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Evaluating User Readiness for IoT-Based Smart Home Adoption: A PLS-SEM and IPMA Study Integrating TAM and Technological Readiness Model in the Context of NTB, Indonesia

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***Abstract*—The swift evolution of Internet of Things (IoT) innovations has significantly accelerated the integration of smart home solutions into everyday life. However, user readiness remains a pivotal aspect for ensuring successful adoption, particularly in developing regions such as Indonesia. This study aimed to evaluate user readiness for IoT-based smart home adoption by integrating the Technology Acceptance Model (TAM) and the Technology Readiness Index (TRI) within the socio-cultural context of Nusa Tenggara Barat (NTB) province, Indonesia. A quantitative survey involving 496 respondents was conducted using purposive sampling during the 2025 data collection period. The data were analyzed using Partial Least Squares Structural Equation Modelling (PLS-SEM) and Importance-Performance Map Analysis (IPMA). The results indicate that optimism, innovativeness, and digital literacy have a significant influence on perceived ease of use and perceived usefulness. In contrast, discomfort and insecurity negatively affect user acceptance. Furthermore, perceived ease of use and perceived usefulness were found to predict behavioral intention strongly. The IPMA results further highlight optimism and innovativeness as high-impact yet underperforming areas that require attention. This study contributes theoretically by extending the integration of TAM and TRI in the context of IoT-based smart home adoption, while providing practical insights for policymakers, system designers, and digital transformation stakeholders to design more inclusive and user-aligned smart home strategies. The combined TAM–TRI framework reflects both cognitive and emotional elements that shape user decision-making, thereby strengthening the understanding of technology adoption in developing regions.**

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***Index Terms*—Smart home, internet of things, TAM, technological readiness, PLS-SEM, IPMA.**

I. Introduction

The emergence of the Internet of Things (IoT) has transformed contemporary lifestyles by facilitating smart home systems that combine automation, seamless connectivity, and user-oriented management via digital platforms [1], [2]. As global demand for smart home solutions continues to surge, the market is projected to exceed USD 163 billion by 2028 [3]. The technology has increasingly permeated households in both developed and developing regions. Smart homes offer numerous benefits, including enhanced security, improved energy efficiency, increased convenience, and personalized living experiences [4], [5], [6]. However, the uptake of IoT-enabled smart home systems depends on more than just the availability of the necessary technological infrastructure; it also requires users to be adequately prepared, psychologically willing to embrace these systems, and equipped with the requisite digital skills [7], [8].

In Indonesia, particularly in regions such as Nusa Tenggara Barat (NTB), the deployment of IoT-driven smart home solutions remains in its infancy. While national and international firms like Samsung and Qualcomm have begun showcasing AI-enabled home automation, the penetration rate in semi-urban and rural communities remains minimal. For instance, Kompas reported that there were only 8,000 smart home units nationally as of 2024, indicating a significant digital divide in access to innovative technology. NTB, characterized by diverse socio-economic demographics and infrastructural gaps, lags behind in IoT adoption despite having a growing middle class and increasing smartphone penetration [9], [10], [11]. The challenges facing smart home adoption in such regions are multifaceted. Digital literacy levels vary significantly among household members, affecting their ability to operate and maintain smart home system [12], [13]. Moreover, users often harbor concerns regarding data privacy, perceived risk, and the reliability of IoT devices [14], [15]. These apprehensions are compounded by limited trust in service providers and vendors, which further obstructs the adoption process [16], [17]. Infrastructural instability, including inconsistent internet coverage in parts of NTB such as Sembalun and Sekotong, presents a critical barrier [18], [19].

The TAM continues to be one of the most widely used frameworks for explaining user behavior in the context of emerging technologies, particularly through its emphasis on constructs such as perceived usefulness and perceived ease of use [7], [20]. However, given the evolving nature of IoT ecosystems, TRI provides a complementary lens by examining user predispositions, optimism, innovativeness, discomfort, and insecurity toward new technologies [21]. Recent research suggests that the integration of TAM and TRI offers a robust analytical model to predict and enhance technology adoption in household contexts [22], [23], [24].

Despite the increasing scholarly interest in smart home adoption, studies focusing on user readiness in the context of developing regions, such as NTB, are scarce. Prior work has primarily centred on urban populations or advanced economies, leaving a critical gap in understanding the unique socio-cultural and infrastructural dynamics that influence adoption in Indonesia's emerging areas [25], [26], [27] . Moreover, while some research explores the impact of psychological variables such as trust and risk [28], [29], few have examined how these interact with digital literacy and technological readiness in determining readiness levels across different user segments.

