





Foreign Learners' Needs for Interactive Digital BIPA Materials: Evidence from Indonesian Language Programs

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ARTICLE INFO	ABSTRACT
<p>Article history: Submitted: February 10, 2026 Final Revised: May 26, 2026 Accepted: June 15, 2026 Published: June 17, 2026</p> <p>Keywords: BIPA Digital; Learning Interactivity; Needs of Foreign Learners; Indonesian Language Learning.</p>	<p>Purpose: This study aims to examine the factors influencing foreign learners' needs for interactive digital Indonesian language learning materials (Bahasa Indonesia bagi Penutur Asing/BIPA) by integrating technological and cultural dimensions within the Technology Acceptance Model (TAM) framework. Methods: A quantitative explanatory survey design was employed involving 210 foreign learners enrolled in BIPA programs across several institutions in Indonesia. Data were collected using a structured questionnaire measuring user interface quality, digital interactivity, cultural relevance, perceived ease of use, perceived usefulness, and learners' needs. The data were analyzed using Structural Equation Modeling–Partial Least Squares (SEM-PLS) with SmartPLS 4. Findings: The results revealed that user interface quality and digital interactivity significantly influenced perceived ease of use, while digital interactivity and perceived ease of use significantly affected perceived usefulness. Perceived usefulness was found to positively influence foreign learners' needs for interactive digital BIPA materials. Cultural relevance also had a significant direct effect on learners' needs, although its influence on perceived usefulness was not significant. These findings indicate that both technological usability and cultural authenticity play important roles in shaping learners' expectations and preferences toward digital BIPA materials. Research Implications: The findings provide practical guidance for BIPA educators, instructional designers, and educational institutions in developing user-centered, interactive, and culturally responsive digital learning materials. Emphasis on intuitive interfaces, meaningful interactivity, and authentic cultural content can enhance learner engagement and learning effectiveness. Originality: This study extends the Technology Acceptance Model by integrating cultural relevance and digital interactivity into a single framework to explain foreign learners' needs for interactive digital BIPA materials, offering a more comprehensive understanding of technology-enhanced language learning in intercultural contexts.</p>
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INTRODUCTION

The rapid expansion of global mobility, international education, and cross-cultural communication has contributed to a growing interest in learning Indonesian as a foreign language. Indonesian Language for Foreign Speakers (Bahasa Indonesia bagi Penutur Asing/BIPA) programs have experienced substantial development in recent years, both within Indonesia and through overseas educational and cultural institutions. As the number of international learners increases, BIPA instruction faces the challenge of accommodating learners with diverse linguistic backgrounds, cultural experiences, technological competencies, and learning objectives. Contemporary language education increasingly emphasizes learner-centered approaches that prioritize accessibility, engagement, and meaningful learning experiences. Within this context, the integration of digital technologies into BIPA instruction has become an important strategy for improving learning effectiveness and expanding access to Indonesian language education (Bakri et al. 2025)

The digital transformation of education has fundamentally changed how languages are taught and learned. Digital learning environments allow the integration of multimedia resources, interactive activities, real-time feedback, and

personalized learning pathways that are difficult to achieve through conventional instructional materials. In second-language acquisition research, interactive digital materials have been associated with higher learner motivation, increased engagement, and improved language retention because they facilitate active participation and autonomous learning (Liu et al, 2024; Pinto-Llorente & Izquierdo-Álvarez 2024). For foreign language learners, digital technologies also provide opportunities to access authentic linguistic and cultural content beyond classroom boundaries. Consequently, educational institutions offering BIPA programs have increasingly adopted digital platforms, electronic modules, interactive videos, mobile applications, and web-based learning resources to support language instruction.

Despite these developments, the effectiveness of digital learning materials depends not only on technological availability but also on their ability to meet learners' actual needs. International learners frequently encounter challenges related to unfamiliar linguistic structures, cultural differences, and varying levels of digital literacy. Learning materials that fail to address these characteristics may reduce learner engagement and hinder language acquisition. Research on educational technology consistently demonstrates that user experience plays a critical role in technology acceptance and learning outcomes (Lun et al. 2024). Therefore, understanding how foreign learners perceive and evaluate digital BIPA materials is essential for designing learning resources that are pedagogically meaningful, technologically accessible, and culturally relevant.

