

Effectiveness of Digital Literacy Interventions on the Adoption of the Jaminan Kesehatan Nasional, Mobile Application: The Technology Acceptance Model Approach

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Abstract. Digital transformation in public healthcare requires more than the mere provision of technology; successful adoption is fundamentally shaped by users' perceptions and behavioral intentions toward digital applications. In the Indonesian context, the utilization of the Mobile JKN (mJKN) application remains suboptimal, particularly among non-clinical participants of the National Health Insurance (JKN) program. This study therefore, aims to examine the effectiveness of a digital literacy education intervention in enhancing perceived ease of use (PEOU), perceived usefulness (PU), and intention to use the mJKN application, drawing upon the Technology Acceptance Model (TAM) framework. Employing a quasi-experimental one-group pretest-posttest design, the study involved 115 JKN participants in Gorontalo City. Data were collected using a TAM-based instrument and analyzed through paired sample t-tests to assess changes in mean scores before and after the intervention. The findings reveal statistically significant improvements across all three constructs, with PEOU increasing from 3.00 to 3.23, PU from 3.16 to 3.32, and intention to use from 3.12 to 3.26. In addition, user engagement with application features improved, particularly for the online queue function (43.47%) and participant information (26.95%), although a substantial proportion of respondents (46.08%) had not yet explored other available features. These results indicate that community-based digital literacy interventions play a critical role in reshaping user perceptions and fostering stronger intentions to adopt public service technologies. Consequently, the study not only reinforces the applicability of TAM within grassroots contexts in Indonesia but also highlights the importance of user-centered application design that is responsive to local needs in advancing sustainable digital health service adoption.

Keywords: Digital Literacy; mJKN; TAM; Digital Transformation; Public Health

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INTRODUCTION

Over the past decade, the digitalization of healthcare services has become a key foundation for reforming Indonesia's public healthcare system. The National Health Insurance (JKN) program, managed by the Social Security Agency (BPJS Kesehatan), initiated the Mobile JKN (mJKN) application as a primary channel for digitizing administrative services and accessing healthcare facilities online (BPJS Kesehatan, 2023). This initiative aligns with the Global Digital Health Strategy vision launched by the World Health Organization (WHO, 2022), which emphasizes the importance of transforming the healthcare system toward a technology-driven model with efficient and universal access.

However, the availability of technology does not guarantee user adoption. Resistance to digital innovation remains high, especially among user groups with limited digital literacy. (Davis, 1989), using the Technology Acceptance Model (TAM) framework, stated that successful technology adoption is highly dependent on two main constructs: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). The higher the perceived usefulness and ease of use, the greater the likelihood of behavioral intention to use the technology.

Several contemporary studies have utilized the TAM model in the context of digital public service systems in Indonesia, such as a study by (Susanto and Goodwin, 2013) that demonstrated significant differences between users and non-users of SMS-based e-Government services. However, most of these studies only describe adoption in a static (descriptive) manner, failing to address the dynamic changes that occur after contextually designed educational interventions.

(Putri and Wulandari, 2022) also highlighted the lack of use of TAM in the context of participatory interventions, particularly in mobile-based public service applications. In other words, there is a gap in the literature that has not been widely explored: how can digital literacy-based educational strategies shift user perceptions and behaviors toward adopting public health service applications?

Based on this background, this study aims to fill this scientific gap by testing the effectiveness of digital literacy interventions on three key TAM variables PEOU, PU, and Intention to Use in the context of using the Mobile JKN application. This study is expected to not only enrich local approaches to the TAM model in e-health but also provide an empirical basis for policymakers in designing adaptive and sustainable digital interventions.

Previous studies on the adoption of digital applications in the public service sector in Indonesia, particularly the Mobile JKN application, have been dominated by descriptive and correlational approaches with minimal educational interventions. For example, (Irawan and Anwar, 2020; Putri and Wulandari, 2022) only identified factors influencing user acceptance without experimentally evaluating behavioral changes following socialization interventions or digital literacy training. However, within the Technology Acceptance Model (TAM) framework developed by (Davis, 1989), both Perceived Ease of Use and Perceived Usefulness are not merely descriptive but can be engineered through structured user experiences and contextual educational strategies.

