Evaluating User Acceptance in a Pilot A2-Level German MOOC: TAM as Core Framework with Future Integration of Complementary Models

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Manuscript received September 1, 2025; revised October 10, 2025; accepted December 4, 2025; published June 11, 2026

***Abstract*—This pilot study investigates user's acceptance of a German language Massive Open Online Course (MOOC) titled *Lese- und Hörübung* (Reading and Listening Exercise), developed for A2-level learners and hosted on the platform idmooc [1]. Drawing on the Technology Acceptance Model (TAM), the study explores users' perceptions of the platform's usefulness, ease of use, and their behavioral intention to continue using the course. While TAM was the main framework in this study, other models such as the Unified Theory of Acceptance and Use of Technology 3 (UTAUT3), the Recent Advances in Individual Digital Use Acceptance (RAIDUA) model, and the Unified MOOC Utilization Model (UMUM) were also considered as useful perspectives. However, these models were not tested here because of the small number of participants but will be used in future larger studies to give a more complete view of learner acceptance. Data were collected from 12 participants through an online survey consisting of closed- and open-ended items. Given the small sample size, the study is exploratory in nature, aiming to assess the initial feasibility of the course design and to inform future course development and research. Descriptive analysis revealed generally positive learner responses across all TAM constructs, with ease of navigation and clarity of instruction being key factors influencing acceptance. Thematic analysis of open-ended responses further highlighted the importance of visual design, onboarding support, and user experience. The results cannot be generalized to all situations, but they give useful ideas about how students take part in MOOC German courses. They also give some advice for improving digital language classes in schools with limited resources. Future studies should include more participants and look at other ways to evaluate the courses.**

***Keywords*—Massive Open Online Course (MOOC), German as a foreign language, Technology Acceptance Model (TAM), complementary models, online learning**

I. Introduction

Universitas Negeri Malang (UM), Indonesia, has initiated the development of a Massive Open Online Course (MOOC) platform through www.mooc.um.ac.id to expand access to distance education. While this platform offers diverse learning strategies that promote flexibility and accessibility for students at various proficiency levels [1], it has yet to provide specific content for German language learning. This is a missed opportunity, as MOOC-based instruction is increasingly recognized as an effective approach for developing language skills [2, 3], which is aligned with the Common European Framework of Reference for Languages (CEFR).

In addition to developing a learning material platform, it is crucial to understand how users perceive and accept technology-based learning environments. In this context, the Technology Acceptance Model (TAM) provides a framework for evaluating the factors influencing users' willingness to adopt and use digital language learning platforms. Therefore, this study aims not only to present the development of a platform idmooc, but also to assess users' acceptance and perceptions based on the TAM framework.

Foreign languages become international communication and a medium of intellectual and social actualization [4]. Therefore, integrating components that enhance proficiency, such as listening exercises, is vital. These exercises, a key part of effective learning settings, have demonstrated measurable improvements in student proficiency, emphasizing the importance of tailored teaching models. Through structured digital media, learners engage with the language in a context that is both relevant and conducive to their proficiency level, thereby bolstering their receptive skills. However, it is important to note that the effectiveness of MOOCs in developing receptive skills, specifically reading competences (*Lesen*) and listening competences (*Hören*) at the A2 levels of the CEFR, has not been fully empirically tested. Further research is needed to specifically investigate how well the MOOC format facilitates the acquisition of these crucial skills at this intermediate proficiency level. Therefore, this course is named *'Lese- und Hörübung'*.

Another critical factor is the collaboration among German language teachers through professional learning communities, which has been shown to positively influence student outcomes. By exchanging resources and ideas, educators can enhance their teaching practices and thereby improve overall learning achievements among their students. This peer collaboration is vital in educational contexts where MOOC platforms are often utilized, helping to streamline teaching approaches across different learning environments [5, 6]. It is essential for educational frameworks to adhere to the CEFR standards, which guide the development of curricula and assessments. As learners engage with MOOCs designed around these standards, they are better equipped for receptive and productive German language skills.

MOOC-based German language courses exhibit a

[1] www.idmooc.id

successful framework for elevating reading and listening skills through various innovative teaching strategies. The evidence from current research indicates that tools like gamification, engaging learning media, authentic materials, cooperative teaching practices, and adherence to the CEFR standards work synergistically to enhance learners' competencies in the German language. One notable approach is the application of gamification in language education, which engages learners through interactive exercises. A recent study illustrates that the BRIX application on a MOOC platform incorporates gamified elements to foster language acquisition in a community-driven environment, addressing the demand for improved language skills through engaging activities tailored for various learners [7]. This strategy not only facilitates sustainability in learning but also enhances student motivation, crucial for mastering competencies such as reading and listening.

