

THE PARADOX OF CHATGPT DEPENDENCE: NEGATIVE IMPACTS ON ACADEMIC READING, RESEARCH SKILL AND ACADEMIC WRITING

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Abstract: The integration of artificial intelligence (AI) in higher education has revolutionized learning practices, yet its impacts on academic competencies remain an area of exploration. This study employed Partial Least Squares Structural Equation Modeling (PLS-SEM), combining reflective and formative measurement models, to investigate the correlation among ChatGPT usage, English academic reading, research skill, and English academic writing. A total of 284 postgraduate students majoring in linguistics and English education across five universities in Indonesia participated. The participants selected through purposive sampling completed an online questionnaire distributed via Google Forms. Findings reveal negative correlation between ChatGPT usage and English academic writing. It implies that ChatGPT alone does not directly enhance the academic writing proficiency of graduate students. The result also shows an unexpected yet significant negative correlation between ChatGPT usage and both English academic reading ($\beta = -0.175$, $p = 0.017$) and research skill ($\beta = -0.164$, $p = 0.015$), suggesting that over-reliance on AI-assisted tools may hinder critical engagement and skill development. Conversely, academic reading ($\beta = 0.640$, $p = 0.000$) demonstrates the strongest influence on academic writing, showing the necessity of cultivating strong reading competencies to enhance scholarly output. These results indicate a pressing need for a balanced approach to AI integration in academic settings, requiring students to actively engage with research materials rather than relying solely on AI-generated content. By fostering academic literacy and research-driven methodologies, educators can mitigate the adverse effects of ChatGPT dependence while maximizing the potential of AI as a supplementary tool. This study contributes to the discourse on AI-driven education, emphasizing the nuanced role of technology in shaping academic literacy and research proficiency.

Keywords: academic reading, academic writing, AI, ChatGPT, PLS-SEM, research skill

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In higher education, English academic writing is central to knowledge construction and scholarly participation because it enables students to develop arguments, connect ideas, and communicate

research clearly (Ardi et al., 2024; Badley, 2009). Defined as a disciplined process emphasizing precision, clarity, and logical coherence, academic writing serves as a critical medium through which researchers disseminate findings and actively engage with scholarly communities (Al-Hammadi & Sidek, 2015; Harshalatha & Sreenivasulu, 2025). For many Indonesian graduate students, however, English academic writing remains difficult due to limitations in English proficiency, academic reading, and research-related skills. In this context, ChatGPT has emerged as a potentially useful support tool. It functions as a cognitive and linguistic scaffold that helps students generate ideas, organize arguments, improve language use, and receive immediate feedback on grammar, vocabulary, and style (Songkram et al., 2025; Xu & Jumaat, 2024). Such support may reduce linguistic barriers and increase students' confidence in academic communication (Castillo-González et al., 2022).

At the same time, academic writing should not be treated as an isolated skill. From a reading-to-write perspective, it develops through engagement with source texts, as students interpret, evaluate, and transform disciplinary knowledge into new written arguments (Linuwih, 2021). In EFL graduate settings, this process involves students' socio-cognitive ability because they must manage language demands, rhetorical choices, and disciplinary expectations while regulating their learning. Accordingly, this study views English academic reading as a source-based meaning-making practice and research skill as L2 research literacy, namely the ability to locate, evaluate, synthesize, and ethically use scholarly sources, formulate researchable problems, and report inquiry in academic English. In this sense, academic writing depends not only on language proficiency but also on participation in disciplinary literacy practices through reading, researching, and composing (Ciraso-Calí et al., 2022).

Recent studies report mixed findings on the role of ChatGPT in students' academic work. Some research suggests that it can support idea generation, organization, and structural clarity in academic writing, and both students and teachers often view it as useful and accessible (Acosta-Enriquez et al., 2024; Apriani et al., 2025; Mahapatra, 2024). Other studies, however, raise concerns about over-reliance, weakened critical thinking, plagiarism, authenticity, and the risk of inaccurate or overly generic output (Alkaissi & McFarlane, 2023; Kim et al., 2025; Lund & Wang, 2023; Niloy et al., 2024). These contrasting findings suggest that the value of ChatGPT depends not simply on its availability, but on the way students use it.

Despite increasing interest in ChatGPT and academic writing, much of the literature still emphasizes usefulness, efficiency, and acceptance, with less attention to its relationship with second language acquisition, academic literacy, and EFL pedagogy (Apriani et al., 2025; Islam & Islam, 2024; Mondal & Mondal, 2023; Rezaei et al., 2024). In applied linguistics, tools such as ChatGPT are better understood as mediational resources rather than neutral technologies: they may scaffold comprehension, language production, and strategy use, but they may also externalize cognitive work that learners need to perform themselves. Thus, the key issue is not whether students use ChatGPT, but how AI-mediated support relates to source engagement, self-regulation, and participation in disciplinary literacy practices. This gap is especially important in the Indonesian EFL graduate context, where students often negotiate linguistic demands, disciplinary expectations, and limited institutional support simultaneously. Furthermore, quantitative analyses employing Partial Least Squares Structural Equation Modeling (PLS-

SEM) that model ChatGPT usage alongside multiple academic competencies also remain limited (Livberber & Ayvaz, 2023; Rahman et al., 2023).

Guided by this perspective, the present study examines the interrelationships among ChatGPT usage, English academic reading, research skill, and English academic writing among Indonesian EFL graduate students. In this study, ChatGPT usage is conceptualized not merely as technology adoption, but as the extent to which students rely on an AI-mediated literacy support tool while reading academic texts, generating ideas and organizing arguments as part of English academic writing, and handling research-related tasks. This framing positions ChatGPT not as an educational technology variable, but as a form of digital mediation whose value depends on whether it supports or substitutes for core literacy work. By situating the model within reading-to-write, genre-informed, and socio-cognitive views of academic literacy, this study seeks to explain how AI use is associated with the development of graduate students' disciplinary writing in English. Accordingly, this research addresses the following central research question: What are the interrelationships among ChatGPT usage, English academic reading, research skill, and English academic writing competencies of EFL graduate students in Indonesia?

The following sections review the main constructs in the study: ChatGPT usage, English academic reading, research skill, and English academic writing. It also provides the rationale for the proposed hypotheses.