On the other hand, (Venkatesh and Davis, 2000) expanded the TAM model by emphasizing the importance of perceived usefulness as a mediator between technical ease and

behavioral intentions. However, this theoretical application has not been widely implemented in the context of public services in Indonesia, which target non-professionals with low digital literacy backgrounds. In this context, resistance to technology adoption is no longer simply a technical issue, but reflects the epistemic distance between digital system designers and socio-culturally diverse end users. This complexity demands a more reflective participatory approach to the local context, including the characteristics of regions such as Gorontalo City, which lies at the digital crossroads between urban and rural areas.

Considering these gaps, this study presents a novelty by testing the effectiveness of a training-based digital literacy intervention in improving three key constructs of TAM: Perceived Ease of Use, Perceived Usefulness, and Intention to Use. The quasi-experimental pretest–posttest design used is complemented by inferential statistical analysis such as paired t-tests and effect sizes (Cohen's d), allowing for an empirical evaluation of the extent to which significant changes in perceptions and usage intentions occur after the intervention. Thus, this study not only strengthens the external validity of the TAM model in the local Indonesian context but also provides strategic recommendations for digitalizing the national healthcare system to be more adaptive to end-user needs.

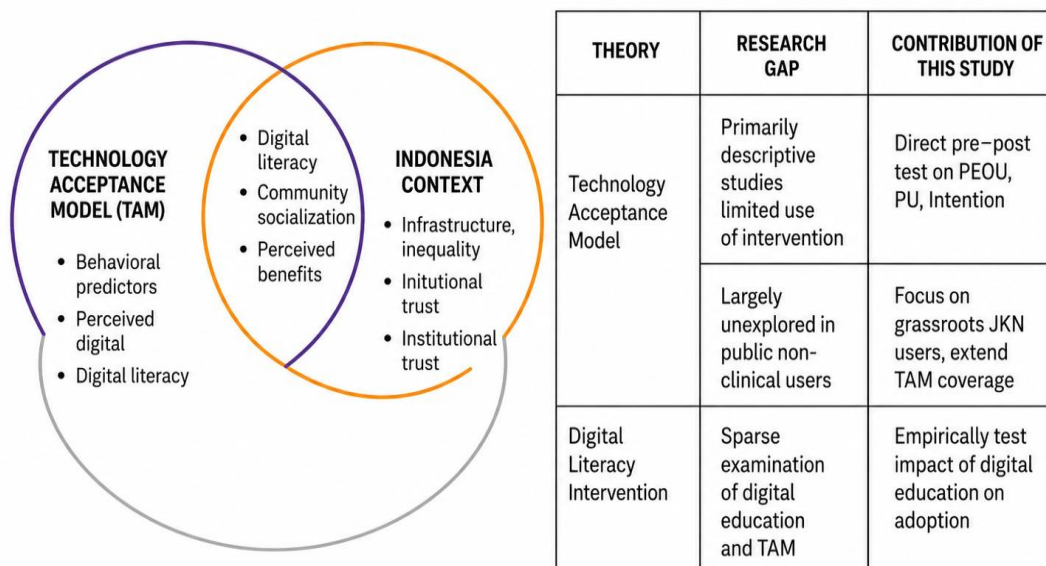


Figure 1. Integration of TAM and Local Context in mJKN Adoption

The conceptual framework in this study is visualized through the integration of the Technology Acceptance Model (TAM) with the Indonesian socio-structural context, displayed in

the form of a Venn diagram and a theoretical gap matrix table. The Venn diagram illustrates that the successful adoption of the Mobile JKN (mJKN) application is not only determined by universal determinants such as Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) as proposed by (Davis, 1989), but is also greatly influenced by local characteristics such as digital literacy, infrastructure inequality, and the level of trust in state institutions.