Therefore, this study aims to bridge this gap by investigating user readiness to adopt IoT-based smart homes in NTB through a comprehensive framework integrating TAM and TRI. The investigation addresses both external and internal determinants of adoption, incorporating user trust, privacy concern, and perceived risk as contextual variables. This study employs a partial least squares approach to structural equation modelling (PLS-SEM) to investigate users' behavioral intentions toward smart home technologies, thereby providing empirically grounded insights into their behavior. The findings are expected not only to enrich theoretical understanding but also to inform practical policy-making, particularly by guiding the design of inclusive digital infrastructure and literacy programs for rural communities in Indonesia.

II. Conceptual Framework

The rapid evolution of smart home technologies has been facilitated by the proliferation of IoT devices and AI integration, yet user adoption remains influenced by both psychological and technological factors [7], [21]. To understand user readiness for IoT-based smart home adoption, this study integrates the TAM, TRI, and external constructs such as digital literacy and trust in vendors. Optimism, a positive belief in the benefits of technology, has been shown to enhance perceptions of ease of use and usefulness [23]. Optimistic individuals tend to view smart home systems as manageable and helpful, encouraging engagement with such technologies.

- H1: Optimism positively affects perceived ease of use.
- H2: Optimism positively affects perceived usefulness.

Innovativeness, or the tendency to embrace new technologies, is also associated with greater technology engagement. Users high in innovativeness are more willing to explore smart home systems and report higher ease of use [30].

- H3: Innovativeness positively affects perceived ease of use.

Conversely, discomfort and insecurity represent inhibitors to adoption. Discomfort refers to feeling overwhelmed by the complexity of technology, while insecurity is related to concerns about data privacy or control. These factors can impede the perceived usability and value of smart home systems [13], [15].

- H4: Discomfort negatively affects perceived ease of use.

H5: Insecurity negatively affects perceived usefulness.

Aligned with TAM, perceived ease of use influences perceived usefulness and directly affects behavioral intention [20], [31].

- H6: Perceived ease of use positively affects perceived usefulness.
- H7: Perceived ease of use positively affects behavioral intention.

Similarly, perceived usefulness has consistently been shown to impact behavioral intention to adopt or continue using innovative technologies [32], [33].

- H8: Perceived usefulness positively affects behavioral intention.

Digital literacy, or users’ ability to effectively engage with digital environments, has become a critical determinant of adoption readiness [12], [34]. Digitally literate individuals are better equipped to navigate and accept smart home systems.

- H9: Digital literacy positively affects behavioral intention.

Trust in the vendor, representing confidence in the provider's reliability and ethical handling of user data, significantly affects adoption decisions, especially in technology requiring continuous data exchange [7], [29].

- H10: Trust in the vendor positively affects behavioral intention.

Perceived Affordability, the extent to which smart home technology is seen as financially accessible, emerges as a practical enabler of adoption. This construct is shown to influence both perceived usefulness and user intention in cost-sensitive environments [4], [35].

- H11: Perceived Affordability positively affects behavioral intention.
- H12: Perceived Affordability positively affects perceived usefulness, which in turn influences behavioral intention (mediated effect).

Furthermore, digital literacy and trust in the vendor may exert indirect effects through perceived ease of use and perceived usefulness as mediators. These complex paths highlight the importance of cognitive and relational enablers in promoting smart home adoption[16], [22].

- H13: Digital literacy positively affects perceived ease of use, which in turn positively affects behavioral intention.
- H14: Trust in vendor positively affects perceived usefulness, which in turn positively affects behavioral intention.

This conceptual model provides a comprehensive framework that reflects both technological perceptions and user-specific readiness traits. By integrating constructs from TAM-TRI and contemporary digital engagement theories, this study aims to uncover nuanced determinants of smart home adoption behavior, particularly in the emerging market context of NTB, Indonesia.

Figure 1 illustrates the conceptual relationships among constructs of technological readiness (optimism, innovativeness, discomfort, and insecurity), perceived ease of use, perceived usefulness, and external factors such as digital literacy, trust in vendor, and perceived Affordability. This model illustrates both direct and indirect pathways leading to behavioral intention considering the interaction between individual characteristics and technology perceptions in influencing user readiness to adopt smart home technologies.

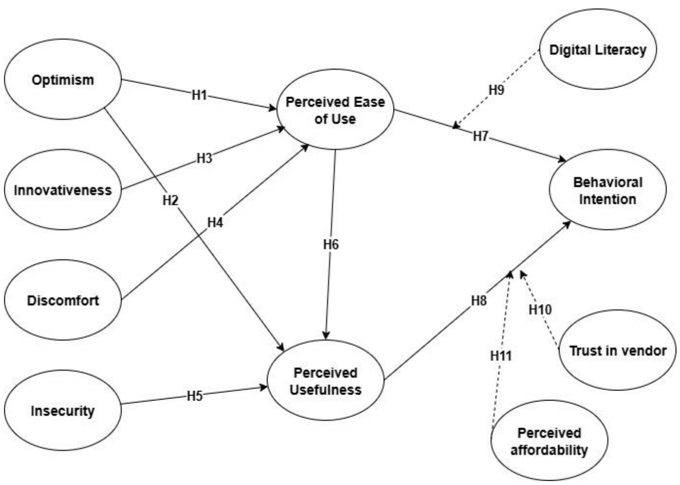

Fig 1. The conceptual framework.