The urgency of investigating learners' needs has become even more pronounced as digital learning increasingly serves as a primary rather than supplementary mode of instruction. Modern learners expect educational technologies to be intuitive, interactive, and responsive to their learning preferences. At the same time, language learning differs from many other educational domains because successful learning requires not only cognitive engagement but also exposure to authentic cultural contexts. In the case of BIPA programs, digital materials must simultaneously facilitate language acquisition and support intercultural understanding. Consequently, identifying the factors that influence foreign learners' preferences for digital BIPA materials is necessary for ensuring the long-term effectiveness and sustainability of technology-enhanced Indonesian language education (Krisbiantoro 2026; Werdaningsih 2026).

A growing body of literature has examined the integration of technology into BIPA learning and foreign language education more broadly. Previous studies have explored digital game-based language learning, mobile learning applications, augmented reality, artificial intelligence-enhanced materials, digital workbooks, and web-based cultural learning resources (Cai et al., 2022; Hung & Yeh 2023; Lee, 2022). Other studies have highlighted the importance of cultural integration in BIPA instruction and emphasized that language learning is inseparable from the sociocultural contexts in which language is used (Bakri et al. 2025; Werdaningsih 2026). These investigations generally report positive outcomes regarding learner engagement, motivation, and language achievement when technology is integrated effectively into instructional practices. Collectively, these findings suggest that digital innovation has substantial potential to enhance the quality of Indonesian language learning for international audiences.

Research grounded in technology acceptance theories has also contributed to understanding learners' interactions with educational technologies. The Technology Acceptance Model (TAM) proposes that perceived ease of use and perceived usefulness are central determinants of technology adoption and user behavior. Numerous studies in educational settings have confirmed that systems perceived as easy to use and beneficial are more likely to be accepted by learners (Alyoussef 2023; Bansah & Darko Agyei 2022). Similarly, investigations of digital language learning environments have demonstrated that interface quality, usability, and interactive features significantly influence learning satisfaction and behavioral intentions (Pikhart et al., 2024; Syamala et al., 2025). Although these studies provide valuable insights, they primarily focus on technology acceptance outcomes rather than on the specific needs of international learners participating in BIPA programs.

Nevertheless, several limitations remain evident in the existing literature. First, most BIPA-related studies emphasize the development or evaluation of specific digital products rather than systematically identifying the factors that shape learners' needs and preferences. Second, prior research often examines technological characteristics, cultural elements, or learning outcomes separately, resulting in a fragmented understanding of digital BIPA learning. Third, relatively few studies integrate user interface quality, digital interactivity, cultural relevance, and technology acceptance constructs within a single analytical framework. Finally, empirical investigations involving diverse groups of international learners as the primary unit of analysis remain limited. As a result, there is insufficient evidence regarding how these interrelated factors collectively influence foreign learners' demand for interactive digital BIPA materials. This gap highlights the need for a more comprehensive and theoretically grounded model capable of explaining learner needs from both technological and cultural perspectives.

Addressing this gap is important because digital BIPA materials are increasingly expected to serve learners from diverse countries, educational backgrounds, and learning contexts. A deeper understanding of learner needs can help

developers design materials that are not only technically effective but also culturally meaningful and responsive to users' expectations. Furthermore, integrating cultural relevance with technology acceptance perspectives may provide a more holistic explanation of learner behavior in language learning environments. Such an approach is particularly relevant for BIPA programs because language learning inherently involves intercultural communication, identity negotiation, and cultural adaptation. Therefore, investigating the relationships among user interface quality, digital interactivity, cultural relevance, perceived ease of use, perceived usefulness, and learner needs offers an opportunity to extend current knowledge in both educational technology and BIPA research.

Based on these considerations, this study aims to examine the factors influencing foreign learners' needs for interactive digital BIPA materials through an integrated structural model based on the Technology Acceptance Model. Specifically, the study investigates the effects of user interface quality, digital interactivity, and cultural relevance on perceived ease of use, perceived usefulness, and learners' needs for digital BIPA materials. The study contributes theoretically by extending TAM through the inclusion of cultural relevance and digital interactivity within the context of Indonesian language learning for foreign speakers. Practically, the findings are expected to provide evidence-based guidance for curriculum designers, instructional developers, BIPA educators, and educational institutions in designing more effective, user-centered, and culturally responsive digital learning materials. Ultimately, this research contributes to the development of sustainable and globally competitive digital BIPA education in an increasingly technology-driven learning environment.

