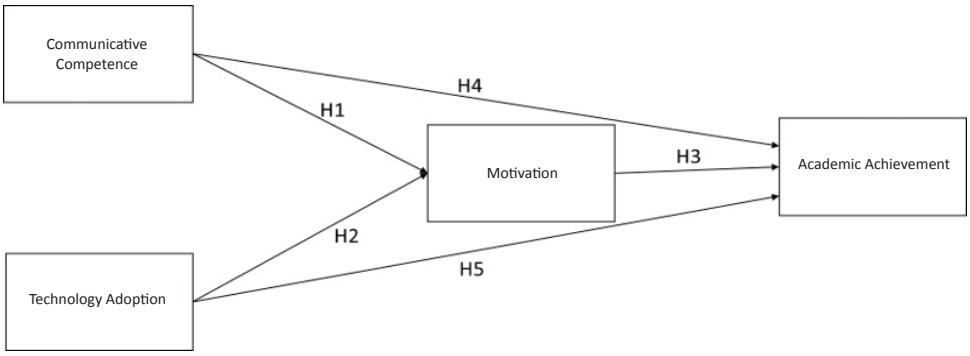
The Technology Acceptance Model (TAM) is a theoretical framework that has been used to explain and predict the adoption and use of technology in various settings, including education. TAM, as the first step of technology adoption, is an attitude towards technology, and it is influenced by various factors. TAM proposes that two key factors, perceived usefulness and perceived ease of use, influence a person's intention to use technology and ultimately, their actual use of technology (Davis, 1989). In addition, perceived usefulness (PU) and perceived ease of use (PEU) are key factors that directly and indirectly boost academic achievement (Marangunić & Granić, 2015).

Motivation

Motivation can be defined as a need, a drive supported by expectations, goals, and emotions. Intrinsic motivation means that the student takes a new course just for its pleasure, because it is considered rewarding and motivating in itself. Extrinsic motivation means that the learning activity is carried out for external activities, such as receiving recognition, a certificate, a good grade or avoiding negative situations such as a reprimand (Capone & Lepore, 2022).

Motivation is a significant predictor of academic achievement (Steinmayr, et. al., 2019). Students who are highly motivated to learn and achieve tend to perform better academically than those who lack motivation. Increasing students' motivation is one of the pedagogical objectives in higher education. A past study suggested that students with higher motivation would actively engage in the learning process and were likely to obtain good learning outcomes (Foong et al., 2021). Students who are highly motivated are more likely to have higher academic achievement (Hōigaard et al., 2015; SuárezÁlvarez et al., 2014).

Figure 1. Conceptual Framework



METHODOLOGY

The study employed a quantitative research design to synergize the impact of communicative competence and technology adoption on academic achievement among undergraduates. Also, the role of motivation in mediating the relationship was analyzed. The study involved a total of 129 undergraduate students, aged 18 to 24, from Malaysian university. Participants were selected using random sampling from a population of undergraduate students. Eligibility criteria included being full-time students and actively using online learning for at least one year.

The study utilized a structured questionnaire consisting of 69 items divided into three key areas: communicative competence, technology adoption, and motivation. The communicative competence section comprised 35 questions designed to assess participants' ability to effectively use language in various contexts. Technology adoption was measured using 10 questions that focused on perceived usefulness and perceived ease of use. Lastly, the motivation section included 24 questions aimed at evaluating students' intrinsic and extrinsic motivation toward academic and technological engagement. The questionnaire was carefully designed to ensure clarity and relevance, with responses collected using a 5-point Likert scale ranging from "strongly disagree" to "strongly agree."

The data were analyzed using second-order confirmatory factor analysis (CFA) with Smart PLS 4 to assess the relationships between various factors influencing academic achievement in online education contexts. Smart PLS 4, a partial least squares structural equation modeling (PLS-SEM) tool, was chosen for its ability to handle complex models and small sample sizes. The analysis focused on the three primary constructs of communicative competence, technology adoption, and motivation, all of which were modeled as second-order latent variables. By utilizing this advanced statistical technique, the study aimed to understand both the direct and indirect effects of these variables on academic achievement. The results provided insights into the strength of the relationships between the constructs and their contributions to students' academic achievement in an online learning environment.