Furthermore, the model explicitly incorporates three mediating (indirect effect) hypotheses: perceived Affordability influencing behavioral intention through perceived usefulness (H12), digital literacy influencing behavioral intention through PEOU (H13), and trust in vendor influencing behavioral intention through PU (H14).

III. Research Method

This research adopted a quantitative explanatory approach using a structured questionnaire to investigate an integrated framework that merges the two models, the Technology Acceptance Model (TAM) and the Technology Readiness Index (TRI), for assessing user readiness in adopting Internet of Things (IoT) based smart home technologies in West Nusa Tenggara (NTB), Indonesia. The research design aimed to analyze the influence of psychological factors, technological readiness, and user perceptions on individuals' behavioral intentions regarding the implementation of smart home technologies.

A. Data Collection and Sampling

A purposive sampling technique was utilized to target respondents with knowledge or experience in IoT-based technologies, specifically smart home systems. The data collection process was conducted both online and offline from February to May 2025, resulting in 496 valid responses from various regions across NTB, including urban and semi-urban areas such as Mataram, Praya, Selong, and Bima. The inclusion criteria for participant selection included: (1) minimum age of 20 years, (2) residence in NTB Province, (3) access to the internet or private Wi-Fi networks, and (4) prior use of at least one IoT-based smart device such as smart TVs, bright lamps, app-connected CCTV, or AI-based speakers. Respondents who submitted incomplete questionnaires or had no experience with such technologies were excluded from the analysis. The demographic profile revealed that the majority of respondents were between 31 and 45 years old (41.3%), followed by those between 20 and 30 years old (38.9%) and those between 46 and 55 years old (19.8%). In terms of educational background, 67.8% held a Diploma or Bachelor's degree, 21.4% graduated from high school (SMA/SMK), and 10.8% held postgraduate degrees. Respondents worked predominantly in the private sector (35.5%), civil service (23.2%), entrepreneurship (18.9%), and other professions (22.4%). A total of 60.3% had experience using smart home devices at home, such as smart TVs, AI-powered speakers, or automated lighting and surveillance systems. Furthermore, digital literacy levels were relatively high, with respondents demonstrating ownership of digital devices and literacy scores above 70%. Additionally, 62.5% of respondents owned their homes, positioning them as primary decision-makers in household technology adoption. These characteristics underscore the relevance and generalizability of the sample to the broader context of smart home adoption in NTB [4], [33].

B. Instrumentation and Measurement Model

The research instrument was constructed based on the core constructs of TAM and TRI, supplemented by three contextual variables. A total of ten latent variables were measured using 26 indicators on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). These constructs included optimism, innovativeness, discomfort, and insecurity (TRI); perceived ease of use and perceived usefulness (TAM); and digital literacy, trust in vendor, and perceived Affordability as contextual factors. All indicators were adapted from previously validated instruments and underwent expert content validation by three scholars specializing in information systems and user behavior research [20], [36], [37], [38]. Construct validity and instrument reliability were assessed using outer loadings, composite reliability, and average variance extracted (AVE), in accordance with the PLS-SEM standards for evaluating measurement models.

C. Data Analysis Technique

Data analysis was performed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4.0. This method was selected due to its effectiveness in estimating complex relationships among latent constructs, its tolerance for non-normal data, and its suitability for moderate sample sizes [37], [38]. The analysis comprised two stages: (1) Evaluation of the measurement model, including assessments of indicator reliability, internal consistency (Cronbach's Alpha and Composite Reliability), convergent validity (Average Variance Extracted), and discriminant validity using both the Fornell Larcker criterion and Heterotrait Monotrait ratio (HTMT); and (2) Evaluation of the structural model, involving the estimation of path coefficients, explained variance (R^2), effect sizes (f^2), predictive relevance (Q^2), and hypothesis testing via bootstrapping with 5,000 resamples. In addition, Importance-Performance Map Analysis (IPMA) was employed to highlight constructs with high importance but suboptimal performance in predicting behavioural intention. The IPMA findings provide actionable insights for policymakers, technology providers, and industry stakeholders seeking to enhance user readiness for IoT-based smart home adoption.

IV. Result and Discussion

A. Measurement Model

A range of evaluations was carried out to assess the reliability and validity of the measurement model, encompassing indicator reliability, internal consistency, convergent validity, and discriminant validity. These procedures follow the guidelines established for PLS-SEM [36], [37], [39]. As shown in Table 1, all indicators exhibit outer loading values above 0.70 as the recommended threshold, indicating strong indicator reliability. The outer loading values for each item range from 0.835 to 0.962, suggesting that the indicators are reliable representations of their respective latent constructs. Each construct is measured with multiple items that consistently load highly, confirming their representational strength within the model.