ChatGPT Usage

In higher education contexts, ChatGPT is increasingly used to support reading, writing, and research-related tasks. In EFL and applied linguistics fields, however, its use should be understood not as technology adoption or frequency of access, but as AI-mediated literacy support that can scaffold language and academic work (Deng et al., 2025; Mahande et al., 2025; Tsai et al., 2024). For graduate EFL students, ChatGPT may function as a mediational tool when they seek help with difficult readings, idea reformulation, outlining, or feedback on language and rhetorical organization. Its use is therefore closely tied to strategy use and self-regulated learning, since students must decide when to consult the tool, how to evaluate its output, and whether to revise or reject its suggestions. Its pedagogical value depends on how it is used. When used critically, ChatGPT may support vocabulary development, paraphrasing, summarizing, rhetorical awareness, and idea generation. When used uncritically, it may reduce engagement with source texts and weaken independent meaning making (Strzelecki, 2024). For this reason, the present study treats ChatGPT usage as an AI-mediated support practice whose role depends on whether it supports or substitutes for students' literacy work.

English Academic Reading

This study approaches English academic reading from a reading-to-write perspective, which views reading as a constructive activity that provides conceptual, rhetorical, and evidential resources for writing (Evans et al., 2015). For graduate EFL students, academic reading involves more than comprehension. It includes evaluating claims, tracing arguments, identifying rhetorical moves, and selecting information that can be transformed into new written

knowledge (Eriksson, 2023a; Nejadghanbar et al., 2022). This perspective is especially relevant in AI-supported learning. ChatGPT may help students understand terminology, summarize dense passages, and access difficult texts more easily. Still, effective academic reading cannot be reduced to efficient information retrieval. Students must engage in inferencing, comparison across texts, rhetorical interpretation, and critical judgment about evidence and stance (Songkram et al., 2025; Tsai et al., 2024). Although AI-generated summaries may support comprehension and vocabulary development (Deng et al., 2025; Naznin et al., 2025; Zangrossi et al., 2024), over-reliance may weaken the deeper interpretive work needed in EFL academic settings. In this study, English academic reading is therefore treated as a source-engaged literacy practice.

English Academic Writing

English academic writing, in this study, is treated as a source-based and socially situated practice rather than only as a grammatically correct text production. For EFL graduate students, effective academic writing involves constructing claims, positioning a voice, integrating sources, and aligning with disciplinary conventions (Cahyono et al., 2024; Nurkamto et al., 2024). It is shaped by textual knowledge, rhetorical awareness, and self-regulation. Within this framework, ChatGPT may support lower- and mid-level writing processes such as planning, sentence reformulation, coherence improvement, and language noticing (Apriani et al., 2025; Yuan et al., 2024). Even so, graduate-level academic writing still depends on sustained engagement with reading and research practices. AI may help refine expression, but it cannot replace the work of building arguments from sources, evaluating evidence, and participating in scholarly dialogue. In this study, academic writing is viewed as the outcome of broader literacy processes rather than a skill directly improved by tool use alone.

Research Skills

Research skill in this study is framed more narrowly as research literacy in an EFL graduate context rather than as a general academic ability. It refers to the ability to formulate researchable questions, locate and evaluate literature, synthesize findings, interpret methods, and report inquiry in academically appropriate English (Creswell, 2017). This construct is closely connected to second language academic literacy because graduate students carry out these activities through English-medium texts, disciplinary vocabulary, citation practices, and evidence-based argumentation (Castillo-Martínez & Ramírez-Montoya, 2021). Research skill is therefore both methodological and linguistic, which helps explain its place in the model. For EFL graduate students, research literacy links reading and writing by enabling movement from source consultation to problem formulation, from literature review to argument construction, and from evidence gathering to scholarly reporting. ChatGPT may assist some of these processes by helping students brainstorm topics, organize themes, clarify methodological terms, or restate ideas more clearly (Li et al., 2025; Songkram et al., 2025). However, research literacy also depends on judgment, source verification, ethical citation, and critical synthesis, which cannot be delegated fully to AI.

Rationale for Hypothesized Relationships

The proposed relationships are based on the view that academic writing develops through interconnected literacy processes. English academic reading provides source knowledge, rhetorical awareness, and interpretive depth for writing. Research skill extends this process by enabling students to formulate questions, evaluate evidence, synthesize literature, and communicate inquiry in academic contexts. Together, these competencies support EFL graduate students' participation in scholarly discourse.

Within this framework, ChatGPT usage is conceptualized as AI-mediated scaffolding. It may support reading, writing, and research when students use it strategically to clarify texts, generate ideas, organize arguments, and regulate learning. However, its role may become counterproductive when students use it to replace deep reading, critical synthesis, and independent inquiry. The hypotheses, therefore, examine how ChatGPT usage is associated with English academic reading, research skill, and English academic writing, while also recognizing the foundational roles of reading and research in writing development.

H1: ChatGPT usage correlates with English academic reading.

H2: ChatGPT usage correlates with English academic writing.

H3: ChatGPT usage correlates with research skills.

H4: English academic reading correlates with English academic writing.

H5: Research skill correlates with English academic writing.

METHOD

This study employed a quantitative design using Partial Least Squares Structural Equation Modeling (PLS-SEM) to examine the relationships among ChatGPT usage, English academic reading, research skill, and English academic writing among EFL graduate students. The method section covers the research design, respondents, instruments, data collection, and data analysis.

Research Design

PLS-SEM was selected because it is suitable for examining models involving multiple constructs, indicators, and structural paths, particularly in exploratory research and theory development (Hair et al., 2019; Hair & Alamer, 2022). In this study, it enabled the simultaneous analysis of the hypothesized relationships among ChatGPT usage, academic reading, research skills, and academic writing. Its predictive orientation also aligned with the study's aim of examining the structural relationships among these academic competencies (Sarstedt et al., 2021).

Respondents

The participants were 284 graduate students from universities across Indonesia. They were enrolled in doctoral (48.6%) and master's (51.4%) programs and came from three fields:

Educational Science (22.5%), English Language Education (49.6%), and Linguistics (27.8%). Most participants were female (69%). Their ChatGPT use also varied in duration and frequency, with 29.6% reporting use at least five times per week.

These participants were selected because EFL graduate students frequently encounter challenges in English proficiency, academic reading, research, and writing, while working within varying levels of institutional support. Having studied academic writing and research methodology, they were considered appropriate participants for investigating the role of ChatGPT in academic literacy development. An overview of the participants' demographic characteristics is provided in Table 1.