ANALYSIS AND RESULTS

The data analysis and results present the details of the data analysis. PLS-SEM analysis that includes the assessment of Measurement and Structural Model. The measurement model establishes the reliability and validity of the construct. The structural model ascertains the significance of hypothesized relationships. Different hypotheses were proposed to evaluate the relationship of predictors on the outcome.

H1. Communicative competence positively and significantly influences motivation

H2. Technology adoption positively and significantly influences motivation

H3. Motivation positively and significantly influences academic achievement/GPA

H4. Motivation mediates the relationship between communicative competence and academic achievement/GPA

H5. Motivation mediates the relationship between technology adoption and academic achivement/GPA

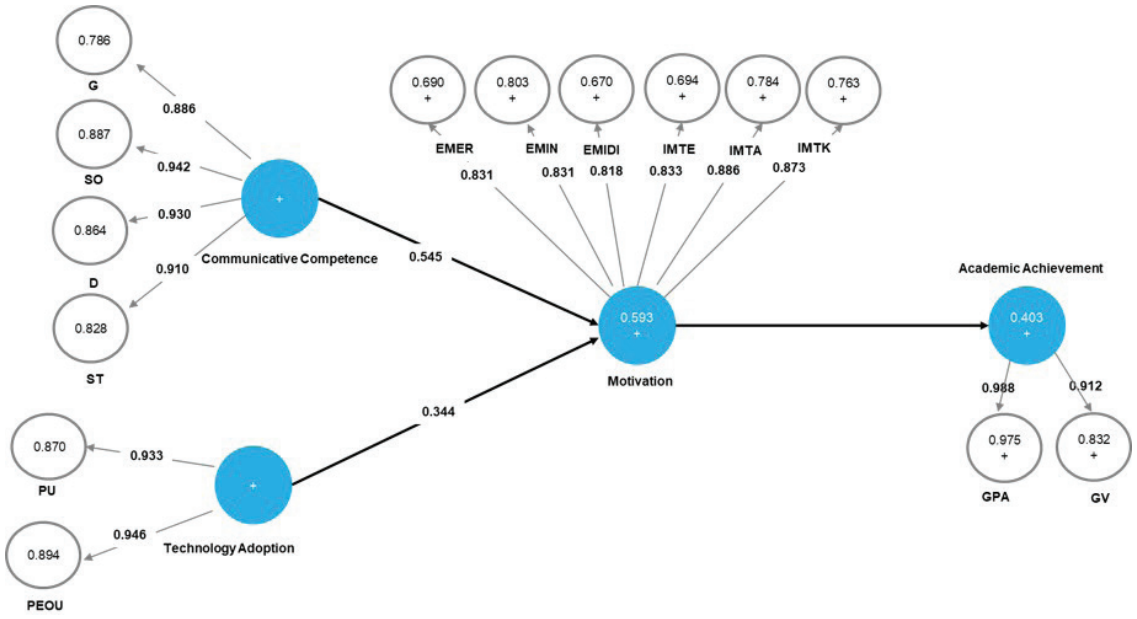
Measurement Model

The quality of the constructs in the study is assessed based on the evaluation of the measurement model. The assessment of the quality criteria starts with evaluation of the factor loading which is followed by establishing the construct reliability and construct validity.

Factor loadings

Factor loading refers to the "the extent to which each of the items in the correlation matrix correlates with the given principal component, Factor loadings can range from - to +1.0, with higher

Figure 2. Measurement model for lower order construct



absolute values indicating a higher correlation of the item with the underlying factor" (Pett et al., 2003). None of the item in these study had factor loading less than the recommended value of 0.5 (Hair et al., 2016). Hence, no items were further removed.