Table 1.
Construct Measurement Items and Outer Loadings

Variable	Code	Indicator	Outer Loadings
Optimism	OPT1	Technology makes life easier	0.869
	OPT2	Technology improves my life quality.	0.854
	OPT3	Technology increases my efficiency.	0.880
Innovativeness	INN1	I like trying new tech	0.910
	INN2	I enjoy digital innovation.	0.924
	INN3	I experiment with new tools.	0.933
Discomfort	DIS1	I feel overwhelmed by tech.	0.949
	DIS2	I feel uneasy using new tech.	0.924
Insecurity	INS1	I doubt tech reliability	0.958
	INS2	I worry about data privacy.	0.954
Perceived Ease of Use	PEOU1	Smart tech is easy to use	0.935
	PEOU2	Features are easy to navigate.	0.943
	PEOU3	I quickly understand its use	0.950
Perceived Usefulness	PU1	It simplifies home tasks	0.945
	PU2	Smart tech is useful	0.957
	PU3	It improves daily work	0.942
Digital Literacy	DL1	I can use digital tools	0.859
	DL2	I understand IoT systems.	0.867
	DL3	I am familiar with smart apps	0.879
Trust in Vendor	TV1	I trust the provider	0.909
	TV2	The vendor protects my data.	0.917
	TV3	The vendor is reliable	0.835
Perceived Affordability	PA1	Smart tech is affordable	0.954
	PA2	I can afford smart tools	0.957
Behavioral Intention	BI1	I intend to use smart tech	0.962
	BI2	I will keep using it	0.961

The results of the internal consistency and convergent validity assessments are presented in Table 2. All constructs achieved Cronbach's alpha and composite reliability (ρc) values above 0.70, with most values exceeding 0.90, indicating excellent internal consistency [37] . Furthermore, all AVE (Average Variance Extracted) values were above the threshold value of 0.50, supporting convergent validity. For instance, the AVE values ranged from 0.753 (Optimism) to 0.956 (Perceived Affordability), indicating that every construct accounts for a significant share of the variance observed in its associated indicators. These outcomes affirm that the reflective measurement items are both consistent and adequately representative of their respective constructs, thereby establishing the robustness of the measurement model and justifying its use in further structural model analysis.

Table 2.
Construct Reliability and Validity

Construct	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Optimism	0.836	0.837	0.901	0.753
Innovativeness	0.913	0.914	0.945	0.851
Discomfort	0.860	0.883	0.934	0.876
Insecurity	0.906	0.907	0.955	0.914
PEOU	0.937	0.938	0.960	0.888
PU	0.943	0.944	0.964	0.898
BI	0.918	0.918	0.961	0.924
Digital Literacy	0.838	0.848	0.902	0.754
Trust in Vendor	0.865	0.877	0.918	0.788
Perceived Affordability	0.905	0.906	0.955	0.914

The evaluation of discriminant validity began with the application of the Heterotrait Monotrait (HTMT) ratio. As presented in Table 3, all HTMT values fell below the conservative cutoff of 0.85, supporting the empirical distinctiveness of each construct from one another. The highest HTMT value observed is between innovativeness and perceived affordability (0.841), which remains within acceptable limits, indicating a lack of multicollinearity and confirming construct uniqueness. In addition to HTMT, the Fornell-Larcker criterion was applied to ensure discriminant validity. Table 4 indicates that the square root values of each construct's AVE, as presented along the diagonal, exceed their respective correlations with other constructs in the model. For example, the square root of AVE for perceived ease of use is 0.943, which exceeds its highest correlation with any other construct (0.845 with perceived usefulness), thereby supporting discriminant validity. These results collectively confirm that the constructs in the model are sufficiently distinct from one another, justifying their inclusion in subsequent structural model evaluations.

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Table 3.
Discriminant Validity - Heterotrait-monotrait (HTMT) ratio

Construct	OPT	INN	DIS	INS	PEOU	PU	BI	DL	TV	PA	PA x PU	DL x PEOU	TV x PU
OPT													
INN	0.885												
DIS	0.800	0.834											
INS	0.764	0.773	0.891										
PEOU	0.758	0.797	0.782	0.782									
PU	0.777	0.808	0.760	0.774	0.898								
BI	0.729	0.773	0.782	0.789	0.835	0.895							
DL	0.587	0.578	0.497	0.420	0.500	0.513	0.511						
TV	0.429	0.444	0.418	0.406	0.589	0.521	0.484	0.880					
PA	0.754	0.841	0.757	0.795	0.837	0.834	0.829	0.563	0.476				
PA x PU	0.333	0.321	0.226	0.201	0.354	0.348	0.344	0.172	0.169	0.375			
DL x PEOU	0.134	0.150	0.070	0.066	0.211	0.195	0.193	0.134	0.096	0.207	0.561		
TV x PU	0.171	0.183	0.106	0.083	0.242	0.250	0.198	0.124	0.070	0.207	0.596	0.791	

Note(s): OPT: Optimism, INN: Innovativeness, DIS: Discomfort, INS: Insecurity, PEOU: Perceived Ease of Use, PU: Perceived Usefulness, BI: Behavioral Intention, DL: Digital Literacy, TV: Trust in Vendor, PA: Perceived Affordability.