The intersection between the two main poles TAM and the Indonesian context is identified through three crucial elements: digital literacy, community outreach, and perceived service benefits. These three elements act as an epistemic bridge between theoretical models and real-world conditions, where community participation in health technology adoption remains hampered by structural skepticism and limited access.

Meanwhile, the gap matrix compiles three relevant theoretical perspectives: (1) TAM in general, (2) TAM in the Indonesian context, and (3) digital literacy interventions. All three indicate unfilled literature gaps, such as the dominance of descriptive approaches in TAM studies, limited application to non-clinical populations such as JKN users at the Community Health Center level, and minimal exploration of the relationship between educational interventions and changes in perceptions of technology adoption. This study aims to fill these gaps by adopting a pre-post test approach that directly measures the impact of digital education on the three main constructs of TAM, thereby extending the model's validity to the realm of grassroots-based public services.

METHODS

This study employed a quantitative approach using a quasi-experimental one-group pretest–posttest design to evaluate changes in user perceptions and behavioral intentions toward the Mobile JKN (mJKN) application following a digital literacy intervention. This design was selected due to its suitability in capturing intervention effects within real-world community settings where the inclusion of a control group is not always feasible for ethical and logistical reasons. The study was conducted across five Community Health Centers (Puskesmas) in Gorontalo City, namely Kota Tengah, Sipatana, Kota Selatan, Kota Utara, and Dumbo Raya, which were purposively selected based on their active involvement in mJKN socialization programs. A total of 115 respondents were included using a total sampling technique, consisting of active JKN participants who had access to smartphones and were willing to participate in all stages of the study.

The distribution of respondents across the selected study sites indicates relatively balanced representation, allowing for contextual generalization within the primary healthcare setting. As

presented in Table 1, the proportion of participants from each Puskesmas ranged from 18.26% to 20.87%, reflecting an even geographic spread.

Data were collected using a structured questionnaire adapted from the Technology Acceptance Model (TAM), consisting of three main constructs: perceived ease of use (PEOU), perceived usefulness (PU), and intention to use. Each construct was represented by five items, resulting in a total of 15 measurement items assessed using a 4-point Likert scale ranging from strongly disagree to strongly agree.

Prior to data collection, the instrument underwent content validation through expert judgment involving specialists in digital public health, health information systems, and applied statistics to ensure conceptual alignment and contextual relevance. Construct validity was further examined using item-total correlation, with all items demonstrating acceptable correlation values (≥ 0.35). The intervention was implemented through a 90-minute community-based digital literacy training session delivered in small groups using a participatory and demonstrative approach. The training included guided installation of the mJKN application, introduction to key features, and direct simulation of functions such as online queue registration and participant information access. This approach was designed to enhance both technical familiarity and perceived usefulness among participants.

Data collection was conducted in two stages, namely pretest and posttest, using the same instrument to measure changes in user perceptions after the intervention. The collected data were analyzed using paired sample t-tests to examine differences in mean scores before and after the intervention. In addition, effect size was calculated using Cohen's d to assess the magnitude of the intervention's impact. All statistical analyses were performed using IBM SPSS version 25 to ensure analytical accuracy and reproducibility.

RESULT AND DISCUSSION

Statistical Tests and Interpretation

Pre–Post Descriptive Analysis Results

Table 1. Results of Pre–Post Descriptive Analysis.

Variables	Pretest (Mean $\pm$ SD)	Posttest (Mean $\pm$ SD)	Δ Mean	p-value	Cohen's d
Perceived Ease of Use (PEOU)	3.00 $\pm$ 0.61	3.23 $\pm$ 0.47	+0.23	0,000 **	0.49 (medium)
Perceived Usefulness (PU)	3.16 $\pm$ 0.55	3.32 $\pm$ 0.46	+0.16	0.001 **	0.33 (medium)
Intention to Use	3.12 $\pm$ 0.62	3.26 $\pm$ 0.48	+0.14	0.001 **	0.32 (medium)

Analysis of 115 respondents showed an increase in the average scores on the three main constructs of the TAM model after the digital education intervention. All differences showed statistical significance ($p < 0.05$), with effect sizes in the medium category according to (Cohen, 1988) classification.