Table 1. Demographic Information

Parameter	Category	Frequency	Percentage (%)
Gender	Female	196	69
	Male	88	31
Duration of ChatGPT Usage	>1 years	76	26.8
	>3-6 months	66	23.2
	>6 months-1 year	71	25
	1-3 months	71	25
Usage Frequency	1 time per month	24	8.5
	1-2 times per week	75	26.4
	2 times per month	25	8.8
	3-4 times per week	76	26.8
	5 times or more per week	84	29.6
Study Level	Doctor	138	48.6
	Master	146	51.4
Study Program	Educational Science	64	22.5
	English Language Education	141	49.6
	Linguistics	79	27.8

Research Instruments

This study employed a questionnaire adapted from previously validated studies (see Appendices 1 and 2). Research skills were measured with 13 items adapted from (Hemmings & Kay, 2010), while academic reading and academic writing were measured using 5 and 10 items respectively, adapted from (Phyo et al., 2024). ChatGPT usage was measured using 13 items adapted from (Nemt-allah et al., 2024). In line with the study's focus on language education, ChatGPT usage was interpreted as AI-mediated support for reading, writing, and research-related tasks, whereas research skill was treated as research literacy enacted through English-medium academic work. All items were translated from English into Indonesian and subsequently back-translated to ensure semantic equivalence. The translated version was

reviewed by two expert linguists, each with more than 25 years of experience in language education. A pilot test was then conducted with 30 graduate students who shared characteristics similar to the target sample. The questionnaire demonstrated good reliability, with a Cronbach's alpha of 0.813. Item validity was also confirmed, with correlation coefficients ranging from 0.388 to 0.428, exceeding the critical value of 0.296 (Brown, 2002).

Data Collection Procedures

Purposive sampling was employed to recruit graduate students who had used ChatGPT for at least one month and had completed academic writing or research methodology courses. Ethical approval was obtained before data collection. The questionnaire was administered through Google Forms with the help of department heads and lecturers at selected universities. Participants were informed that their participation was voluntary, and their responses would remain confidential, and they were given one week to complete the survey. A total of 284 valid responses were collected for analysis.

Data Analysis

The data were analyzed using SmartPLS 4 following established PLS-SEM procedures (Hair et al., 2019). The analysis was conducted in two stages: measurement model assessment and structural model assessment. The measurement model was evaluated through indicator loadings, composite reliability, average variance extracted (AVE), and heterotrait-monotrait ratio (HTMT). The structural model was then assessed using Variance Inflation Factor (VIF), path coefficients, coefficient of determination (R^2), effect size (f^2), and predictive relevance (Q^2). These procedures were applied to test the proposed hypotheses and evaluate the explanatory and predictive performance of the model.

FINDINGS AND DISCUSSION

Findings

This section presents the empirical results derived from the PLS-SEM analysis, structured in accordance with the study's research objectives and hypotheses. The findings are organized into two main stages: the measurement model assessment and the structural model assessment.

The Measurement Model Assessment

The measurement model assessment served as the initial stage in PLS-SEM analysis and was conducted to evaluate the reliability and validity of constructs within the research framework. The assessment of the reflective measurement model involved examining indicator loadings, internal consistency reliability, convergent validity (see Table 2) and discriminant validity (see Table 3). Indicator loadings should ideally exceed the threshold of 0.70, indicating that the constructs explain at least 50% of the indicator variance and thus ensure satisfactory item reliability (Hair et al., 2019). Internal consistency reliability was evaluated using Cronbach's alpha (α) and composite reliability (CR), both recommended to surpass the value of

0.70 to confirm internal coherence. (Hair et al., 2014) Convergent validity was confirmed using AVE, where values exceed 0.50 demonstrate that a construct adequately explain variance in their respective indicators (Hair et al., 2014). Finally, discriminant validity was examined using the HTMT, with values below 0.85 indicating that constructs are empirically distinct from one another.

Indicator Loadings, Internal Consistency Reliability, and Convergent Validity

Indicator loadings were analyzed to assess item reliability, and the results are presented in Table 2. The reflective indicators showed loadings ranging from 0.711 to 0.906, all exceeding the recommended threshold of 0.70 (Hair et al., 2019). Notably, indicators EAR_2 and EAW_8 exhibited particularly high loadings of 0.906 and 0.869, respectively, signifying strong associations to their respective constructs. The construct of ChatGPT usage (UGPT) maintained a robust range of loadings between 0.772 and 0.826, supporting adequate item reliability across its indicators. Consequently, these results indicate all observed variables represented each construct's essence within the context of Indonesian graduate EFL students.

Table 2. Indicator Loadings, Internal Consistency Reliability, and Convergent Validity

Items	Indicator Loadings	α	CR	AVE
UGPT_1	0.774	0.909	0.930	0.638
UGPT_2	0.826			
UGPT_4	0.806			
UGPT_5	0.815			
UGPT_6	0.806			
UGPT_7	0.790			
UGPT_8	0.772			
EAR_1	0.813	0.812	0.819	0.728
EAR_2	0.906			
EAR_3	0.838			
RS_2	0.737	0.891	0.901	0.605
RS_3	0.738			
RS_4	0.767			
RS_5	0.822			
RS_6	0.838			
RS_7	0.809			
RS_8	0.724			
EAW_1	0.802	0.933	0.934	0.625
EAW_2	0.799			
EAW_3	0.744			
EAW_4	0.842			

Items	Indicator Loadings	α	CR	AVE
EAW_5	0.801			
EAW_6	0.797			
EAW_7	0.711			
EAW_8	0.869			
EAW_9	0.763			
EAW_10	0.765			

UGPT = Chat GPT Usage, EAR = English Academic Reading, RS = Research Skills, EAW = English Academic Writing

Table 2 presents the internal consistency reliability and convergent validity values. Cronbach's alpha (α) values range from 0.812 (EAR) to 0.933 (EAW), all exceeding the acceptable threshold of 0.70 (Hair et al., 2014). Similarly, CR values, ranged from 0.819 to 0.934, indicate satisfactory internal consistency among indicators within each construct. Convergent validity, measured through AVE, reveals values between 0.605 (RS) and 0.728 (EAR), which surpass the recommended minimum threshold of 0.50 (Hair & Alamer, 2022). Among the constructs, English Academic Reading exhibited the highest AVE of 0.728, underscoring that its indicators explained a substantial proportion of variance within the construct. Overall, these findings demonstrate satisfactory internal consistency and convergent validity across all studied constructs.