Indicator Multicollinearity

Variance Inflation Factor (VIF) statistic in utilized to assess multicollinearity in the indicators (Fornell & Bookstein, 1982). According to Hair et al (2016) multicollinearity is not a serious issue if the value for VIF is below 5. Table 1 presents the VIF values for the indicators in the study and reveals that VIF for each indicator is below the recommended threshold.

Low multicollinearity in regression analysis offers several key benefits that enhance the reliability and accuracy of the model. One of the primary advantages is stable estimates, where regression coefficients remain more consistent and are less sensitive to changes in the model. This stability is crucial for ensuring that small variations in the data or model structure do not lead to large fluctuations in the coefficients, making the results more trustworthy.

Another benefit is accurate significance tests. When multicollinearity is low, the tests for determining the significance of individual predictors are more reliable. This allows researchers to confidently assess the unique contribution of each variable, leading to a clearer understanding of their individual effects on the outcome variable. Alongside this, the model benefits from lower standard errors, as the standard errors of the regression coefficients are not inflated by shared variance among predictors. This contributes to more precise estimates, increasing the overall accuracy of the results.

Finally, low multicollinearity leads to clearer interpretation of the model. Since the predictors share less variance with each other, it becomes easier to understand the distinct impact of each variable on the dependent variable. This clarity is essential for deriving meaningful insights from the model. By maintaining low multicollinearity, the regression analysis produces more reliable, interpretable, and insightful results, providing a solid foundation for understanding the relationships between the predictors and the outcome variable.

TABLE 1. Multicollinearity Statistics (VIF) for indicators

Indicators	VIF	Indicators	VIF	Indicators	VIF
D1	2.069	EMIN2	3.633	GP7	2.777
D1	2.825	EMIN2	2.601	GP7	2.642
D2	2.168	EMIN3	3.323	GP8	3.532
D2	3.587	EMIN3	2.147	GP8	2.728
D3	4.891	EMIN4	3.305	GV1	1.754
D3	2.625	EMIN4	4.849	GV1	2.34
D4	3.454	G1	2.965	GV2	2.745
D4	2.507	G1	2.154	GV2	2.161
D5	3.382	G2	2.388	GV3	4.622
D5	2.133	G2	3.587	GV3	2.481
EMER1	2.492	G3	2.642	IMTA1	2.81
EMER1	1.455	G3	4.537	IMTA1	1.917
EMER2	4.222	G4	3.766	IMTA2	2.014
EMER2	3.187	G4	2.328	IMTA2	3.666
EMER3	4.14	G5	4.073	IMTA3	3.733
EMER3	2.62	G5	2.992	IMTA3	2.556
EMER4	3.253	G6	3.85	IMTA4	3.365
EMER4	4.227	G6	3.039	IMTA4	1.714
EMIDI1	1.791	GP2	4.122	IMTE1	1.554
EMIDI1	2.414	GP2	3.927	IMTE1	2.735
EMIDI2	2.393	GP3	3.975	IMTE2	3.053
EMIDI2	4.407	GP3	3.892	IMTE2	2.255
EMIDI3	1.892	GP4	4.934	IMTE3	2.986
EMIDI3	2.894	GP4	4.021	IMTE3	2.393
EMIDI4	1.877	GP5	4.136	IMTE4	2.813
EMIDI4	2.631	GP5	3.645	IMTE4	1.567
EMIN1	2.271	GP6	3.259	IMTK1	2.906
EMIN1	3.383	GP6	3.156	IMTK1	2.168
IMTK2	2.842	PU4	2.375	SO9	2.512
IMTK2	1.982	PU4	2.661	SO9	3.672
IMTK3	1.563	PU5	2.5	ST1	2.646
IMTK3	2.828	PU5	3.453	ST1	2.093
IMTK4	1.843	SO1	2.831	ST2	2.746
IMTK4	2.996	SO1	3.872	ST2	4.196