Interpretation of Findings Based on TAM

1. Perceived Ease of Use (PEOU)

The significant increase in PEOU indicates that digital education directly improved perceived ease of use of the mJKN application. This supports the key proposition in the TAM model that initial perceptions of usability are a cognitive catalyst for intention to use. As the variable with the largest effect ($d = 0.49$), PEOU is a critical component of community-based interventions.

2. Perceived Usefulness (PU)

The increase in PU scores ($+0.16$) reflects respondents' growing understanding of the practical value of mJKN, particularly in service access, online queues, and participant data. PU serves as a bridge between technical ease and functional relevance in the technology adoption model. While the increase was not as significant as PEOU, it reinforces the finding that perceived benefits grow with increased user experience.

3. Intention to Use

The Intention construct showed the most moderate increase ($+0.14$), although significant. This indicates that the perceptual transformation has not yet fully internalized the application into the user's routine. As (Venkatesh and Davis, 2000) noted, digital behavioral intentions are highly dependent on perceptions of long-term usefulness and feature integration into daily needs.

Delta Graph and TAM Cognitive Hierarchy

The delta graph visualization shows a hierarchical pattern of change:

$\Delta \text{PEOU} > \Delta \text{PU} > \Delta \text{Intention}$, which supports the classical structure of TAM: "Convenience $\rightarrow$ Benefit $\rightarrow$ Intention". This pattern shows that strategies for increasing technology adoption should start from intuitive technical ease, then strengthen the perception of utility, and only then encourage sustainable behavioral intentions.

The visual diagram in figure 2, displays a comparison of the average scores between the pretest and posttest on three key constructs in the Technology Acceptance Model (TAM): Perceived Ease of Use (PEOU), Perceived Usefulness (PU), and Intention to Use. Each pair of bars depicts the change in the average score after the digital literacy education intervention on respondents' use of the Mobile JKN (mJKN) application. It is clear that all variables experienced

an increase, with PEOU recording the highest score difference, from 3.00 to 3.23. This indicates that the perception of ease of use increased significantly after the socialization.