In the specific context of long distance learning, MOOCs can assist participants in developing creative and analytical language skills. The use of MOOCs is based on their ability to enable individuals to access courses offered by leading universities and educational institutions worldwide. MOOCs also provide opportunities for self-directed learning, enabling participants to select materials most relevant to their interests and needs [8–13].

While many studies have examined the instructional design and benefits of MOOCs in promoting language skills, there remains a critical need for theoretically grounded investigations into how users perceive and accept such platforms. Understanding user acceptance is essential for evaluating the effectiveness and sustainability of digital learning tools.

This study uses the TAM as the main framework. The model focuses on Perceived Usefulness (PU), Perceived Ease of Use (PEOU), and Behavioral Intention (BI). Other models such as the UTAUT2 [14], which adds factors like social influence, facilitating conditions, hedonic motivation, and price value; the IS Success Model [15], which focuses on system quality, information quality, and service quality; and Task-Technology Fit [16], which looks at how well the technology matches the tasks and how it affects performance can also give useful ideas, and they were also considered as useful perspectives.

In addition to this models, recent developments in technology acceptance research propose more comprehensive frameworks such as the Unified Theory of Acceptance and Use of Technology 3 (UTAUT3) [17–19], the Recent Advances in Individual Digital Use Acceptance (RAIDUA) model [20], and the Unified MOOC Utilization Model (UMUM) [21]. These newer frameworks integrate dimensions such as Artificial Intelligence (AI)-based interaction, emotional engagement, and contextual factors that are increasingly relevant in digital learning environments. These other models were not tested in this pilot study because the number of participants was small. However, they are important for future research when more data is available.

As the *Lese- und Hörübung* course was still in its early implementation stage, this research was intentionally framed as a pilot study. The aim was to explore the feasibility of the course, gather initial feedback from a small group of learners, and identify key insights for future development.

Grounded in the TAM, the study examines learners' perceptions of usefulness, ease of use, and behavioral intention to continue using the platform. While TAM is often applied using more advanced statistical techniques such as Structural Equation Modeling (SEM), such methods typically require large sample sizes. Given the limited number of participants in this pilot, the study adopts a descriptive and exploratory approach, which is more appropriate for early-stage evaluation. The findings are expected to inform the refinement of the course and provide a foundation for future large-scale research in technology-enhanced foreign language learning in the Indonesian context.

II. Methods

A. Research Design

This study employed a pilot research design incorporating elements of Research and Development (R&D), guided by the TAM as a theoretical framework to look at perceived usefulness, perceived ease of use, and behavioral intention. Other models like UTAUT-2, the IS Success Model, and Task-Technology Fit could also give more understanding. But in this pilot study, they were not included in the analysis because of the small sample size. They will be considered in future research with more participants and larger scope.

Although TAM is often operationalized using advanced statistical modeling techniques such as SEM, such approaches typically require substantial sample sizes to ensure statistical robustness and meaningful interpretation. Given the exploratory nature of this study and the limited number of participants (n = 12), a descriptive approach was deemed more appropriate. Rather than seeking to generalize findings, the study aimed to identify key trends and issues to inform future development and research.

B. Participants

A total of 12 participants were in the *Lese- und Hörübung* course hosted on idmooc. All participants were German language teachers who possess at least A2–B1 level proficiency in German according to the Common European Framework of Reference for Languages (CEFR). Their professional background in teaching German made them well-suited to provide informed feedback on the course content, structure, and usability. Therefore, the small sample size was not due to sampling bias but rather to the early-stage implementation of the pilot course and the voluntary engagement of the participants. Despite the small number, the respondents' professional expertise as language teachers ensures that their evaluations are credible and pedagogically informed, making their insights highly valuable for this exploratory phase.

The participants' ages ranged from 25 to 44 years (M = 33.2), and all had at least two years of teaching experience in secondary or tertiary German language education. Most participants had prior exposure to online teaching or learning environments, which may have positively influenced their ability to navigate the MOOC platform effectively. This background context provides important interpretive value for understanding their acceptance patterns.