Table 4.
Discriminant Validity - Fornell-Lacker Criterion

Construct	OPT	INN	DIS	INS	PEOU	PU	BI	DL	TV	PA
OPT	0.868									
INN	0.773	0.923								
DIS	0.679	0.744	0.936							
INS	0.664	0.702	0.789	0.956						
PEOU	0.672	0.739	0.709	0.722	0.943					
PU	0.691	0.750	0.690	0.716	0.845	0.948				
BI	0.639	0.708	0.700	0.719	0.776	0.833	0.961			
DL	0.486	0.503	0.423	0.368	0.449	0.460	0.452	0.869		
TV	0.366	0.396	0.366	0.360	0.533	0.470	0.433	0.758	0.888	
PA	0.657	0.766	0.674	0.720	0.772	0.771	0.756	0.500	0.424	0.956

Note(s): OPT: Optimism, INN: Innovativeness, DIS: Discomfort, INS: Insecurity, PEOU: Perceived Ease of Use, PU: Perceived Usefulness, BI: Behavioral Intention, DL: Digital Literacy, TV: Trust in Vendor, PA: Perceived Affordability.

With all reliability and validity criteria satisfactorily met, including consistency across items, evidence of convergence, and a clear distinction between constructs, it can be concluded that the measurement model is robust and methodologically sound. These results confirm that each construct is adequately represented by its indicators and can be empirically distinguished from others. Therefore, the confirmed measurement structure provides a reliable basis for advancing to the structural model stage, which is designed to explore the relationships among variables and identify key factors influencing users' willingness to adopt smart home technologies in the NTB setting.

B. *Structural Model*

To assess the structural relationships among the latent variables, this study evaluated the coefficient of determination (R^2), predictive relevance (Q^2), effect size (f^2), multicollinearity (VIF), and path significance. The results indicate a strong explanatory power and robustness of the proposed model.

As shown in Table 5, the Perceived Ease of Use construct accounted for 61.3% of the variance ($R^2 = 0.613$; $Q^2 = 0.538$), primarily influenced by optimism, innovativeness, and discomfort. Similarly, Perceived Usefulness demonstrated a high level of explained variance ($R^2 = 0.751$; $Q^2 = 0.670$), which is substantially predicted by perceived ease of use, optimism, and insecurity. Lastly, the model explains 73.6% of the variance in Behavioral Intention ($R^2 = 0.736$; $Q^2 = 0.657$), suggesting the integrative TAM–TRI model effectively captures the key antecedents of users' intention to adopt IoT

based on smart home technologies.

Table 5.
Coefficient of Determination

Construct	R^2	R^2 adjusted	Q^2	T values	P values
Perceived Ease of Use	0.613	0.611	0.538	12.755	0.000
Perceived Usefulness	0.751	0.750	0.670	25.090	0.000
Behavioral Intention	0.736	0.732	0.657	20.967	0.000

The path analysis (Table 6) reveals that 8 out of 14 hypothesized relationships were statistically significant. Optimism was found to influence both perceived ease of use significantly ($\beta = 0.169$, $p = 0.007$) and perceived usefulness ($\beta = 0.173$, $p < 0.001$). Innovativeness also exhibited a strong positive effect on perceived ease of use ($\beta = 0.372$, $p < 0.001$), supporting the view that individuals who enjoy experimenting with new technologies tend to perceive innovative systems as more user-friendly. Discomfort significantly reduced perceived ease of use (β = 0.317, $p < 0.001$), while insecurity had a positive, albeit counterintuitive, relationship with perceived usefulness (β = 0.158, $p = 0.001$), possibly reflecting the belief that despite concerns, smart technologies still offer functional benefits.

Within the TAM core structure, perceived ease of use had a strong influence on perceived usefulness (β = 0.615, $p < 0.001$), and both constructs significantly contributed to behavioural intention (PEOU → BI: β = 0.165, $p = 0.013$; PU → BI: β = 0.528, $p < 0.001$). These findings reinforce the robustness of TAM in predicting user behavior in smart home adoption contexts. Among contextual variables, perceived Affordability significantly affected behavioral intention (β = 0.199, $p = 0.001$), indicating that cost considerations remain crucial in determining adoption intentions for emerging technologies in developing regions (Shin et al., 2018). However, digital literacy (β = 0.065, $p = 0.173$) and trust in vendor (β = –0.042, $p = 0.431$) did not exhibit significant direct effects. Additionally, none of the interaction effects (moderating hypotheses H12–H14) were supported, suggesting that the influence of digital literacy, Affordability, and vendor trust on behavioral intention may operate indirectly or be mediated by perceived ease of use and usefulness. The effect size (f^2) results further support the importance of perceived usefulness ($f^2 = 0.260$) and perceived ease of use ($f^2 = 0.023$–0.627), especially in mediating the impact of readiness and contextual factors. Moreover, all VIF values were below the conservative threshold of 5, indicating no multicollinearity issues. The structural model provides empirical support for the integrated TAM–TRI framework in explaining the adoption of smart home technology. The strong R^2 and Q^2 values affirm the model's explanatory and predictive relevance.