METHOD

This study employed a quantitative research approach with an explanatory survey design to investigate the factors influencing foreign learners' needs for interactive digital Indonesian language learning materials (Bahasa Indonesia bagi Penutur Asing/BIPA). The explanatory survey approach was selected because the primary objective of the study was to examine and explain the structural relationships among multiple latent variables, including user interface, digital interactivity, cultural relevance, perceived ease of use, perceived usefulness, and foreign learners' needs. Given the predictive nature of the proposed model and the intention to test causal relationships among constructs derived from the Technology Acceptance Model (TAM), a quantitative design was considered the most appropriate methodological approach. Furthermore, the use of Structural Equation Modeling based on Partial Least Squares (SEM-PLS) enabled the simultaneous examination of measurement and structural models while accommodating complex relationships among latent variables.

The study was conducted between January and April 2025 in several Indonesian Language for Foreign Speakers (BIPA) programs offered by universities, language centers, and educational institutions across Indonesia. These institutions were selected because they had implemented digital learning resources as part of their instructional activities. The research context involved foreign learners who regularly used digital BIPA materials, including e-modules, interactive learning platforms, mobile applications, digital exercises, and multimedia-based instructional resources. Conducting the study across multiple institutions allowed the collection of data from learners with diverse linguistic, cultural, and educational backgrounds, thereby increasing the representativeness of the findings.

The target population consisted of foreign learners enrolled in formal BIPA programs in Indonesia. A purposive sampling technique was employed to ensure that participants possessed relevant experience with digital BIPA learning materials. To be included in the study, participants had to meet three criteria: (1) be registered as active learners in a BIPA program, (2) have used digital BIPA learning materials for at least one academic semester, and (3) voluntarily agree to participate in the study. Learners who had limited exposure to digital learning materials or who did not complete the questionnaire were excluded from the final analysis. A total of 210 respondents met the inclusion criteria and provided complete responses. The sample size exceeded the minimum recommendation for SEM-PLS analysis based on the ten-times rule and recent methodological guidelines, ensuring adequate statistical power for model estimation and hypothesis testing.

Data were collected using a structured questionnaire administered electronically through an online survey platform. The questionnaire consisted of six latent constructs measured using reflective indicators adapted from previous studies on educational technology acceptance, digital learning environments, and language learning research. User Interface (UI) was measured through indicators related to visual design quality, navigation clarity, interface consistency, and content readability. Digital Interactivity (DI) included indicators reflecting interactive exercises, multimedia integration, learner engagement, and immediate feedback. Cultural Relevance (CR) assessed the extent to which learning materials represented authentic Indonesian cultural content, contextual language use, and intercultural understanding. Perceived Ease of Use (PEOU) measured learners' perceptions regarding the simplicity and accessibility of digital materials. Perceived Usefulness (PU) evaluated the extent to which digital materials enhanced

language learning effectiveness and learning performance. Finally, Foreign Learners' Needs (FLN) were measured through indicators related to learning preferences, motivation, satisfaction, and intention to continue using interactive digital BIPA materials. All items were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Prior to the main data collection, the questionnaire underwent a rigorous validation process to ensure content accuracy and measurement quality. Content validity was assessed through expert review involving three specialists in BIPA education, educational technology, and applied linguistics. Their feedback was used to refine wording, improve clarity, and ensure conceptual alignment with the proposed constructs. Subsequently, a pilot study involving 35 foreign learners was conducted to evaluate item comprehension and preliminary reliability. Construct validity was assessed through convergent validity and discriminant validity testing during the SEM-PLS analysis. Convergent validity was evaluated using indicator loadings and Average Variance Extracted (AVE), with acceptable thresholds of factor loadings above 0.70 and AVE values above 0.50. Discriminant validity was examined using the Heterotrait-Monotrait Ratio (HTMT), where values below 0.90 indicated adequate construct distinction. Instrument reliability was assessed using Cronbach's Alpha and Composite Reliability (CR), with values exceeding 0.70 considered satisfactory.

The data collection process followed several sequential stages. First, the research instrument was developed based on theoretical constructs derived from the Technology Acceptance Model and previous literature on digital language learning. Second, expert validation and pilot testing were conducted to ensure instrument quality. Third, permission was obtained from participating institutions before distributing the questionnaire. Fourth, the online survey link was disseminated to eligible participants through institutional communication channels, including email and learning management systems. Participants completed the questionnaire voluntarily within a four-week period. Finally, all responses were screened for completeness, consistency, and eligibility before being entered into the analytical dataset. Incomplete responses and duplicate submissions were removed to maintain data quality and integrity.