C. Instruments

The TAM-based questionnaire used in this study was adapted from established instruments Davis [22]; Venkatesh & Davis [23] and tailored to the context of MOOC-based language learning. The final instrument consisted of 12 items grouped into three key constructs: PEOU, and BI. All items were measured on a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

1) Closed-ended items (5-point Likert scale) measuring three constructs: PU, PEOU, and BI.
2) Open-ended questions designed to elicit user feedback on usability, challenges, and suggestions for improvement.

Table 1 below provides a detailed overview of the questionnaire items categorized according to the TAM framework.

Table 1. Questionnaire items categorized according to the TAM framework

TAM Construct	Item No.	Questionnaire Statement
Perceived Usefulness (PU)	PU1	Overall course materials are satisfactory.
	PU2	Reading texts match my language proficiency.
	PU3	Audio materials are clear and understandable.
	PU4	Quiz difficulty is appropriate for my level.
	PU5	Pre-reading discussion questions are engaging.
Perceived Ease of Use (PEOU)	PEOU1	Instructions are easy to follow.
	PEOU2	Course structure is coherent and logical.
	PEOU3	Answer keys help me correct my responses.
	PEOU4	Final forum aids in learning reflection.
	PEOU5	Quiz leaderboard motivates better performance.
Behavioral Intention (BI)	BI1	Discussion forum encourages participation.
	BI2	I would recommend this course to others.

The questionnaire was reviewed by two experts in educational technology and German language pedagogy to ensure content validity and contextual relevance. A pilot pre-test with two participants was conducted to check clarity and usability before full deployment.

D. Data Analysis

Given the small sample size, descriptive statistical analysis (mean, frequency, and standard deviation) was used to summarize trends across TAM constructs. Open-ended responses were analyzed thematically to enrich the interpretation of quantitative findings and identify areas for improvement. These qualitative inputs were used to better interpret learner perceptions and to capture nuanced experiences that numerical data alone could not fully represent. The results are not intended for generalization but rather to inform future research directions and course refinement.

III. Results and Discussion

A. MOOC Platform

The homepage interface of the MOOC platform as shown in Fig. 1 below, was developed using the Moodle as a Learning Management System (LMS) with the "The Learning" theme and customized for A2-level learners of German as a foreign language, allowing for visual clarity, structured modules, and access to multimedia content. Each unit includes a structured progression of activities: pre-reading discussion, reading texts, quizzes, listening tasks, and final reflections.