Table 1. ***CONTINUATION***

Indicators	VIF	Indicators	VIF	Indicators	VIF
PEOU1	2.461	SO10	3.962	ST3	4.009
PEOU1	2.6	SO10	4.729	ST3	2.772
PEOU2	3.724	SO2	4.026	GP1	3.58
PEOU2	3.474	SO2	2.418	GP1	3.946
PEOU3	2.766	SO3	4.412		
PEOU3	2.201	SO3	3.382		
PEOU4	1.486	SO4	4.075		
PEOU4	1.599	SO4	2.44		
PEOU5	2.452	SO5	2.875		
PEOU5	3.073	SO5	2.132		
PU1	2.675	SO6	4.968		
PU1	2.627	SO6	2.49		
PU2	3.905	SO7	2.481		
PU2	3.528	SO7	2.28		
PU3	2.703	SO8	2.998		
PU3	2.835	SO8	2.241		

According to Mark (1996), "Reliability is defined as the extent to which a measuring instrument is stable and consistent. The essence of reliability is repeatability. If it is administered over and over again, it will yield the same results." In research, reliability is a critical aspect of ensuring that the measurements taken are not only accurate but can be consistently replicated under similar conditions. This repeatability is essential for the validity of any scientific or statistical analysis, as it assures that the data collected through the instrument is dependable over time.

Two of the most commonly used methods for assessing and establishing reliability in the field of quantitative research are Cronbach's Alpha and Composite Reliability (CR). Cronbach's Alpha is a measure of internal consistency, which indicates how well a set of items measures a single unidimensional latent construct. A higher value of Cronbach's Alpha suggests that the items within a scale are highly correlated and provide a reliable measure of the underlying construct. Composite Reliability, on the other hand, is an alternative reliability measure that considers the overall reliability of a latent variable in relation to the measured items and is often preferred in structural equation modeling (SEM) contexts.

The results of both Cronbach's Alpha and Composite Reliability for this study are presented in Table 2. The values of Cronbach's Alpha ranged from 0.808 to 0.974, indicating a high level of internal consistency across the constructs measured. Similarly, the Composite Reliability statistics ranged from 0.874 to 0.976, further affirming the consistency and stability of the measurement model. Both of these reliability indicators surpass the widely accepted threshold of 0.70 (Hair et al.,

2011), which is considered the minimum level required to establish acceptable reliability in social science research.

Given that both Cronbach's Alpha and Composite Reliability values exceed the required threshold, it can be concluded that the constructs used in this study are reliable. The high reliability scores ensure that the measurement instrument is capable of producing consistent results, which strengthens the overall credibility of the data and the findings derived from the analysis. Therefore, construct reliability is well-established, providing a solid foundation for the subsequent phases of data interpretation and analysis.

TABLE 2. Construct Reliability Analysis (Cronbach Alpha and Composite Reliability)

Construct Validity

	Cronbach's alpha	Composite reliability
Communicative Competence	0.974	0.976
D	0.93	0.947
EMER	0.862	0.908
EMIDI	0.825	0.884
EMIN	0.891	0.925
G	0.916	0.935
GP	0.944	0.953
GPA	0.953	0.959
GV	0.843	0.905
IMTA	0.846	0.897
IMTE	0.808	0.874
IMTK	0.839	0.892
Motivation	0.956	0.96
PEOU	0.878	0.912
PU	0.916	0.937
SO	0.953	0.96
ST	0.919	0.949
Technology Adoption	0.933	0.944

In statistical analysis using PLS-SEM, construct validity is established when there is convergent validity and discriminant validity.

Convergent Validity

"Convergent validity is the degree to which multiple attempts to measure the same concept are in agreement. The idea is that two or more measure of the same thing should ovary highly if they are valid measures of the concept" (Bagozzi et al, 1991). When the AVE value is greater than or equal to the recommended value of 0.50, items coverage to measure the underlying construct and hence

convergent validity is established (Fornell & Larcker, 1981). Convergent validity results based on the AVE statistics in the current study show that all the constructs have an AVE greater than 0.50. Hence, convergent validity is established. Table 3 shows the AVE Value for each of the constructs.