The analytical procedures were conducted using SmartPLS 4 software. Data analysis consisted of two major stages: measurement model evaluation (outer model) and structural model evaluation (inner model). The measurement model assessment included indicator reliability, internal consistency reliability, convergent validity, and discriminant validity. Indicator reliability was established when outer loadings exceeded 0.70. Internal consistency reliability was assessed using Cronbach's Alpha and Composite Reliability values greater than 0.70. Convergent validity was confirmed through AVE values above 0.50, while discriminant validity was evaluated using HTMT ratios below 0.90. Following satisfactory measurement model results, the structural model was assessed using coefficient of determination (R^2), effect size (f^2), predictive relevance (Q^2), and path coefficient analysis. Hypothesis testing was performed through a bootstrapping procedure with 5,000 subsamples. Path relationships were considered statistically significant when the t-value exceeded 1.96 and the p-value was below 0.05 at the 95% confidence level. Multicollinearity was assessed using Variance Inflation Factor (VIF) values, with values below 5 indicating the absence of collinearity concerns. To facilitate methodological transparency and replicability, the overall research procedure is summarized in Figure 1.

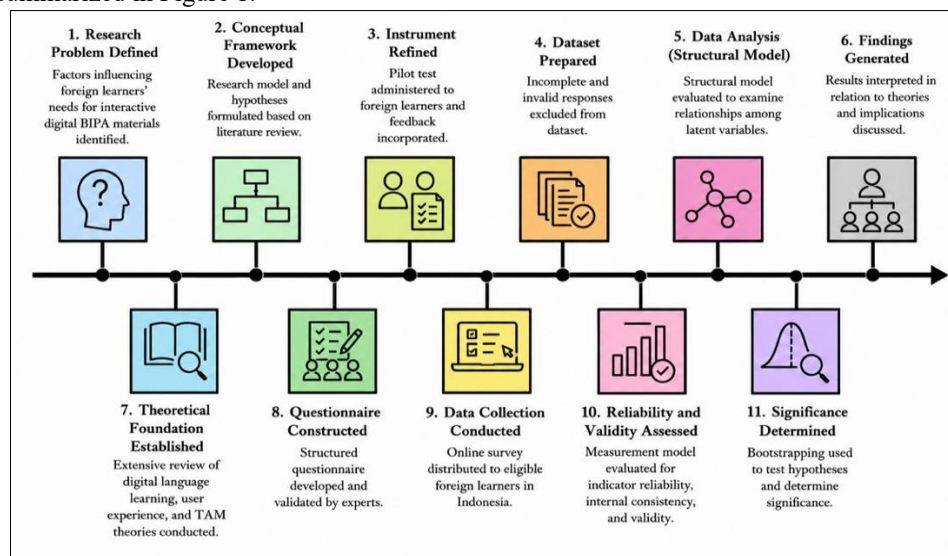


Figure 1. Research Procedure for Interactive BIPA Materials

The study adhered to internationally accepted ethical standards for educational research involving human participants. Prior to participation, respondents were informed about the objectives of the study, the voluntary nature of participation, and their right to withdraw at any stage without consequence. Informed consent was obtained electronically before respondents accessed the questionnaire. No personally identifiable information was collected, and all responses were analyzed anonymously. Data were stored securely and used exclusively for academic purposes. Furthermore, the research complied with principles of confidentiality, privacy protection, academic integrity, and responsible data management throughout all stages of the study.

RESULTS

The results of this study present empirical findings regarding the needs of foreign learners for interactive digital BIPA materials based on Structural Equation Modeling based on Partial Least Squares (SEM-PLS) analysis. The analysis was carried out in stages through testing the characteristics of respondents, evaluating the outer model, evaluating the inner model, and testing hypotheses between research variables. The presentation of the results focuses on the level of validity and reliability of the instrument, the quality of the structural model, and the relationship between constructs including user interface, cultural relevance, digital interactivity, perceived ease of use, perceived usefulness, and foreign learners' needs. The test results are used to explain the dominant factors that influence the needs of foreign learners for interactive digital BIPA materials in Indonesian language learning programs. The research findings are expected to provide an empirical picture of the pattern of relationships between variables in technology-based BIPA learning. The analysis of the results also serves as a basis for understanding user behavior tendencies towards the use of interactive digital learning media. All research findings are presented systematically according to the stages of SEM-PLS analysis.