Discriminant Validity

To assess discriminant validity, the Heterotrait-Monotrait Ratio (HTMT) approach was utilized, as depicted in Table 3. HTMT values below 0.85 suggest adequate discriminant validity between constructs (Henseler et al., 2015). The HTMT values in this study ranged from 0.126 to 0.705. The highest HTMT value of 0.705, observed between English academic reading and English academic writing, indicates a robust, yet acceptable distinction between these interrelated constructs. Conversely, the lowest value of 0.126 was found between ChatGPT usage and English academic writing suggesting a clear differentiation between constructs. Hence, all HTMT values in the model remained below the recommended threshold, confirming satisfactory discriminant validity of the constructs.

Table 3. Heterotrait-Monotrait Ratio (HTMT)

	UGPT	EAR	EAW	RS
UGPT				
EAR	0.168			
EAW	0.126	0.705		
RS	0.161	0.245	0.330	

The Structural Model Assessment

The structural model assessment is the subsequent analytical step within the PLS-SEM approach, and was conducted to examine the predictive strength and the relationships among the latent constructs. In this stage, key diagnostic assessments include multicollinearity testing, hypothesis testing through path analysis, the coefficient of determination (R^2), effect sizes (f^2), and the predictive relevance (Q^2) of the structural model. Multicollinearity was examined first to ensure that inter-correlation among predictors did not compromise the integrity of the structural paths. Following this, the hypotheses derived from theoretical propositions were tested to assess whether predicted relationships among constructs were statistically supported. Lastly, the structural model's explanatory and predictive power were evaluated through the coefficient of determination (R^2), effect sizes (f^2), and predictive relevance (Q^2) based on established thresholds (Ketchen, 2013).

Multicollinearity Testing

The multicollinearity assessment of this research is summarized in Table 4, which presents the Variance Inflation Factor (VIF) for each predictor construct. Furthermore, to explicitly address the risk of common method bias (CMB) arising from self-reported data, a full collinearity assessment approach was utilized. Variance Inflation Factor (VIF) values were scrutinized to ensure the independence of predictors and confirm that CMB is not a pervasive issue in this study. Following (Hair et al., 2014), multicollinearity is typically considered problematic when the VIF values exceed the threshold of 3.3. In this study, the results indicated acceptable VIF values ranging between 1.000 and 1.064, remaining below the threshold. Specifically, ChatGPT usage had a VIF of 1.045 when predicting English academic reading and a VIF of 1.000 for both English academic writing and research skill (RS). The VIF values of English academic reading and research skill predicting English academic writing were 1.064 and 1.061 respectively. Hence, multicollinearity was confirmed not to pose any substantial concern within this structural model, allowing subsequent analyses to proceed reliably without the risk of inflated standard errors or compromised statistical inferences.

Table 4. Variance Inflation Factor

	UGPT	EAR	EAW	RS
UGPT		1.000	1.045	1.000
EAR			1.064	
EAW				
RS			1.061	

Hypotheses Testing

The structural model evaluation tests the hypothesized relationships by assessing the statistical significance and relevance of the path coefficients. To determine this significance, a bootstrapping procedure is utilized to generate the corresponding t-statistics and p-values. For a hypothesis to be empirically supported at the standard 95% significance level ($p < 0.05$), the t-statistic must exceed the critical threshold of 1.96 for a two-tailed test (Hair et al., 2014).

Furthermore, the standardized path coefficients (β) should ideally fall within the acceptable range of -1 to +1 (Hair et al., 2014). Table 5 presents these exact metrics to evaluate the direct predictive effects among ChatGPT Usage, English Academic Reading, Research Skill, and English Academic Writing, establishing the statistical foundation for either confirming or rejecting Hypotheses 1 through 5.

Table 5. Path Analysis Result

Hypotheses	Path	β	Mean	SD	T Statistics	P Values	Significance
H1	ChatGPT Usage -> English Academic Reading	-0.166	-0.178	0.078	2.111	0.035	Supported
H2	ChatGPT Usage -> English Academic Writing	0.009	0.008	0.054	0.168	0.867	Rejected
H3	ChatGPT Usage -> Research Skill	-0.156	-0.170	0.062	2.506	0.012	Supported
H4	English Academic Reading -> English Academic Writing	0.580	0.581	0.043	13.345	0.000	Supported
H5	Research Skill -> English Academic Writing	0.188	0.193	0.056	3.353	0.001	Supported

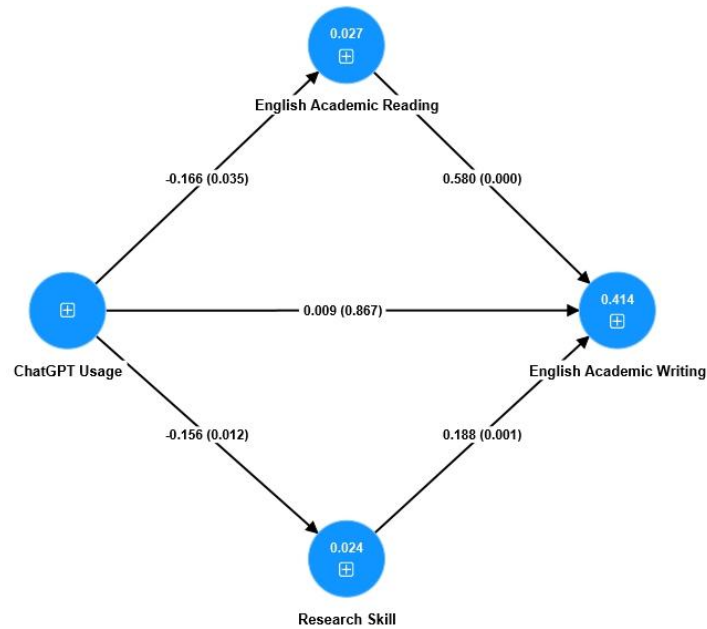


Figure 2. Final Model

Hypotheses H1 to H3 explored the direct relationships between ChatGPT usage and core academic competencies, specifically English academic reading, English academic writing, and research skill. As shown in Table 5 and illustrated in Figure 2, the relationship between ChatGPT usage and English academic reading (H1) is statistically significant and negative ($\beta = -0.166$, $p = 0.035$), indicating that higher reported ChatGPT usage was associated with lower reported academic reading. This result should be interpreted as correlational rather than causal. Although one possible explanation is that frequent reliance on ChatGPT may reduce students' direct engagement with academic texts, an equally plausible interpretation is that students with weaker

reading abilities may turn to ChatGPT more often as a compensatory support tool. Likewise, the significant negative association between ChatGPT usage and research skill (H3; $\beta = -0.156$, $p = 0.012$) suggests that greater AI use co-occurred with lower self-reported research skill; however, this pattern does not establish that ChatGPT use diminishes research competence. Rather, it may also indicate that students who perceive themselves as less confident in research-related tasks are more likely to rely on AI assistance. By contrast, hypothesis H2, assessing the direct relationship between ChatGPT usage and English academic writing, was not supported ($\beta = 0.009$, $p = 0.867$), indicating no significant association between ChatGPT usage and academic writing in this sample.