TABLE 3. Construct Convergent Validity (AVE)

Average variance extracted (AVE)	Communication Competence 0.628
D	0.782
EMER	0.714
EMIDI	0.656
EMIN	0.754
G	0.706
GP	0.719
GPA	0.683
GV	0.761
IMTA	0.685
IMTE	0.634
IMTK	0.675
Motivation	0.503
PEOU	0.678
PU	0.748
SO	0.706
ST	0.860
Technology Adoption	0.629

Discriminant Validity

"Discriminant validity is the degree to which measures of different concepts are distinct. The notion is that if two or more concepts are unique, then valid measures of of each should correlate to highly" (Bagozzi et al, 1991).

Fornell and Larcker Criterion

According to Fornell and larcker (1981) criterion, discriminant validity is established when the square root of AVE for a construct is greater than its correlation with all other constructs. In this study, square root of AVE (in Bold and Italics) for a construct was found greater than its correlation with other constructs. Hence, providing strong support for establishment of discriminant validity.

Cross Loadings

Cross loadings help assess if an item belonging to particular constructs load strongly onto its own parent construct instead of other constructs in the study. The results show that factor loading of all the items is stronger on the underlying construct to which they belong instead of the other

constructs in the study (Wasko & Faraj, 2005). Hence, based on the evaluation of cross loadings, discriminant validity is attained.

Heterotrait-Monotrait Ratio (HTMT)

HTMT is and based on the estimation of the correlation between the constructs. Discriminant validity is established based on the HTMT ratio. However, the threshold for HTMT has been debated in existing literature, Kline (2011) suggested a threshold of 0.85 or less, while Theo et al (2008) recommend a liberal threshold of 0.90 or less. The HTMT results in this study indicates that HTMT ratio for required threshold of 0.90.

These higher order constructs were also validated as part of the measurement model assessment. Each of these constructs was assessed for reliability and convergent validity. Furthermore, the higher order construct was tested for discriminant validity with lower order constructs in the study as recommended by Sarstedt et al. (2019). The results for reliability and validity of the higher order constructs showed that both reliability and validity was established. The reliability and convergent validity for all other constructs were established as the value for reliability is > 0.70 and the AVE is greater than 0.50 respectively (Table 4). Further to assessment of reliability and validity, discriminant validity of the higher order construct was also assessed. The results of Fornell and Larcker (1981) criterion shows that square-root of AVE of the constructs is higher than its correlation with all other constructs (Table 5) whereas HTMT is also lower than 0.90 (Table 6).

TABLE 4. Higher Order Construct Reliability and Convergent Validity

	Cronbach's alpha	Composite reliability	Average variance extracted (AVE)
Communicative Competence	0.94	0.957	0.848
GPA	0.911	0.957	0.918
Motivation	0.927	0.943	0.734
Technology Adoption	0.867	0.938	0.883

TABLE 5. Fornell and Larcker (1981) Criterion – Higher Order Discriminant Validity

	Communicative Competence	GPA	Motivation	Technology Adoption
Communicative Competence				
GPA	0.856			
Motivation	0.743	0.665		
Technology Adoption	0.515	0.46	0.669	

TABLE 6. HTMT – Higher Order Discriminant Validity

	Communicative Competence	GPA	Motivation	Technology Adoption
Communicative Competence	0.921			
GPA	0.885	0.958		
Motivation	0.701	0.623	0.857	
Technology Adoption	0.466	0.41	0.601	0.939

Subsequently, to confirm the proposed hypothesis, assessment of the hypothesized relationship was carried out. The results revealed that Communicative Competence has significantly influenced Motivation on OP (b = 0.538, t = 6.946, p = 0.000). Technology Adoption has significantly influenced Motivation on OP (b = 0.350, t = 4.725, p = 0.000). Motivation has significantly influenced Academic Achievement on OP (b = 0.623, t = 11.238, p = 0.000). Therefore, H1, H2 and H3 were supported. H1 Communicative Competence positively and significantly influences Motivation. H2 Technology Adoption positively and significantly influences Motivation. H3 Motivation positively and significantly influences GPA.