Table 1. Respondent Demographic Data

Characteristics	Category	Frequency	Percentage
Gender	Male (1)	114	54.3%
	Women (2)	96	45.7%
Age	18–22 years	80	38.1%
	23–27 years	75	35.7%
	28–32 years	38	18.1%
	>33 years	17	8.1%
	Education	Bachelor	91
	Master	61	29.0%
	Doctoral	20	9.5%
	Exchange Program	38	18.1%
Region of Origin	Asia	96	45.7%
	Europe	51	24.3%
	America	36	17.1%
	Africa	20	9.5%
	Australia	7	3.3%
Length of Studying BIPA	<6 months	65	31.0%
	6–12 months	75	35.7%
	1–2 years	52	24.8%
	>2 years	18	8.6%

The composition of respondents shows a predominance of male foreign learners with a percentage of 54.3%, while females reached 45.7%. The 18–22 age group was the largest category with 38.1%, followed by 23–27 years old at 35.7%. The education level was dominated by bachelor's level at 43.3%, while doctoral participants were the smallest group. Most respondents came from the Asian region with a percentage of 45.7%. The longest BIPA study period was in the range of 6–12 months at 35.7%. The distribution of these characteristics shows that the study involved foreign learners with quite diverse backgrounds. This condition supports data representation in describing the need for interactive digital BIPA materials.

Table 2. Outer Loading

Indicator	Loading	Indicator	Loading
CR2	0.758	PEOU3	0.819
CR3	0.807	PEOU4	0.732
CR4	0.782	PU1	0.726
DI1	0.789	PU2	0.824
DI2	0.725	PU3	0.723
DI3	0.801	PU4	0.746
DI4	0.778	UI1	0.704
FLN1	0.822	UI2	0.777
FLN2	0.834	UI3	0.809
PEOU1	0.804	UI4	0.742

The outer loading test results showed that all indicators had values above 0.70, thus meeting the requirements for convergent validity. The FLN2 indicator obtained the highest value of 0.834, while UI1 was the lowest indicator with a value of 0.704. The PEOU and PU variables showed fairly stable indicator consistency because all items were within a good loading range. The DI construct also showed a strong indicator contribution to the latent variable with the highest value in DI3 of 0.801. The relatively high loading values indicate that each indicator is able to adequately explain the construct being measured. The distribution of values between indicators did not show extreme differences, so the quality of the instrument was considered stable. These results indicate that all items are suitable for use in the structural analysis stage.

Table 3. Construct Reliability and Validity

Variables	Cronbach's Alpha	Composite Reliability	AVE
CR	0.686	0.825	0.612
IN	0.778	0.856	0.599
FLN	0.543	0.814	0.686
PEOU	0.691	0.828	0.617
Public Works	0.750	0.842	0.572
UI	0.756	0.845	0.577

Reliability and construct validity testing showed that all variables met the criteria for good measurement. The composite reliability values for all constructs were above 0.80, indicating a strong level of internal consistency. The DI variable achieved the highest composite reliability of 0.856, while the FLN variable had the highest AVE value of 0.686. The UI and PU constructs also demonstrated adequate Cronbach's Alpha values for SEM-PLS analysis. The AVE values for all variables exceeded the minimum limit of 0.50, indicating that the constructs were able to optimally explain the indicator variance. The differences in reliability values between constructs were not too large, so the measurement model was considered quite stable. These findings demonstrate that the research instrument has good measurement quality.

Table 4. Heterotrait-Monotrait Ratio (HTMT)

Variables	CR	IN	FLN	PEOU	Public Works	UI
CR	–					
IN	0.385	–				
FLN	0.721	0.525	–			
PEOU	0.547	0.558	0.686	–		
Public Works	0.238	0.593	0.538	0.621	–	
UI	0.541	0.509	0.442	0.732	0.383	–

The HTMT test showed that all values were below the maximum limit of 0.90, thus discriminant validity was declared fulfilled. The highest correlation was found between UI and PEOU with a value of 0.732. The relationship between CR and FLN also showed a fairly strong level of association of 0.721. The PU and PEOU variables had an HTMT value of 0.621, indicating a moderate relationship between the constructs. The lowest value was found in the relationship between CR and PU at 0.238. The relatively controlled distribution of HTMT values indicated the absence of multicollinearity problems between latent variables. This condition indicates that the research model has good construct separation quality.