Hypotheses H4 and H5 examined the relationships among English academic reading, research skills and English academic writing. Hypothesis H4 reveals a positive relationship between English academic reading and English academic writing ($\beta = 0.580$, $p < 0.001$), suggesting that enhanced academic reading abilities strongly facilitate students' academic writing. This finding aligns with theoretical assumptions that effective comprehension of scholarly texts significantly enriches writing proficiency through better genre understanding and argumentation. Similarly, hypothesis H5 examining the impact of research skill on English academic writing also demonstrated a significant and positive relationship ($\beta = 0.188$, $p = 0.001$), indicating that improved research skills were associated with stronger academic writing performance.

Coefficient of Determination (R^2) and Effect Size (f^2)

The coefficient of determination (R^2) and effect size (f^2) were evaluated to gauge the model's predictive power and assess each predictor's substantive impact. Table 6 illustrates the coefficient of determination results, with English academic writing attaining a moderate R^2 value of 0.414, suggesting substantial predictive power in line with Ketchen's (2013) recommendation that R^2 values of 0.25, 0.50, and 0.75 represent weak, moderate, and substantial explanatory levels respectively. However, English academic reading and research skills show very weak R^2 values of 0.027 and 0.024, respectively.

Table 6. Coefficient determination (R^2)

	R-square	R-square adjusted	Consideration
EAR	0.027	0.024	Weak
EAW	0.414	0.407	Moderate
RS	0.024	0.021	Weak

These findings indicate that ChatGPT usage alone explained only a minimal portion of the variance, suggesting that these complex academic competencies are likely influenced by a broader nomological network of omitted variables (such as baseline English proficiency or prior digital literacy). In addition, table 7 presents the effect size analysis, with English academic reading's impact on English academic writing revealing a large f^2 value of 0.540 (Hair et al., 2014). In contrast, the other paths demonstrated small or negligible effect sizes, notably

ChatGPT usage's direct impact on English academic writing ($f^2 = 0.000$), suggesting minimal practical significance for this path.

Table 7. Effect Size (f^2)

Path	f^2	Effect size
ChatGPT Usage → English Academic Reading	0.028	Small
ChatGPT Usage → English Academic Writing	0.000	Very Small
ChatGPT Usage → Research Skill	0.025	Small
English Academic Reading → English Academic Writing	0.540	Large
Research Skill → English Academic Writing	0.057	Small

Predictive Relevance (Q^2)

Predictive relevance (Q^2) analysis was employed to evaluate the model's capability to predict omitted data points using blindfolding procedures. Values greater than 0 indicate acceptable predictive accuracy, with benchmarks of 0.02, 0.15, and 0.35 commonly interpreted as small, medium, and large predictive relevance, respectively (Hair et al., 2014). As presented in Table 8, the Q^2 value for English academic writing was 0.246, falling within the medium range, thus demonstrating that the model has solid predictive accuracy for students' writing competencies. In contrast, English academic reading ($Q^2 = 0.016$) and research skill ($Q^2 = 0.013$) were below the small threshold, reflecting limited predictive capability explained by ChatGPT usage alone. Lastly, ChatGPT usage itself, as an exogenous construct, understandably showed no predictive relevance ($Q^2 = 0.000$). Overall, these findings underscore that English academic writing predictions within the model are robustly reliable, while improvements in predicting English academic reading and research skills may require additional explanatory variables or more refined model specification.

Table 8. Predictive Relevance

	SSO	SSE	$Q^2 (=1-SSE/SSO)$
ChatGPT Usage	1764	1764	0.000
English Academic Reading	756	744	0.016
English Academic Writing	2520	1900	0.246
Research Skill	1764	1740	0.013

Discussion

This study has examined the relationships between ChatGPT usage and three academic competencies among Indonesian EFL graduate students: English academic reading, research skill, and English academic writing.

The first result indicates a negative association between ChatGPT usage and English academic reading. This is an important finding, but it should be interpreted cautiously. Because the study employed a cross-sectional design and self-reported measures, the result does not

demonstrate that ChatGPT usage causes weaker reading ability. One possible explanation is that frequent use of ChatGPT may coincide with reduced direct engagement with academic texts, especially when students rely on summaries or simplified explanations instead of reading source materials in depth. However, an alternative explanation is equally plausible: students who already experience difficulty with academic reading may be more likely to use ChatGPT as a compensatory tool to manage complex texts, terminology, or cognitive load. In this sense, higher usage may reflect support-seeking behavior rather than a detrimental effect of the tool itself. Another possibility is that the observed coefficient is partly shaped by how the constructs were operationalized, particularly if some students interpreted ChatGPT use as part of their reading process while academic reading items emphasized independent comprehension practices. Thus, the negative coefficient should be understood as evidence of an inverse association that warrants further investigation, not as definitive proof that ChatGPT undermines academic reading.

This interpretation is consistent with previous research showing that AI-assisted tools can improve reading efficiency by summarizing, simplifying, and contextualizing texts (Baidoo-Anu & Owusu Ansah, 2023; Cotton et al., 2024). However, the quality of this support depends heavily on students' literacy, critical awareness, and patterns of engagement. Chea and Xiao (2024) note that while AI-enhanced feedback loops foster positive emotions in planning and evaluating reading, prompting-based interactions often elicit cognitive overload, particularly when students are unsure how to assess the tool's accuracy. In this study's context, graduate students may have over-relied on ChatGPT without possessing sufficient AI literacy to critically evaluate or integrate its outputs. This point also supports previous study by Zheng and Fan (2024) who found that excessive reliance on generative tools might reduce the perceived need for deeper textual engagement. Moreover, as highlighted by Zhai et al. (2024), overdependence may inhibit critical skills such as inferencing, annotation, and synthesis. This erosion in cognitive rigor likely contributes to the negative reading outcomes observed, as students bypassed the struggle essential for comprehension and idea construction, opting instead for AI-generated simplifications. Thus, the use of ChatGPT may have unintentionally replaced, rather than enhanced, active reading processes.