This finding indicates that higher levels of Communicative Competence are strongly associated with increased Motivation. The result underscores the importance of effective communication skills in enhancing students' motivational levels, which could be attributed to the confidence and engagement that competent communicators often exhibit. The result also highlights the role of Technology Adoption in fostering Motivation, possibly by making learning more interactive and engaging, thus reinforcing the value of integrating technology into educational practices. In addition, this finding aligns with existing literature suggesting that motivated students are more likely to achieve higher academic performance, as they are more likely to engage with learning materials and put in the necessary effort to excel. The significant relationships identified in this study emphasize the importance of fostering Communicative Competence and encouraging Technology Adoption to enhance Motivation and, consequently, Academic Achievement. Educational institutions and instructors might consider incorporating strategies that develop communication skills and integrate technology to boost student motivation and improve academic outcomes. Additionally, these results suggest that interventions aimed at increasing Motivation could be effective in enhancing students' academic achievement.

TABLE 7. Direct Relationship Results

	Original sample (O)	Standard deviation	T statistics	p values
H1. CC -> M	0.538	0.077	6.946	0
H2. T A -> M	0.35	0.074	4.725	0
H3. M -> GPA	0.623	0.055	11.238	0

For the Mediation Analysis, the results (Table 8) revealed significant (p < 0.05) partial mediating roles of motivation (H4: b = 4.526, p = 0.000). The total effect of Communicative Competence on GPA was significant (b = 6.946, p = 0.000), with the inclusion of the mediator, the direct effect was still significant (b =5.073, p = 0.000). Also, the results (see Table 8) revealed significant (p<

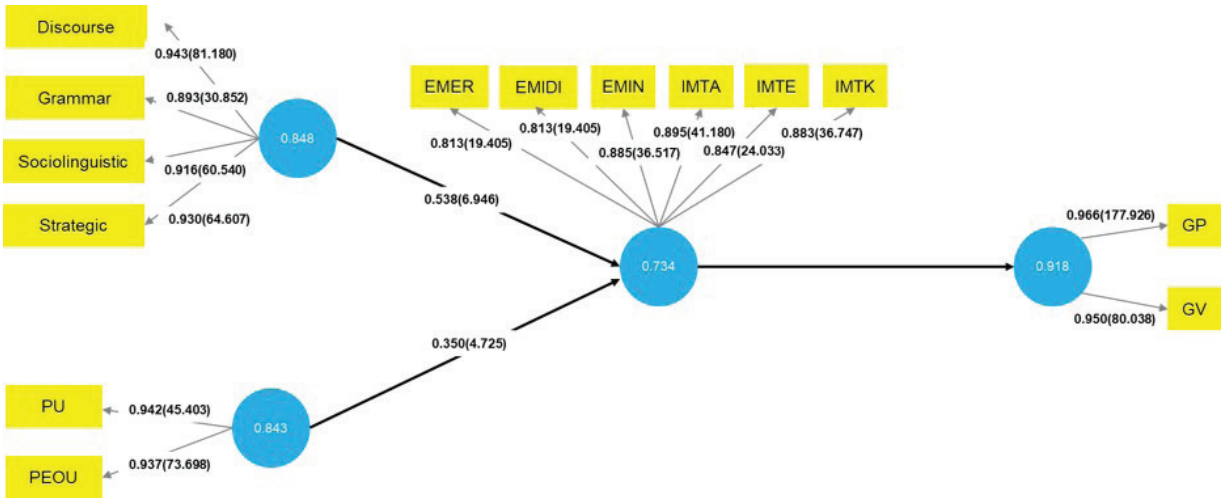
0.05) partial mediating roles of motivation (H4: b = 5.073, p = 0.000). The total effect of Technology Adoption on GPA was significant (b = 4.725, p = 0.000), with the inclusion of the mediator, the direct effect was still significant (b = 4.526, p = 0.000). Therefore, H4 and H5 were validated. H4 Motivation mediates the relationship between Communication Competence and GPA. H5 Motivation mediates the relationship between Technology Adoption and GPA.