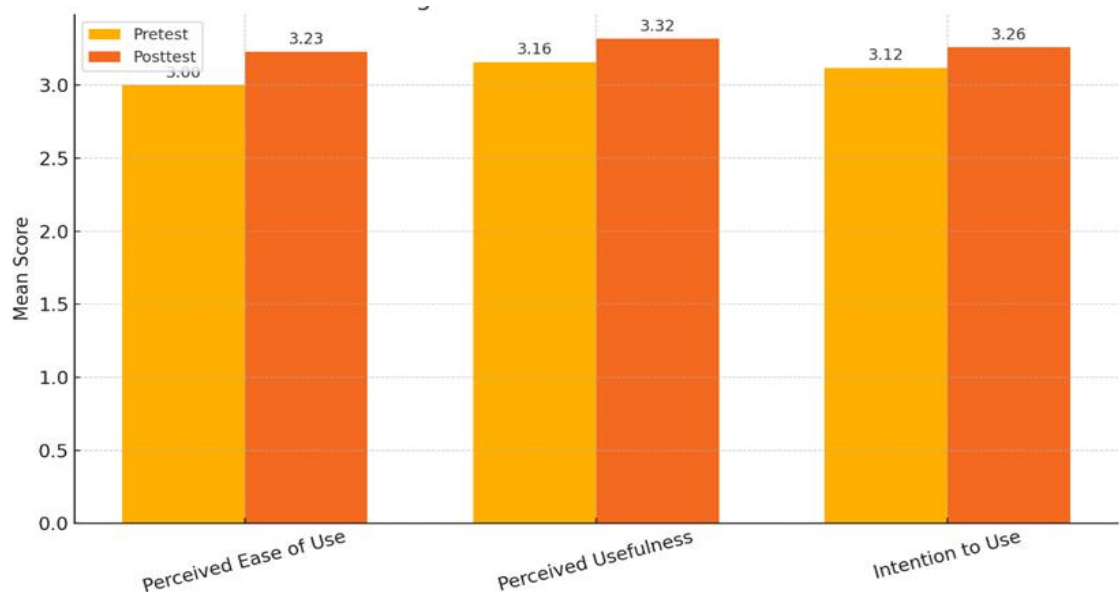


Figure 2. Delta Graph and TAM Cognitive Hierarchy

Furthermore, PU increased from 3.16 to 3.32, indicating that the application's benefits are beginning to be internalized by users as a relevant healthcare tool. Meanwhile, Intention to Use increased from 3.12 to 3.26, reflecting a shift in behavioral intention toward more active technology adoption, although still in the moderate increase category. The simultaneous increase in these three variables strengthens the hierarchical structure of TAM: starting with perceived ease, moving on to assessment of benefits, and then culminating in actual use intention. This visual effectively represents the intervention's success in shifting user perceptions in a more positive direction and supporting the sustainability of the digital transformation of public healthcare services.

Frequency of Use Comparison

Before the intervention, 57.39% of respondents had never used the mJKN app despite having downloaded it, and only 1.74% used it daily. The majority used it at low rates, 1–2 times per month (34.78%) and 1–2 times per week (6.09%). This pattern indicates a gap between app ownership and actual use, potentially caused by low digital literacy or unfamiliarity with the app's functions. After the intervention, there was a sharp transformation in digital behavior: no respondents were still using the app. The majority (92.17%) used the app 1–2 times per month, and the remainder (7.83%) increased to 1–2 times per week. There were no daily users,

indicating that despite increased perception and intention, app use remains need-specific and has not yet become internalized as a routine.

App Feature Preferences

The pattern of mJKN feature utilization after the intervention showed a strong tendency towards two main features:

Table 2. Application Features

Application Features	Number of Users	Percentage
Online Queue	50	43.47%
Participation Information	31	26.95%
Check Bill	9	7.82%
Health Features	12	10.43%
Doctor Consultation	6	5.21%
Not Using Features	53	46.08%

The high reliance on the online queue feature reflects the need for time efficiency and convenience in administrative services. Meanwhile, the participant information feature is used for self-access information, indicating the success of the digital health self-service function. However, 46.08% of respondents stated they were unaware of or did not use any of the features, indicating a significant gap in feature utilization despite the app being downloaded and used to a limited extent.

These findings underscore the importance of a user experience (UX)-based approach and intuitive interface design, especially for populations with low technological literacy. The lack of feature exploration indicates that positive post-intervention perceptions do not necessarily translate to a comprehensive understanding of the app's functionality. As noted by (Alalwan et al., 2017), user experience, perceived usability, and continued socialization are a crucial combination for encouraging continued feature use.

The horizontal graph visualization shows the pattern of feature utilization in the Mobile JKN application after the implementation of the digital literacy education intervention. The online queue feature was the most dominant feature used by respondents, with a percentage of 43.47%, followed by participant information at 26.95%. These two features represent a high perceived usefulness dimension because they provide direct solutions to users' administrative needs such as time efficiency and independent access to participant data. This finding aligns with the TAM theory, which emphasizes that perceived usefulness of functional features significantly influences actual usage intentions.