C. *Impact Performance Map Analysis (IPMA)*

To gain deeper managerial insights beyond path coefficients, this study employed IPMA (Importance Performance Map Analysis), focusing on three key outcome variables: PEOU, PU, and BI. This approach not only highlights the relative importance (total effect) of each predictor but also considers the performance levels (the mean values of the latent constructs, expressed within a standardized range between 0 and 100), thus offering a strategic view of where improvements could yield the most significant impact [37], [39], [40]. Table 7 presents the IPMA results for all predictors across the three outcomes, while Fig. 2, 3, and 4 visualize the performance-impact positioning of each construct for PEOU, PU, and BI, respectively. As shown in Table 7, *innovativeness* has the highest importance (0.372) for predicting PEOU, followed by discomfort (0.317) and optimism (0.169), suggesting that interventions aimed at fostering user enthusiasm for new technologies and reducing discomfort may significantly enhance ease-of-use perceptions. Figure 2 visually reinforces this finding by placing innovativeness in the high-importance, moderate-performance quadrant, making it a prime target for strategic enhancement.

With respect to behavioral intention, perceived usefulness stands out as the most impactful factor (importance = 0.528), followed by perceived ease of use (0.489), and perceived affordability (0.199). Figure 4 further illustrates that despite relatively high performance scores, these constructs still offer room for optimization, particularly in improving value-for-money perceptions among users. On the other hand, constructs such as trust in vendors and digital literacy show lower importance, with a negative or marginal influence, indicating a less strategic priority in the current context.

Table 6.
Path Coefficients and Hypotheses Testing Results

Hypothesis/Relationships	β	SD	T values	VIF	f square	P values	Supported
H1. Optimism -> Perceived Ease of Use	0.169	0.063	2.684	2.644	0.028	0.007	Yes
H2. Optimism -> Perceived Usefulness	0.173	0.043	3.979	2.076	0.058	0.000	Yes
H3. Innovativeness -> Perceived Ease of Use	0.372	0.079	4.725	3.193	0.112	0.000	Yes
H4. Discomfort -> Perceived Ease of Use	0.317	0.069	4.579	2.383	0.109	0.000	Yes
H5. Insecurity -> Perceived Usefulness	0.158	0.047	3.370	2.377	0.042	0.001	Yes
H6. Perceived Ease of Use -> Perceived Usefulness	0.615	0.048	12.886	2.423	0.627	0.000	Yes
H7. Perceived Ease of Use -> Behavioral Intention	0.165	0.066	2.480	4.537	0.023	0.013	Yes
H8. Perceived usefulness -> Behavioral Intention	0.528	0.074	7.091	4.061	0.260	0.000	Yes
H9. Digital Literacy -> Behavioral Intention	0.065	0.047	1.363	2.740	0.006	0.173	No
H10. Trust in Vendor -> Behavioral Intention	-0.042	0.053	0.787	2.836	0.002	0.431	No
H11. Perceived Affordability -> Behavioral Intention	0.199	0.061	3.229	3.232	0.046	0.001	Yes
H12. Perceived Affordability x Perceived Usefulness -> Behavioral Intention	-0.026	0.028	0.938	1.776	0.004	0.348	No
H13. Digital Literacy x Perceived Ease of Use -> Behavioral Intention	-0.040	0.052	0.765	2.797	0.004	0.444	No
H14. Trust in Vendor x Perceived Usefulness -> Behavioral Intention	0.066	0.070	0.949	3.034	0.010	0.343	No

Note(s): β : Path Coefficients; SD: Standard Deviation; VIF: Variance Inflation Factor;

Table 7.
IPMA Results for Perceived Ease of Use, Perceived Usefulness, and Behavioral Intention

Construct	Perceived Ease of Use		Perceived Usefulness		Behavioral Intention	
	Important	Performance	Important	Performance	Important	Performance
Optimism	0.169	72.065	0.276	72.065	0.174	72.065
Innovativeness	0.372	74.397	0.229	74.397	0.182	74.397
Discomfort	0.317	69.543	0.195	69.543	0.155	69.543
Insecurity	-	-	0.158	70.114	0.083	70.114
Perceived Ease of Use	-	-	0.615	76.332	0.489	76.332
Perceived Usefulness	-	-	-	-	0.528	74.782