Table 5. R-Square Value

Endogenous Variables	R Square	R Square Adjusted
FLN	0.274	0.267
PEOU	0.340	0.334
Public Works	0.304	0.294

The R-Square value shows the model's ability to explain endogenous variables in the moderate category. The PEOU variable obtained the highest value of 0.340, meaning that it can be explained by UI and DI by 34.0%. The PU variable has an R-Square value of 0.304, indicating the simultaneous influence of DI, CR, and PEOU on perceived usefulness. The FLN construct obtained a value of 0.274, so the needs of foreign learners can be explained by PU and CR by 27.4%. The difference in values between constructs indicates varying levels of predictor contribution to each endogenous variable. The adjusted R-Square value also did not experience a significant decrease compared to the main value. These results indicate that the structural model has quite good predictive ability.

Table 6. Hypothesis Testing Results

Hypothesis	Track	Original Sample	T Statistics	P Values	Decision
H1	UI → PEOU	0.439	7,662	0.000	Accepted
H2	IN → PEOU	0.248	4,548	0.000	Accepted
H3	DI → PU	0.340	4,487	0.000	Accepted
H4	CR → PU	-0.050	0.754	0.451	Rejected
H5	PEOU → PU	0.335	4,669	0.000	Accepted
H6	PU → FLN	0.276	4,614	0.000	Accepted
H7	CR → FLN	0.401	7,335	0.000	Accepted

Hypothesis testing shows that most of the relationship paths between variables have a significant influence. The largest influence was found in the relationship between UI and PEOU with a coefficient value of 0.439 and T Statistics 7.662. The CR path to FLN also showed a strong positive influence with a coefficient value of 0.401. The influence of DI on PU and PEOU showed a significant value with P Values of 0.000. The relationship between PEOU and PU made a positive contribution to the perception of the usefulness of digital materials. The PU path to FLN was also declared significant so that the perception of usefulness influenced the needs of foreign learners for interactive digital BIPA materials. The only insignificant path was found in the relationship between CR and PU because the P Values were 0.451.

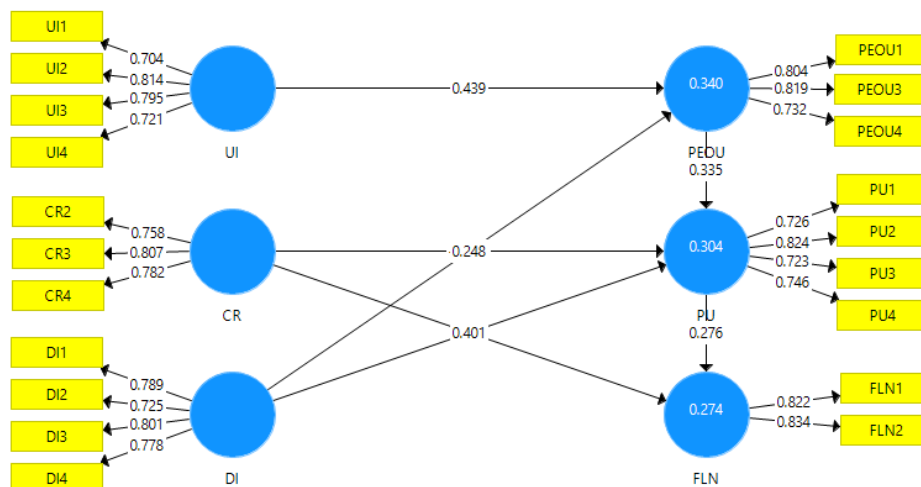


Figure 2. Path

The figure above shows the results of structural model testing using Structural Equation Modeling based on Partial Least Squares (SEM-PLS) in the study of foreign learners' needs for interactive digital BIPA materials. The outer loading value for all indicators is above 0.70, indicating that the indicators are able to represent the research construct well. The relationship between variables shows that the user interface has a positive influence on perceived ease of use with a coefficient value of 0.439. Digital interactivity also shows an influence on perceived ease of use and perceived usefulness with coefficient values of 0.248 and 0.401, respectively. The influence of perceived ease of use

on perceived usefulness obtained a value of 0.335, while perceived ease of use influenced foreign learners' needs by 0.276. The R-Square value shows that the construct of perceived ease of use can be explained by 34.0%, perceived usefulness by 30.4%, and foreign learners' needs by 27.4% by the predictor variables in the model. These results show that interface design, digital interactivity, and system usability are important factors in shaping foreign learners' needs for interactive digital BIPA materials.