The second result shows no statistically significant effect of ChatGPT on academic writing. Despite ChatGPT's potential to support academic writing through surface-level corrections and stylistic improvements, the lack of significant impact on students' writing performance calls for closer scrutiny. Prior research underscores that AI tools can assist with grammar, coherence, and vocabulary selection (Mudhsh et al., 2025) which are undeniably valuable in EFL contexts. However, the benefits offered by AI in surface-level editing may not extend to higher-order writing competencies such as structuring arguments, synthesizing evidence, or maintaining scholarly tone, skills that are particularly essential in graduate-level writing. As Zhao (2025) suggest, these tools can foster passivity and limit the cognitive effort required for original composition. Furthermore, in the Indonesian context where English proficiency is uneven and institutional writing support is often minimal, students may lean on ChatGPT for complete paragraphs or drafts, raising concerns about academic integrity and uncritical adoption of AI-generated ideas (Werdiningsih et al., 2024). This may have resulted in a superficial improvement that did not translate into measurable competence or writing independence. Additionally, instances of AI hallucinations and fake citations may have undermined students' confidence in

using the tool effectively, contributing to the statistically non-significant outcome (Anik et al., 2025). Hence, while ChatGPT can assist in polishing writing, its pedagogical value in fostering critical and original academic discourse appears limited without structured guidance.

Consistent with the first finding, the third result of this study shows a significant negative association between ChatGPT usage and students' research skills. This finding should be interpreted cautiously, as it does not indicate causation. One possible explanation is that frequent use of ChatGPT may coincide with reduced practice in core research activities such as evaluating sources, synthesizing literature, and making independent methodological decisions. However, the reverse is also possible: students with weaker research preparation or lower confidence may rely more heavily on ChatGPT to compensate for difficulties in conducting research tasks. Thus, higher usage may reflect underlying skill gaps rather than cause them directly. The result may also have been influenced by the broad nature of the research skill construct and the self-report format of the questionnaire. This finding also suggests that the benefits of AI in research depend on how the tool is used. Although previous studies have shown that AI can support activities such as literature review, idea generation, and data analysis (Huamani-Anco & Maraza-Quispe, 2025; Songkram et al., 2025), uncritical reliance on ChatGPT may reduce students' engagement in important cognitive processes, including critical evaluation, synthesis, brainstorming, and reflection (Giray, 2024; Khlaif et al., 2023). In the Indonesian EFL graduate context, this may be linked to limited AI literacy and insufficient guidance in using AI for academic purposes. As a result, students may depend on AI outputs without fully engaging in authentic research practices. This may also raise ethical concerns related to plagiarism and the uncritical use of generated content (Frye, 2022; Kotsis, 2024).

The fourth result shows the significant and strong relationship between English academic reading and writing. This finding reaffirms a foundational academic principle that reading serves as the bedrock for academic writing. This relationship is particularly salient in the development of genre awareness and disciplinary discourse. As highlighted by (Atayeva et al., 2019) and (Grabe & Zhang, 2016), academic reading fosters the ability to identify, imitate, and adapt conventional rhetorical moves necessary for scholarly communication. In this study, graduate students who demonstrated higher reading proficiency were better positioned to structure their arguments, integrate sources effectively, and adhere to academic norms. In addition, genre knowledge is not merely about form but also about understanding how genres serve social and communicative purposes within specific academic communities (Deng et al., 2024). When students read with this awareness, they learn to situate their writing within ongoing disciplinary conversations. This practice of using source texts as dialogic tools enables students to negotiate meaning, clarify claims, and position their voice, an essential aspect of academic authorship (Eriksson, 2023b). Moreover, according to Bai & Wang, (2023), students rely on their accumulated academic literacy, developed through reading and peer interaction, as a yardstick to identify and solve rhetorical problems in writing. Therefore, the strong statistical association observed here is logically consistent with both theory and context, underscoring the pedagogical importance of integrating academic reading and writing instruction in AI-supported learning environments.

The fifth finding reveals that research skills significantly influenced English academic writing performance, thereby supporting the fifth hypothesis. This outcome aligns with

theoretical expectations and highlights the essential role of inquiry-based competencies in scholarly communication. Strong research skills provide the foundation for constructing evidence-based arguments, which remain a central hallmark of effective academic writing. According to Castillo-Martínez & Ramírez-Montoya (2021), research self-efficacy strongly predicts not only the quality of research but also academic writing outcomes, as it fosters confidence in problem-solving and critical evaluation. These competencies empower students to formulate questions, analyze data, and translate findings into coherent narratives (Prihandoko, 2024). In the present study, Indonesian graduate students with stronger research abilities were likely better at structuring academic arguments and synthesizing sources. The role of mentoring, although indirect, is also critical. The mentorship process enhances information-seeking and sharing behaviors, which are essential not just for research development but also for refining writing through collaborative feedback (Ardi et al., 2024). These iterative processes that include identifying credible sources, constructing logical connections, and engaging with feedback are integral to producing well-structured academic texts. Thus, the statistical confirmation of this hypothesis supports the idea that research competence is not only a separate academic skill but also a developmental gateway to improved academic writing.

While the negative relationships are statistically significant, the R^2 values for academic reading (0.027) and research skills (0.024), alongside small f^2 effect sizes, indicate that ChatGPT usage alone explains a minimal portion of the variance. Rather than a flaw, this reflects the highly complex, multifactorial nature of these academic constructs (Kraft, 2020; Tobler, 2024). Crucially, while R^2 captures only in-sample explanatory power, the model's true robustness is validated through PLS prediction analysis (Shmueli et al., 2019) (see Appendix 3). Demonstrating strong out-of-sample prediction, the PLS-SEM model employed in this study produced lower prediction errors than the naive linear model (LM) benchmark for 16 out of 19 indicators. This performance establishes a solid medium predictive power (Shmueli et al., 2019). Therefore, despite the modest in-sample variance explained by a single predictor, the structural model successfully predicts new data, confirming the external validity and practical relevance of the findings.