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Digital Literacy	-	-	-	-	0.065	74.004
Trust in Vendor	-	-	-	-	-0.042	72.482
Perceived Affordability	-	-	-	-	0.199	75.728

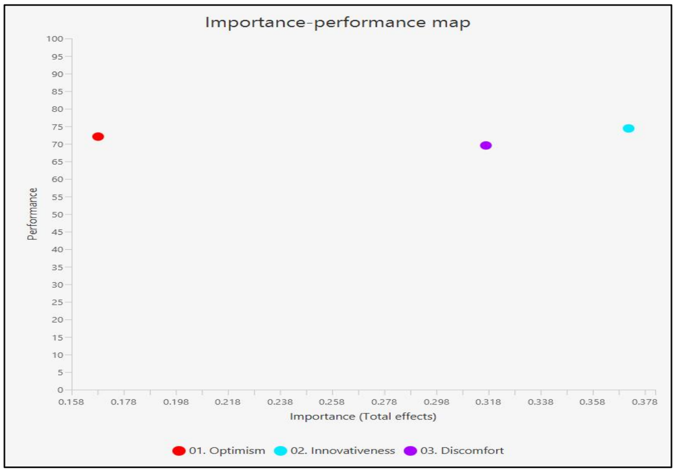

Fig 2. IPMA Result Perceived Ease of Use

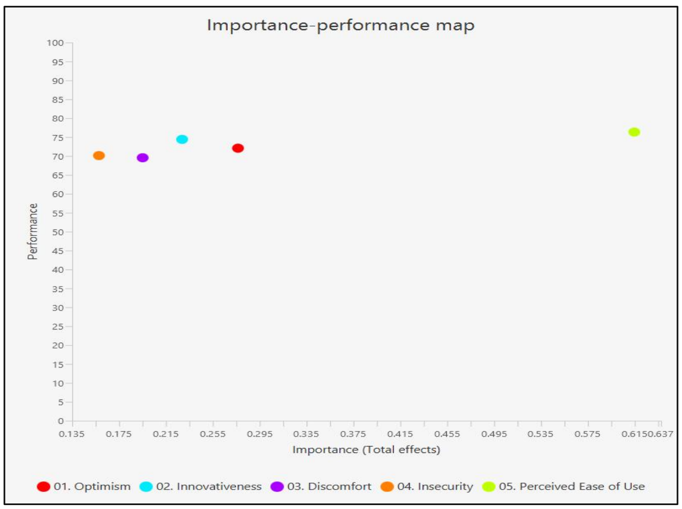

Fig 3. IPMA Result Perceived Usefulness

For perceived usefulness, the strongest predictor is perceived ease of use itself (importance = 0.615, performance = 76.332), indicating that simplifying smart home interfaces and functionalities could significantly improve perceived utility. Optimism and insecurity also contribute meaningfully, as shown in Figure 3, though their performance scores remain moderate. This issue highlights the need to boost confidence and mitigate the perceived risks associated with IoT technologies.

The findings from the IPMA emphasize the critical need to maintain equilibrium between the usability of the system (ease of use) and users' perceived value when encouraging the adoption of smart home technologies. From a practical standpoint, policymakers and IoT service providers should prioritize interventions that enhance perceived usefulness and innovativeness, while mitigating discomfort and addressing affordability concerns, to increase behavioral intention to adopt smart home solutions in Indonesia's emerging regions.

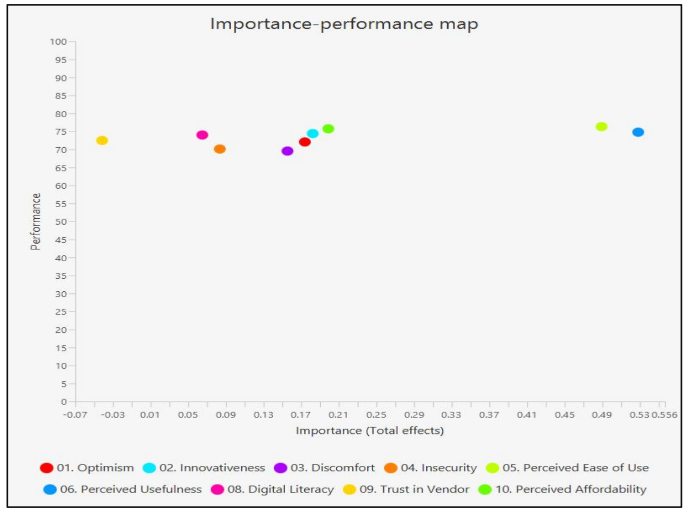

Fig 4. IPMA Result Behavioral Intention

D. Discussion

The outcomes of this research provide valuable insights into understanding the factors that influence individuals' intentions to engage with IoT-enabled smart home systems, particularly in developing areas such as West Nusa Tenggara, Indonesia. By combining the TAM and TRI, along with contextual variables such as digital literacy, trust in vendor, and perceived Affordability, the research offers a comprehensive framework to assess user readiness in a localized context. This integrative approach captures both psychological predispositions and external enablers, enabling a deeper understanding of the socio-technical dynamics that influence smart home adoption.