These findings confirm that Motivation is a significant mediator in both contexts, enhancing our understanding of how Communicative Competence and Technology Adoption influence Academic Achievement. The significant mediating role of Motivation suggests that interventions aimed at improving students' Motivational levels could enhance the impact of Communicative Competence and Technology Adoption on Academic Achievement. Educational programs and strategies that foster both Communication Skills and Technological Engagement should also consider ways to boost Motivation, as it plays a crucial role in achieving better academic outcomes. Overall, these results emphasize the importance of Motivation in educational contexts and provide a deeper understanding of the mechanisms through which Communicative Competence and Technology Adoption affect Academic Achievement. Future research could further explore additional factors that may influence this mediation process and test interventions designed to enhance Motivation as a pathway to improve academic success.

TABLE 8. Mediation Relationship Results

	Total Effect		Direct Effect			Indirect Effects	
	Coefficient	p-value	Coefficient	p-value		Coefficient	p-value
CC->GPA	6.946	0	5.073	0	H4. CC->M -> GPA	4.526	0
TA->GPA	4.725	0	4.526	0	H5. TA-> M -> GPA	5.073	0

Figure 3. Measurement Model Higher Order Constructs.



The structural model results further confirm the support for the proposed hypotheses. The positive and significant influence of Communicative Competence on Motivation (Hypothesis 1) and the positive and significant influence of Technology Adoption on Motivation (Hypothesis 2) are evident. Additionally, the positive and significant influence of Motivation on GPA (Hypothesis 3) underscores the critical role of Motivation in Academic Achievement. Moreover, the mediating role of Motivation in the relationship between Communicative Competence and GPA (Hypothesis 4) and between Technology Adoption and GPA (Hypothesis 5) is supported by the data. This indicates that Motivation acts as a mediator, enhancing the impact of Communication Competence and Technology Adoption on Academic Achievement. In summary, the data analysis and results chapter provide robust evidence supporting all five hypotheses, thereby validating the theoretical framework and providing insights into the complex relationships between Communication Competence, Technology Adoption, Motivation, and Academic Achievement.

LIMITATIONS

Despite the robust support for the hypotheses, this study has several limitations. Firstly, the cross-sectional nature of the research design limits the ability to draw causal inferences. Longitudinal studies are needed to better understand the directionality of the relationships observed. Secondly, the study relies on self-reported measures, which may introduce bias or inaccuracies in the data. Objective measures or multi-source data could provide more reliable insights. Additionally, the sample may not be representative of all educational contexts, limiting the generalizability of the findings. Future research should aim to include diverse populations and educational settings to enhance the external validity of the results. Finally, while the study explores key variables, it does not account for other potential factors influencing academic achievement, such as socio-economic status or prior academic performance, which could further illuminate the complexities of these relationships.

FURTHER RESEARCH

Future research should consider adopting longitudinal designs to examine how the relationships between Communicative Competence, Technology Adoption, Motivation, and Academic Achievement evolve over time. Investigating these dynamics in different educational contexts and with diverse populations can provide a more comprehensive understanding of the variables' effects. Additionally, incorporating objective measures and multi-source data could enhance the accuracy of findings. Researchers might also explore additional factors that could influence academic achievement, such as socio-economic variables, learning environments, and personal characteristics, to provide a more holistic view of the determinants of academic success. Finally, examining interventions aimed at improving Communicative Competence and Technology Adoption, and their subsequent impact on Motivation and Academic Achievement, could offer practical strategies for enhancing educational outcomes.

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