CONCLUSION

This study has examined the relationships between ChatGPT usage and the academic competencies of Indonesian EFL graduate students, namely English academic reading, research skill, and English academic writing. The findings showed a mixed pattern: ChatGPT usage was negatively associated with academic reading and research skill, but not significantly associated with academic writing. These results should not be interpreted causally, given the cross-sectional design and reliance on self-reported data. It is equally possible that students with weaker reading and research skills used ChatGPT more frequently as a compensatory strategy.

At the same time, academic reading and research skill were both positively associated with academic writing, confirming their importance in graduate-level writing development. The low R^2 values for academic reading and research skill also indicate that ChatGPT usage explained only a small proportion of the variance in these constructs. This suggests that other factors, such as English proficiency, academic year, digital literacy, and supervisory support, may provide

stronger explanations and should be included in future research. Overall, this study contributes to current discussions on AI-mediated academic literacy in higher education, particularly in EFL contexts.

From a theoretical perspective, the findings reinforce the view that AI should be understood not simply as a tool, but as a mediational resource whose value depends on how it is integrated into literacy practices. The negative associations involving ChatGPT usage suggest that AI does not automatically strengthen students' reading or research development; rather, its role depends on whether it supports or substitutes for active engagement with texts, source evaluation, and knowledge construction.

From a pedagogical perspective, the findings highlight the need to distinguish between over-reliance on AI and guided pedagogical integration. ChatGPT may be beneficial when it supports learning, but not when it replaces close reading, source comparison, idea development, and independent synthesis. In practice, EFL lecturers can integrate ChatGPT into structured reading-to-write tasks, ask students to evaluate and revise AI-generated outputs, and provide explicit training on citation checking, hallucination awareness, and ethical AI use. These strategies can help position AI as a scaffold rather than a substitute for academic literacy development. The practical contribution of this study, therefore, lies not in discouraging AI use, but in encouraging classroom routines that make AI use visible, accountable, and pedagogically purposeful.

This study also has several limitations. Because the data were cross-sectional and self-reported, the findings are correlational and may not fully reflect actual performance. Future studies should therefore use longitudinal designs and include performance-based measures, behavioral logs, interviews, or think-aloud protocols. They should also examine how institutional policy, access, and training mediate the relationship between AI use and academic competencies, and explore possible nonlinear or dynamic patterns of AI use. Such work is needed to better understand how AI can support academic literacy without weakening learner agency or critical engagement.

DECLARATION OF AI USE

During the preparation of this manuscript, the authors used AI tools solely to support language-related tasks, including suggesting alternative phrasing for author-drafted sentences and checking lexical appropriateness, grammatical accuracy, and formatting. AI tools were not used to conduct or interpret the literature review, develop the conceptual framework, generate scholarly arguments, analyze the data, or draw conclusions. All literature searches, source selection, interpretation of previous research, conceptual synthesis, data analysis, and scholarly judgments were conducted by the authors. All cited sources were directly consulted and independently verified by the authors. The authors carefully reviewed and edited all AI-assisted outputs and take full responsibility for the accuracy, integrity, and originality of the manuscript and for all claims, citations, analyses, and conclusions presented herein.

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APPENDICES

Appendix 1. Questionnaire in *Bahasa Indonesia*

Kemampuan Riset

Saya mampu dalam...

1. Menghasilkan ide penelitian
2. Melakukan studi awal (observasi, wawancara, mengkaji literatur)
3. Merujuk sumber terkini (up to date) untuk topik penelitian
4. Mereviu literatur untuk penelitian
5. Menulis proposal penelitian
6. Mengumpulkan data
7. Menganalisis data (kuantitatif/kualitatif/mix)
8. Memahami etika penelitian (ethical clearance)

Membaca akademik dalam bahasa Inggris

Ketika membaca teks akademik dalam bahasa Inggris ...

9. Saya jarang mengalami kesulitan memahami kata-kata atau frasa teknis.
10. Saya dapat memahami detail dalam teks panjang dan kompleks tanpa menggunakan kamus.
11. Saya dapat memahami artikel jurnal tanpa harus membaca ulang bagian yang sulit.
12. Saya mampu menilai kualitas artikel yang saya baca dengan berfikir kritis.
13. Saya dapat menggunakan pemikiran kritis untuk menentukan kualitas argumen dalam suatu teks.

Menulis akademik dalam bahasa Inggris

Ketika menulis teks akademik dalam bahasa Inggris ...

14. Saya dapat menulis teks akademik yang kompleks secara jelas, akurat, dan mengalir dengan lancar.
15. Saya dapat menuliskan ide secara luwes dalam bentuk tulisan yang berbeda-beda dengan makna yang tepat/ sama.
16. Saya memiliki penguasaan kosakata teknis yang luas pada bidang saya.
17. Saya dapat menciptakan teks yang koheren dan kohesif.
18. Saya dapat menggunakan berbagai kata penghubung dan kalimat kohesif lainnya.
19. Saya memiliki kemampuan tatabahasa (gramatikal) dalam menulis yang konsisten dan sangat akurat dari bentuk bahasa yang kompleks.
20. Kesalahan sangat jarang terjadi dalam teks saya.
21. Saya dapat menulis teks yang jelas, mengalir dengan lancar, dan kompleks.
22. Saya dapat menulis tinjauan kritis tentang literatur yang relevan.
23. Saya dapat menulis makalah yang dapat dipublikasikan tentang studi empiris yang saya rancang dan laksanakan.

Penggunaan ChatGPT

24. Saya menggunakan ChatGPT untuk mengatasi kebuntuan saat menulis.
25. ChatGPT membantu saya mengatur pemikiran dan membuat kerangka tulisan.
26. Saya menggunakan ChatGPT untuk dengan cepat menemukan informasi relevan untuk menulis.
27. Saya menggunakan ChatGPT untuk memparafrase konsep akademik yang kompleks agar lebih mudah dipahami.
28. ChatGPT membantu saya mengembangkan argumen tandingan untuk memperkuat tulisan akademik saya.
29. Saya menggunakan ChatGPT untuk menghasilkan ide-ide untuk tulisan akademik saya.
30. Saya menggunakan ChatGPT untuk membuat draf yang kemudian saya edit dan finalisasi sendiri.
31. ChatGPT menghemat waktu dan usaha saya dalam menulis akademik.
32. ChatGPT memberikan titik awal tetapi tidak dapat menggantikan pemikiran dan tulisan saya sendiri.
33. Saya percaya pada kualitas dan keakuratan keluaran ChatGPT.
34. Saya menggunakan ChatGPT untuk mendapatkan umpan balik dan saran guna meningkatkan tulisan saya.