DISCUSSION

The findings demonstrate that user interface quality exerts the strongest influence on perceived ease of use among foreign learners using interactive digital BIPA materials. This result suggests that learners' initial judgments regarding the usability of digital learning environments are strongly shaped by visual clarity, navigation structure, and interface consistency. From the perspective of the Technology Acceptance Model (TAM), perceived ease of use emerges when users believe that a system can be operated with minimal cognitive effort (Akram et al., 2024). In the context of BIPA learning, this relationship becomes particularly important because learners must simultaneously process unfamiliar linguistic content and navigate digital platforms. The result is consistent with recent studies emphasizing the importance of interface design in technology-enhanced language learning environments (Liu et al., 2023; Žerovnik 2024). However, the magnitude of the effect observed in this study appears stronger than that reported in several general educational technology studies, suggesting that foreign language learners may be especially sensitive to interface complexity. This finding extends TAM by indicating that interface quality functions not merely as a technical attribute but as a pedagogical facilitator that directly influences learners' willingness to engage with digital language-learning resources.

A second important finding concerns the significant influence of digital interactivity on perceived ease of use. While ease of use is traditionally associated with system simplicity, the present findings indicate that interactive features can also contribute to usability perceptions when they are designed in a meaningful and intuitive manner. Interactive exercises, immediate feedback, and multimedia integration appear to reduce uncertainty during learning and provide learners with clearer guidance throughout the instructional process. This interpretation aligns with constructivist learning theory, which posits that active engagement enhances knowledge construction and learning efficiency (Dahl & Mørch 2025). Similar conclusions have been reported in studies examining gamified language learning, digital language platforms, and multimedia-supported instruction (Liu et al, 2024; Roseni & Muho 2024; Shen et al., 2024). Nevertheless, the present study contributes a more nuanced perspective by showing that interactivity affects not only engagement but also users' perceptions of operational simplicity. This suggests that well-designed interactivity can lower perceived learning barriers, thereby strengthening technology acceptance among international learners.

The positive relationship between digital interactivity and perceived usefulness further highlights the pedagogical value of interactive learning environments. Learners appear to perceive digital materials as more useful when they offer opportunities for active participation, personalized practice, and immediate corrective feedback. Such features enable learners to apply linguistic knowledge in contextualized situations rather than passively consume information. This finding supports the core TAM proposition that technology adoption is driven by perceived performance enhancement and resonates with multimedia learning theory, which emphasizes the role of multimodal information processing in improving learning outcomes (Nilashi & Abumalloh 2025). Previous research on digital language learning has similarly reported positive associations between interactivity and learning effectiveness (Han et al. 2024; Shen et al., 2024). However, the current study extends this literature by demonstrating that interactivity remains a significant predictor of usefulness even when interface quality and cultural relevance are simultaneously considered. Consequently, the findings suggest that digital BIPA developers should prioritize interactive design not merely as an engagement strategy but as a mechanism for enhancing perceived instructional value.

Another noteworthy result is the significant influence of perceived ease of use on perceived usefulness. This relationship is one of the central assumptions of TAM and indicates that learners tend to perceive digital learning resources as more beneficial when they are easy to operate. The result supports extensive empirical evidence from educational technology research showing that usability and usefulness are conceptually interconnected rather than independent constructs (Hu et al., 2025; Vlachogianni & Tselios 2023). In the context of BIPA learning, ease of use may be particularly influential because foreign learners often face simultaneous linguistic and technological challenges. A system that minimizes operational complexity allows learners to allocate more cognitive resources to language acquisition, thereby increasing the perceived educational value of the platform. This finding reinforces the argument that usability should be considered an integral component of pedagogical design rather than a purely

technical concern. Furthermore, it suggests that improvements in user experience may indirectly enhance learning outcomes through their influence on learners' perceptions of instructional effectiveness.

The study also found that perceived usefulness significantly predicts foreign learners' needs for interactive digital BIPA materials. This result indicates that learners' preferences and continued demand for digital learning resources are largely determined by their beliefs regarding the practical benefits of those resources. Consistent with TAM, perceived usefulness appears to function as the primary motivational mechanism connecting technology characteristics to behavioral intentions and user needs. Similar patterns have been observed in studies of mobile language learning, online learning environments, and educational applications (Barrot 2022; Geng & Yamada 2023). Nevertheless, the present study advances existing knowledge by focusing specifically on need formation rather than adoption intention alone. This distinction is theoretically important because learning needs represent a broader construct that encompasses motivation, satisfaction, preference, and long-term engagement. Consequently, the findings suggest that the sustainability of digital BIPA programs depends not only on technological innovation but also on learners' perceptions of educational value.