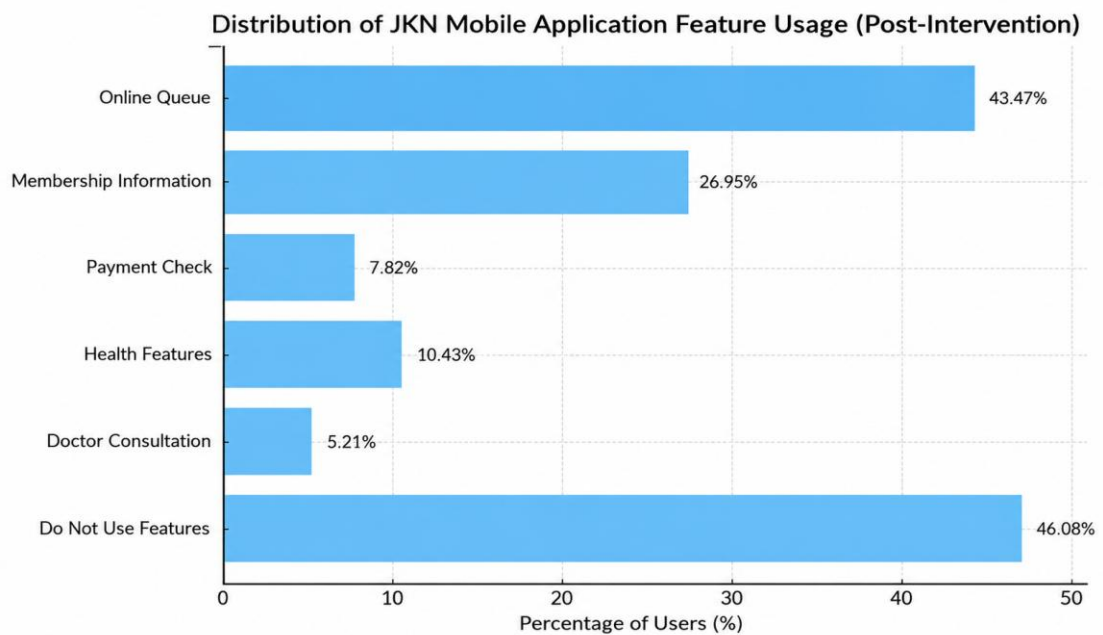


Figure 3. Distribution of use of JKN mobile application features

However, a contrasting result emerged, with 46.08% of respondents stating they were unaware of or had never used any features, even though the app had been downloaded and started using them. This fact indicates a gap between technology adoption and actual sustained use. This phenomenon also indicates that the success of an app download campaign does not automatically lead to full utilization of the available features. This condition is further reinforced by a study by Alalwan et al. (2017), which shows that in the context of m-health, usage intention is influenced not only by the perception of general benefits, but also by the perception of the usefulness of each specific feature and the experience of interacting with the app interface.

The low usage of secondary features such as bill checking (7.82%), health features (10.43%), and doctor consultations (5.21%) further highlights that features whose urgency isn't immediately apparent tend to be underexplored. This opens up opportunities for user experience-based design and simulation-based training approaches to increase awareness and comfort in navigating the app. In the context of digital public services in Indonesia, unequal digital literacy and interface designs that aren't always adaptive to user segmentation present unique challenges that must be addressed with sustainable and locally-based educational strategies.

In the practical context of this study, the PEOU component was influenced by community-based educational interventions, which contributed to respondents' increased understanding of the app's ease of access and navigation. This subsequently increased PU, as users began to see the functional value of features such as online queuing and membership checks. The Behavioral Intention component was activated as a result of these combined positive perceptions, which,

while not yet fully transformed into actual use, has shown strong indications of changing digital behavior.