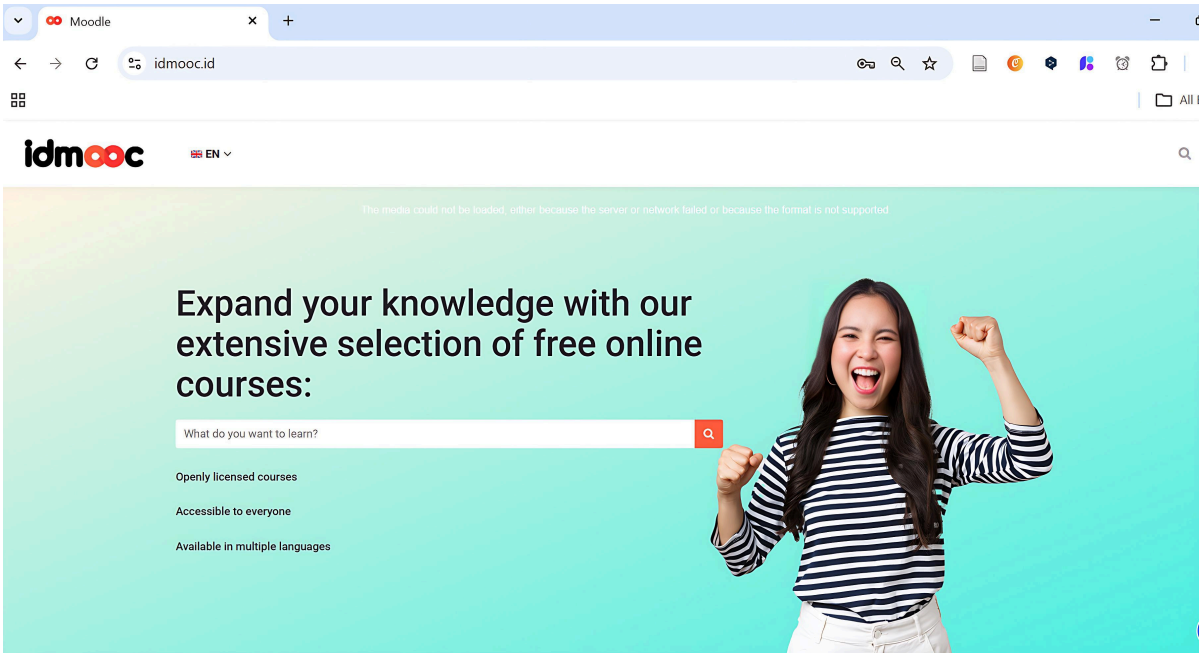

Fig. 1. Interface of the platform.

Currently, the platform offers three courses: Reading and Listening Exercises in German, Cyber Children's Literature, and Calligraphy Writing. While Reading and Listening Exercises in German focuses on receptive language skills, the

development team is currently designing a new course titled Schreib- und Sprechübung. This upcoming module is intended to complement the existing offerings by targeting productive language skills—specifically writing and speaking—thereby providing a more comprehensive approach to German language acquisition on the platform. This course contains learning units designed for completion over several sessions. Each learning unit is meticulously structured to ensure that the provided materials are both accessible and of high quality, meeting the participants' needs.

B. Descriptive Quantitative Statistics Overview of TAM Constructs

Given the small number of participants (n = 12), who were all German language teachers with at least A2–B1 proficiency, the analysis in this section emphasizes both descriptive quantitative findings and qualitative insights derived from open-ended responses. While the numerical data provide an overview of general trends in learner acceptance, the open-ended responses offer deeper reflections on usability, perceived usefulness, and overall user experience.

Because the participants are experienced in language teaching, their qualitative feedback was considered particularly valuable for understanding not only the technical aspects of the MOOC but also its pedagogical relevance. This dual emphasis allows the results to capture the nuances of user perceptions that cannot be fully explained by quantitative measures alone. Selected excerpts from participants' responses are presented in Appendix B to illustrate recurring themes and highlight areas for improvement.

The findings are presented in three parts. First, an overview of the MOOC platform is described to contextualize the learning environment. Second, the descriptive statistics summarize learners' responses across the three TAM constructs: PU, PEOU, and BI. Third, the thematic insights from open-ended responses are discussed to deepen the interpretation of the TAM results and to identify design implications for future course iterations.

Descriptive statistics are presented in Table 2, showing generally favorable ratings across all categories.

Table 2. Descriptive statistics for TAM constructs

TAM Construct	No. of Items	Mean	SD	Min	Max	Range
Perceived Usefulness (PU)	5	4.23	0.43	4.08	4.58	0.50
Perceived Ease of Use (PEOU)	5	4.38	0.49	4.25	4.58	0.33
Behavioral Intention (BI)	2	4.42	0.50	4.25	4.58	0.33

Mean values indicate the average score for each construct, while SD represents the degree of response variation. Minimum and maximum scores show the range of learners' perceptions, indicating consistently high acceptance across constructs. As shown in Table 2, the highest mean score was found in the BI construct (M = 4.42, SD = 0.50), followed closely by Perceived Ease of Use (PEOU), indicating a favorable learner response to the course structure and usability. The results are presented both in graphical and tabular formats to illustrate the overall trends and distribution of responses. The descriptive statistics include the mean, standard deviation, minimum and maximum scores, as well as the range for each construct, providing a concise summary of learners' perceptions toward the course.

Fig. 2 illustrates the descriptive statistical outcomes of the TAM evaluation. Box plots visualize response distributions across TAM constructs, highlighting that most responses cluster toward the upper end of the Likert scale, suggesting favorable perceptions and minimal variance among participants.