Informasi Demografis

Jenis Kelamin

Jenjang

Program studi

Sudah berapa lama Anda menggunakan ChatGPT dalam studi

1-3 bulan

>3-6 bulan

>6 bulan-1 tahun

>1 tahun

Seberapa sering Anda menggunakan ChatGPT

1 kali sebulan

2 kali sebulan

1-2 kali seminggu

3-4 kali seminggu

5 kali atau lebih seminggu

Rerata waktu yang dihabiskan untuk menggunakan ChatGPT untuk studi dalam satu sesi

< 1 jam

> 1 jam

> 2 jam

> 3 jam

> 4 jam

Jumlah artikel yang submit:

Jumlah artikel yang accept/ published:

Seberapa yakin Anda dengan kemampuan Anda untuk mengintegrasikan ChatGPT ke dalam tugas, proyek, atau studi akademis Anda di masa mendatang?

- a. Sangat yakin
- b. Yakin
- c. Netral
- d. Tidak terlalu yakin
- e. Sama sekali tidak yakin

Sejauh mana Anda percaya bahwa penggunaan ChatGPT akan menjadi bagian penting dari alur kerja akademis Anda di masa mendatang?

- a. Sangat penting
- b. Sangat penting
- c. Netral
- d. Tidak terlalu penting
- e. Sama sekali tidak penting

Dengan cara mana Anda berencana menggunakan ChatGPT untuk mendukung studi Anda di masa mendatang? Dapat memilih lebih dari satu

Penelitian atau pembelajaran

Penulisan atau penyuntingan teks

Pemecahan masalah dan penjelasan untuk masalah matematika, pemrograman, atau sains lainnya

Perencanaan dan pengaturan studi (stres berlebihan)

Pembelajaran atau kreasi bahasa

Kreativitas, inspirasi, atau curah pendapat

Pengembangan pribadi (karier, kebiasaan, tujuan)

Tidak, saya tidak berencana menggunakan ChatGPT di masa mendatang

Lainnya

Appendix 2. Original Items from the Literature

Research skills (Hemmings & Kay, 2010)

Reviewing literature for a research project
Generating research ideas
Keeping up to date with research literature
Analysing research results
Leading research projects
Conducting pilot studies
Working with research assistants
Designing research
Adhering to research ethics requirements
Collecting data
Applying for research grants
Collaborating with colleagues about research
Preparing a research budget

English Academic Reading And English Academic Writing (Phyo et al., 2024)

English academic reading

I rarely have difficulty with comprehending technical words or phrases.
I can understand the details in long complex texts without using a dictionary.
I can understand journal articles without rereading difficult sections.
I can use my critical thinking to determine how well a publication is researched.
I can use my critical thinking to decide the validity of arguments in a text.

English academic writing abilities

I can write clear, highly accurate and smoothly flowing complex academic texts.
I can show flexibility in formulating ideas in differing linguistic forms to convey meaning precisely.
I have a good command of specific vocabulary related to my larger field of study.
I can create coherent and cohesive texts.
I can use a wide range of connectors and other cohesive devices.
I can demonstrate consistent and highly accurate grammatical control of complex language forms.
Errors are rare in my texts.
I can write clear, smoothly flowing, complex texts.
I can write a critical overview of the relevant literature.
I can write a publishable paper on an empirical study I designed and implemented.

ChatGPT Usage (Nemt-allah et al., 2024)

Academic Writing Aid

I use ChatGPT to paraphrase complex academic concepts for better understanding.

ChatGPT helps me develop counterarguments to strengthen my academic writing.
I use ChatGPT to generate ideas for my academic writing.
I use ChatGPT to generate drafts that I edit and finalize myself.
ChatGPT saves me time and effort in academic writing.

Academic Task Support

I use ChatGPT to overcome writer's block when starting essays.
ChatGPT assists me in organizing my thoughts and creating outlines.
I use ChatGPT to quickly find relevant information for research tasks.
ChatGPT helps me create study materials like flashcards or summaries more efficiently.

Reliance and Trust

ChatGPT provides a starting point but cannot replace my own thinking and writing.
I trust the quality and accuracy of ChatGPT outputs.
I use ChatGPT to get feedback and suggestions for improving my writing.
I use ChatGPT as a brainstorming partner rather than a source of final answers.

Appendix 3. PLSpredict Result

Indicators	Q ² predict	PLS-SEM_RMSE	LM_RMSE	Remark
EAR_2	0.009	1.066	1.048	No predictive power
EAR_3	0.005	0.990	0.997	High (Strong) predictive power
EAW_1	-0.016	0.911	0.925	High (Strong) predictive power
EAW_10	0.019	0.769	0.780	High (Strong) predictive power
EAW_2	-0.010	0.869	0.881	High (Strong) predictive power
EAW_3	-0.008	0.890	0.879	No predictive power
EAW_4	0.001	0.833	0.844	High (Strong) predictive power
EAW_5	-0.002	0.820	0.820	Equal RMSE – inconclusive
EAW_6	0.003	0.909	0.923	High (Strong) predictive power
EAW_7	-0.001	0.947	0.961	High (Strong) predictive power
EAW_8	0.012	0.898	0.910	High (Strong) predictive power
EAW_9	0.021	0.860	0.870	High (Strong) predictive power
RS_2	0.012	0.634	0.638	High (Strong) predictive power
RS_3	0.003	0.758	0.775	High (Strong) predictive power
RS_4	0.005	0.746	0.763	High (Strong) predictive power
RS_5	0.016	0.777	0.789	High (Strong) predictive power
RS_6	0.010	0.813	0.824	High (Strong) predictive power
RS_7	0.021	0.866	0.878	High (Strong) predictive power
RS_8	-0.006	0.859	0.869	High (Strong) predictive power
Average		0.84670625	0.854665625	

To evaluate the model's out-of-sample predictive power, a PLSpredict analysis was conducted. A comparison of the root mean squared error (RMSE) values reveals that the PLS-SEM model produced lower prediction errors than the naive linear model (LM) benchmark for the vast majority of the indicators (16 out of 19). Following established methodological guidelines, because the PLS-SEM errors are lower for most (but not all indicators), the overall model demonstrates medium predictive power, which successfully establishes its external validity (Shmueli et al., 2019).