One of the most interesting findings concerns the role of cultural relevance. While cultural relevance significantly influenced foreign learners' needs, it did not significantly affect perceived usefulness. This result partially supports previous BIPA studies emphasizing the importance of cultural integration in language learning (Bakri et al. 2025; Widiyanto & Pusse 2026). However, the insignificant relationship with perceived usefulness suggests that learners differentiate between cultural enrichment and technological functionality. Cultural content appears to satisfy learners' expectations regarding authenticity, contextual understanding, and intercultural engagement, yet it may not directly influence their evaluation of whether a digital system improves learning performance. This interpretation aligns with sociocultural theories of language learning, which view culture as a source of meaning-making and identity development rather than merely an instructional tool. The finding therefore challenges the assumption that all valuable learning experiences necessarily translate into perceptions of usefulness. Instead, it suggests that emotional, cultural, and experiential dimensions may operate through different psychological mechanisms than functional evaluations of technology.

Taken together, the findings reveal that foreign learners' needs for digital BIPA materials emerge from the interaction between technological and cultural dimensions rather than from either dimension alone. Interface quality and digital interactivity primarily shape learners' cognitive evaluations of usability and usefulness, whereas cultural relevance contributes to the authenticity and meaningfulness of the learning experience. This integrated perspective addresses a major limitation in previous BIPA studies, which have tended to examine technological and cultural factors separately (Bakri et al., 2025; Rahmat et al., 2024; Werdaningsih, 2026). By incorporating both dimensions into a single structural model, the present study offers a more comprehensive explanation of learner needs in digital language-learning environments. Theoretically, the findings extend TAM by demonstrating that technology acceptance in foreign language education is influenced not only by usability considerations but also by contextual and cultural factors. This contribution is particularly relevant in multilingual and intercultural learning contexts, where language acquisition is inseparable from cultural engagement.

From a broader perspective, this study contributes to the global literature on digital language learning by highlighting the unique characteristics of Indonesian language education for international learners. Unlike many studies that focus primarily on system performance or learning outcomes, the present research emphasizes the multidimensional nature of learner needs and demonstrates how technological, pedagogical, and cultural factors collectively shape user expectations. The findings suggest that future digital language-learning platforms should move beyond technology-centered development toward a more holistic learner-centered design framework. Such an approach would recognize that effective language learning requires not only functional systems but also meaningful cultural experiences and engaging learning interactions. Although the model explains a moderate proportion of variance in learner needs, other factors such as digital literacy, learning motivation, self-regulation, and intercultural adaptation may also play important roles. Future studies incorporating these variables could further refine theoretical explanations and strengthen the development of adaptive digital BIPA learning ecosystems in an increasingly globalized educational landscape.

CONCLUSION

This study examined the factors influencing foreign learners' needs for interactive digital BIPA materials through an integrated model based on the Technology Acceptance Model (TAM). The findings indicate that user interface quality and digital interactivity significantly influence perceived ease of use and perceived usefulness, while perceived usefulness serves as an important predictor of learners' needs for digital BIPA materials. In addition, cultural

relevance was found to have a direct and significant effect on learners' needs, highlighting the importance of integrating authentic cultural content into digital language-learning environments. These results suggest that foreign learners value not only the functional quality of digital learning technologies but also the extent to which learning materials provide meaningful cultural experiences. The study therefore extends TAM by demonstrating that technological, pedagogical, and cultural dimensions collectively shape learner needs in the context of Indonesian language learning for foreign speakers.

The findings offer practical implications for BIPA educators, curriculum developers, and digital learning designers in developing user-centered, interactive, and culturally responsive learning materials. By emphasizing intuitive interface design, meaningful interactivity, and authentic cultural representation, digital BIPA programs can better support learner engagement and learning effectiveness. Nevertheless, this study is limited by its focus on selected BIPA institutions and a restricted set of explanatory variables. Future research is encouraged to incorporate additional factors such as digital literacy, learning motivation, self-regulated learning, and intercultural adaptation, as well as to employ longitudinal or mixed-methods approaches to provide a more comprehensive understanding of foreign learners' needs in technology-enhanced Indonesian language learning environments.

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AUTHOR CONTRIBUTION STATEMENT

MR, NS, ZS contributed to the conception and design of the study. **MR** collected and organized the research data, while **NS** and **ZS** provided academic guidance, reviewed the research framework, and supported the refinement of the manuscript.

AI DISCLOSURE STATEMENT

The authors used ChatGPT (OpenAI) solely for language editing, grammar checking, and improving the readability of the manuscript. All research design, data collection, data analysis, interpretation of findings, and final content were conducted and verified by the authors, who take full responsibility for the accuracy and integrity of this work.

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