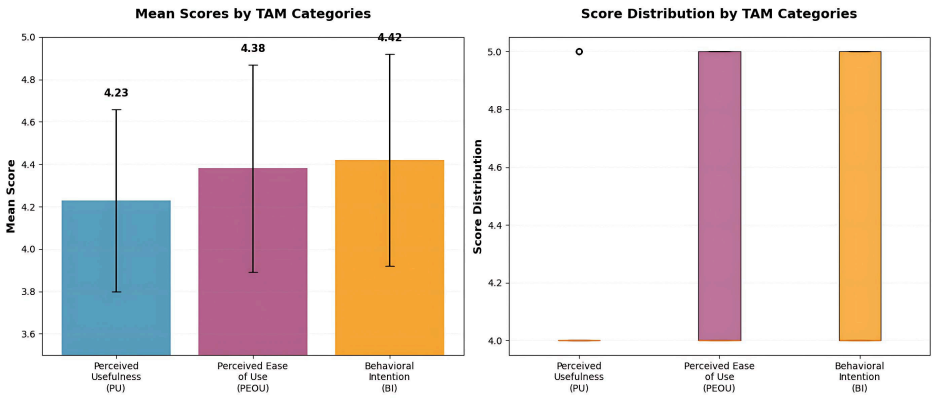

Fig. 2. Box plots of TAM responses across PU, PEOU, and BI, showing median, interquartile range, and outliers.

Panel A shows the mean scores and standard deviations across the three constructs—PU, PEOU, and BI. Panel B visualizes the range and distribution of learner responses for each construct using box plots.

C. Perceived Usefulness and Pedagogical Relevance

The findings suggest that the participants perceived the course content as generally useful, although PU received slightly lower mean scores compared to PEOU and BI. This moderate perception of usefulness could be attributed to learners' relatively short engagement with the course or limited familiarity with online learning environments. However, the design features of the course, such as curated reading texts, relevant quizzes, and integrated listening tasks, appeared to support language learning goals aligned with the CEFR A2 level. These observations resonate with prior studies emphasizing the importance of content alignment and instructional quality in learners' perceptions of usefulness in digital language learning environments. The pedagogical design of the course *Lese- und Hörübung A2*, including curated articles, instructional videos, and voice-integrated tasks, contributed to the high PU score. This reinforces literature that highlights content relevance and quality as central to perceived usefulness in educational

technologies [24].

While most learners responded positively to the navigational design of the Moodle-based platform, user experience in digital learning environments is often shaped by a range of factors, including prior familiarity with the interface. Several participants reported initial challenges such as difficulties logging in, unfamiliar terminology, or accessing the course page in the early stages of use. Comments reflect common transitional difficulties faced by new users. Additionally, technical limitations such as internet connectivity were noted. These responses highlight the need for adequate onboarding resources, user-friendly terminology, and technical readiness to ensure a smooth learning experience. Furthermore, visual presentation was also mentioned, with one respondent describing the site suggesting opportunities for enhanced interface aesthetics. These findings reinforce the importance of not only intuitive platform design but also supportive visual and instructional elements to reduce cognitive load and foster engagement. When usability and pedagogy are addressed in tandem, learners are more likely to adopt and sustain the use of the platform.

In higher education, the development of learning materials that align with the needs of students and lecturers is essential. To design more effective and relevant learning, lecturers must focus on students' needs, often referred to as Differentiated Instruction. This approach allows students to achieve their learning goals according to their individual abilities. This aligns with previous research findings, which emphasize that understanding students' needs is critical to improving the quality of learning [25, 26].

The development of digital technology-based instructional materials is seen as an effective way to meet learning needs. In the digital era, the use of innovative learning media, such as e-modules and instructional videos, can enhance student engagement and help them better understand the material [27, 28]. Research indicates that the appropriate use of technology can increase student satisfaction in e-learning, which is highly relevant in the current context of distance learning [29, 30].

Moreover, the importance of developing instructional materials that align with curriculum demands and students' needs is highlighted in several studies [31]. Developing learning materials that cater to the needs of students, teachers, and lecturers requires a holistic and integrated approach. By leveraging technology, conducting needs analysis, and implementing innovative teaching methods, educational institutions can create a more effective and satisfying learning experience for all stakeholders involved.

The qualitative responses further emphasized the course's pedagogical strengths. Participants highlighted the value of guided pre-reading questions, structured learning units, and clear progression paths. These elements have been associated with improved comprehension and retention in digital learning, especially in self-paced MOOC environments. The structured design may have contributed to users' perception that the course supports their learning goals, even if the duration of their exposure was limited.

D. Perceived Ease of Use and Visual Design

PEOU received one of the highest average ratings in the study, with the score ($M = 4.38$, $SD = 0.49$), suggesting that the participants found the course interface intuitive and the learning process manageable. This reinforces the TAM assumption that perceived ease of use contributes directly to behavioral intention. Moreover, learners' qualitative feedback pointed to the importance of a visually appealing and logically organized platform.