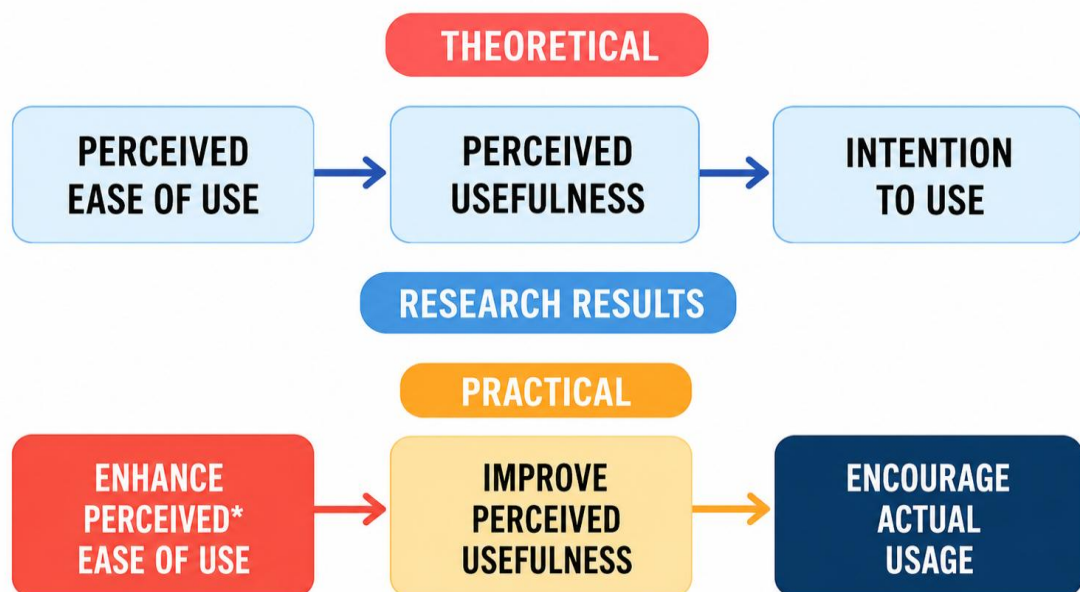


Figure 4. Technology Acceptance Model (TAM) framework

The figure presents an integrative visual model based on the Technology Acceptance Model (TAM) framework that has been contextually modified to illustrate the theoretical pathway and practical implications in the adoption of the Mobile JKN application. This model consists of four main components: (1) Perceived Ease of Use (PEOU), (2) Perceived Usefulness (PU), (3) Behavioral Intention to Use, and (4) Actual System Use. The direction of the arrows connecting the four constructs indicates the causal sequence of influence, where PEOU influences PU, both simultaneously influence behavioral intention, and finally lead to actual use of the application.

The model also displays a reflective feedback loop from Actual Use back to Perceived Usefulness, illustrating that actual use experiences reinforce or correct initial perceptions. This visualization supports the argument that digital technology adoption is dynamic and cyclical, not linear, and requires a touch of educational and cultural interventions, as emphasized in studies. Thus, this model not only represents a theoretical relationship but also serves as an implementative framework for community-based public health service digitalization strategies.

CONCLUSION

This study confirms that a community-based digital literacy education intervention significantly impacts user perceptions of perceived ease of use (EoU), perceived usefulness (Usefulness), and behavioral intention (IU) of the Mobile JKN (mJKN) application. The increase in

pre-posttest scores was statistically significant, with the largest effect on PEOU (Cohen's $d = 0.49$), indicating that contextualized outreach strategies can be a transformative tool in strengthening the adoption of digital public technologies.

This study theoretically validates the hierarchical structure of the Technology Acceptance Model (TAM) in the context of public health services in Indonesia, while expanding its applicability to non-clinical populations at the grassroots level. These findings enrich the local literature by presenting a quasi-experimental approach rarely used in TAM studies in the public health sector.

From a practical perspective, this study underscores that the success of digitalizing public services is determined not only by the availability of applications, but also by how users understand, assess, and internalize the benefits of these technologies in their daily lives. The high proportion of respondents who did not explore mJKN features suggests that digital transformation requires more than just access namely, a user-centered design approach, simplified interface navigation, and enhanced socially relevant utility.

Therefore, it is recommended that digital education and feature development be continuously integrated to meet local user needs. Furthermore, community involvement in app design co-creation and systematic user feedback will be crucial strategies to encourage the continued adoption of mJKN as part of a more inclusive and adaptive national healthcare system.

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