As previously mentioned regarding initial challenges, these are common in first-time use of LMS platforms, especially among users with limited digital literacy. Addressing these concerns through user onboarding, help guides, or introductory tutorials may improve the overall user experience and reduce the cognitive load associated with navigation.

A recurring theme in the feedback was the role of visual aesthetics in facilitating learning. Participants described the course interface as functional but suggested opportunities for visual enhancement. Elements such as clear visual hierarchy, consistent use of color and typography, and intuitive placement of interactive elements can reduce cognitive load and facilitate the efficient processing of information [32–35]. Furthermore, well-designed visuals can aid in making abstract concepts more concrete and accessible, thereby catering to diverse learning styles and preferences [36]. The deliberate application of visual design principles within an LMS is not merely about aesthetics; it is a critical component of instructional design that can profoundly influence student motivation, engagement, and ultimately, their academic success.

E. Behavioral Intention and Continued Engagement

The high ratings for BI suggest that learners are inclined to continue using the platform and are likely to recommend it to others. Based on the questionnaire results, 41.7% of respondents agreed and 58.3% strongly agreed with statements related to their intention to reuse and recommend the course. Based on TAM theory [23], the PEOU is expected to positively influence PU, which in turn contributes to BI. Given the closeness of the mean values, and narrow ranges in each construct (≤0.50), it is likely that the correlations between these variables are both positive and strong. In particular:

- Learners who found the course easy to use (high PEOU) were likely to also find it useful (high PU).
- Learners who perceived the course as both useful and easy to use were likely to indicate higher intention to reuse or recommend it (high BI).

While this cannot be interpreted as a strong predictor of long-term engagement due to the limited sample and short exposure, it nonetheless indicates a favorable first impression and a potential for sustainable use if platform improvements are made.

Importantly, the close relationship between PEOU and BI in the data supports TAM's theoretical framework, which suggests that when users find a system easy to use, they are more likely to perceive it as useful and intend to continue using it. Future research with larger samples may explore the strength and directionality of these relationships through regression or SEM approaches.

F. User-Centered Design and Learner Needs

The findings also reflect the growing importance of user-centered course design in digital education. Participants'

feedback indicates a need for flexible content delivery, differentiated instruction, and attention to individual learner needs. This reinforces the value of incorporating differentiated learning paths in MOOCs, especially in language education where learners' backgrounds and proficiencies can vary widely. Research by [37, 38] on usability heuristics for user interface design underscores the critical role of clarity and consistency in navigation for effective learning. When learners struggle to navigate an LMS, cognitive load increases, potentially hindering the processing and retention of instructional material [39]. This study aims to move beyond a simplistic comparison of Moodle with other LMS platforms, instead focusing on a multi-faceted evaluation of navigational efficacy. The analysis will also examine the menu structure, focusing on how well it is organized and how easy it is to find important features. These are important factors that influence user satisfaction and task. By adopting a more holistic approach, this research seeks to provide a nuanced understanding of how navigational design within different LMS platforms can either facilitate the learning process, ultimately informing pedagogical decisions and the selection of appropriate technologies.

Digital instructional materials were cited as contributing to increased engagement and satisfaction. These elements should not only support learners' progress but also be adaptable to diverse learning preferences. Incorporating gamified features, such as leaderboards or instant feedback, was also seen as a motivating factor and may help sustain attention in asynchronous learning environments.

The importance of CEFR-aligned content was noted, particularly in ensuring that the course materials are developmentally appropriate and systematically structured. The CEFR framework provides a valuable standard for designing learning outcomes and assessments that match learners' language levels, thereby ensuring that instructional goals remain both challenging and achievable.

G. Qualitative Insights from Open-ended Responses

Thematic analysis of the open-ended responses identified three key themes: flexibility, technical issues, and interface improvements. Participants appreciated the flexibility of the MOOC, noting that it allowed self-paced learning: "*I can study independently at home*" and "*It can be done anytime and anywhere*". Some respondents mentioned technical challenges, especially at the beginning: "*It was difficult to log in at first*" and "*Internet connection must be stable*".

Others suggested visual and functional enhancements such as "*The website looks too plain*" and "*The 'mark as done' button should work automatically*". Overall, the comments confirm the platform's usefulness and ease of use, while highlighting areas that can be refined for better user experience.

H. Implications and Next Steps

The findings of this pilot study also align with the principles of the Unified MOOC Utilization Model (UMUM), which emphasizes the interconnectedness of learner motivation, system usability, and institutional support in shaping MOOC participation. The findings also resonate with aspects of the Unified MOOC Utilization Model (UMUM), which emphasizes the role of usability, motivation, and institutional context in MOOC engagement. Although UMUM was not empirically applied in this pilot, its theoretical dimensions—particularly those concerning contextual and institutional factors—provide a valuable direction for future integration with TAM-based analyses. Combining TAM with UMUM and UTAUT3 in subsequent research may yield a richer understanding of learner acceptance in evolving MOOC ecosystems.

IV. Conclusion

This pilot study explored learners' acceptance of a MOOC-based German language course (*Lese- und Hörübung*) developed using the TAM as an analytical framework. Despite its limited sample size, the study provides preliminary evidence that the course was well-received by participants in terms of content usefulness, ease of use, and intention to continue using the platform.

Descriptive statistics showed that learners particularly valued the clarity of instructions and logical course structure, while qualitative feedback highlighted the benefits of modular design and CEFR-aligned materials. The findings also suggest a high willingness among learners to reuse and recommend the course, reinforcing the relevance of user-centered design in digital language learning environments.

As a small-scale pilot, the study does not aim to generalize its results but rather to inform iterative improvements to the platform and guide future research. Subsequent studies with larger and more diverse samples could further explore relationships between TAM constructs and learner performance, as well as the long-term impact of such MOOCs on language acquisition in the Indonesian context. These findings can help improve the course and prepare for larger studies. Future research can combine TAM with other models like UTAUT-2, the IS Success Model, Task-Technology Fit, or Theory of Planned Behavior (TPB) to give a more complete understanding of learner acceptance.

V. Limitations and Future Research

Several limitations of this study should be acknowledged. Most notably, the relatively small sample size (n = 12) reflects the pilot nature of the research and limits the generalizability of its findings. In the context of the TAM, more comprehensive quantitative analyses such as SEM are commonly employed when larger datasets are available. However, given the early-stage nature of this research, a descriptive approach supported by qualitative input was considered more appropriate for capturing users' initial responses and identifying areas for improvement.

Consequently, this study adopted a descriptive and exploratory approach, which is well-suited to early-stage evaluations and small-scale implementations.

Although the results of this pilot study are not statistically generalizable due to the limited sample size, they offer transferable insights that may inform similar MOOC implementations in comparable educational contexts. The findings serve as an empirical foundation for designing larger-scale studies that can test the relationships among constructs with stronger statistical validity and external generalizability.

Future research should aim to replicate and extend this

study with larger and more diverse samples to enhance the statistical power and generalizability of the results. Additionally, subsequent studies could incorporate a broader set of variables, such as learning motivation, tutor interaction, or course retention, to provide a more comprehensive understanding of learner behavior.

While TAM provides a foundational understanding, future studies are planned to integrate complementary frameworks, such as UTAUT3, RAIDUA, and UMUM, to offer a more holistic analysis of learner acceptance and technology utilization in MOOC-based language learning. Finally, qualitative approaches such as in-depth interviews or focus group discussions could provide more nuanced insights into learner experiences and expectations.

DATA AVAILABLE

As Appendix, the dataset supporting the findings of this study has been made publicly available on Zenodo. It includes anonymized responses and is accessible at: https://bit.um.ac.id/appendix.

INFORMED CONSENT

All respondents were provided with sufficient information regarding the purpose and procedures of the study. They voluntarily gave their informed consent to participate and were assured of their right to withdraw from the study at any time without penalty.

ETHICS STATEMENTS

This study was conducted in accordance with ethical standards for research involving human participants.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

AUTHOR CONTRIBUTIONS

M. Kharis conceptualized the study, developed the methodology, performed the formal analysis, and wrote the original draft. Desti Nur Aini and Sri Prameswari Indriwardhani conducted the investigation and literature review, while Dudy Syafruddin participated in the validation of the data and findings. Bouchra Aboura contributed to the critical review and final editing of the manuscript. All authors had approved the final version.

FUNDING

This research was funded by the Institute for Research and Community Service (LPPM), Universitas Negeri Malang (UM), Indonesia.

ACKNOWLEDGMENTS

The authors would like to express their sincere gratitude to all participants who willingly took part as respondents in this study. Their contributions and participation were essential to the success of this research.

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