First, the results of structural model analysis reveal that PU is the strongest predictor of BI ($\beta = 0.528$, $p < 0.001$), aligning with prior TAM-based studies. These findings suggest that individuals are more likely to adopt smart home technologies when they clearly recognize the benefits that enhance their everyday activities. The IPMA further confirms PU's strategic importance, as it exhibits high importance and high performance in relation to behavioral intention, making it a critical area to maintain or enhance.

Second, PEOU not only directly influences behavioural intention ($\beta = 0.165$, $p < 0.05$) but also has a strong effect on PU ($\beta = 0.615$, $p < 0.001$). This result reinforces the foundational TAM assertion that technologies perceived as easy to use are more likely to be seen as applicable. From a managerial perspective, this highlights the importance of user-centric interface design and intuitive functionality in supporting seamless technology adoption. Third, psychological readiness as captured by TRI constructs such as optimism, innovativeness, and discomfort, demonstrates significant influence on PEOU. Notably, innovativeness emerges as the most impactful factor on PEOU (β = 0.372, p < 0.001), suggesting that users who are more inclined to try new technologies tend to find them easier to use. These findings are consistent with previous literature on individual dispositions toward technology adoption.

Fourth, insecurity significantly affects PU (β = 0.158, p < 0.01), indicating that users' concerns about data privacy and technology reliability can diminish their perception of a technology's usefulness. In the context of smart homes where connectivity and personal data are highly integrated building user trust through transparent data policies and security assurances becomes critical. Interestingly, contextual factors such as Digital Literacy, Trust in Vendor, and moderating interactions (e.g., PA×PU, DL×PEOU) showed no statistically meaningful impact on behavioral intention. This suggests that, within the present context, these variables may not yet be dominant in users' decision-making processes. One possible explanation is that trust in local vendors or digital fluency has not matured sufficiently to influence adoption decisions in a statistically significant manner. These results diverge from some previous studies [41], likely due to differing demographic, technological, and cultural conditions. The IPMA results offer actionable strategic insights. Constructs such as innovativeness, optimism, and perceived affordability fall into the high-importance but moderate-performance quadrant, indicating areas of potential improvement. For instance, targeted digital literacy programs and policies that support Affordability could accelerate adoption, particularly in semi-urban and rural communities. The study confirms that an integrated model comprising psychological, technological, and contextual dimensions provides a robust framework for evaluating the readiness of smart home adoption. These findings are highly relevant for local governments, tech developers, and digital service providers aiming to foster inclusive and sustainable technology adoption at the grassroots level.

E. Theoretical Implications

This study contributes to the theoretical advancement of technology adoption research by developing an integrated framework that combines the Technology Acceptance Model (TAM) and the Technology Readiness Index (TRI) with contextual variables, including digital literacy, trust in the vendor, and perceived Affordability. Unlike previous studies in advanced economies, where digital literacy and vendor trust consistently emerged as significant determinants of adoption, this study in the rural and semi-urban context of Indonesia demonstrates that their effects are not universally applicable. Such findings provide evidence that theoretical models need contextual adaptation when applied to emerging markets characterized by infrastructural limitations and socio-cultural diversity.

The results reaffirm the mediating roles of perceived ease of use and perceived usefulness, while also underscoring the differentiated influence of readiness traits: positive traits, such as optimism and innovativeness, strengthen adoption intentions, whereas negative traits, such as discomfort and insecurity, act as inhibitors. Interestingly, the insignificant effects of digital literacy and vendor trust challenge conventional assumptions, suggesting that readiness to adopt smart homes in developing regions may be shaped more by Affordability, infrastructural access, and localized cultural factors than by generic trust or literacy variables. This nuanced understanding broadens the explanatory power of TAM–TRI integration and opens new avenues for future research to explore psychological and contextual enablers and inhibitors in tandem.

F. Managerial Implications

The findings of this study offer several actionable insights for stakeholders in NTB, particularly the local government, IoT vendors, and community leaders. First, the strong influence of perceived usefulness and ease of use highlights the need for developers and vendors to adopt user-centred design principles, ensuring that smart home systems are intuitive, affordable, and able to communicate their benefits clearly. Local governments can play a crucial role in supporting awareness campaigns that emphasize usability and practical benefits for everyday life.

Second, the positive influence of optimism and innovativeness suggests that early adopter individuals, who are inclined to embrace new technologies, should be strategically targeted as community opinion leaders. By empowering these users as informal ambassadors, diffusion of innovation can be accelerated among late adopters who are more resistant. Conversely, the negative influence of discomfort and insecurity emphasizes the necessity of addressing psychological barriers through transparent communication on data privacy, security guarantees, and responsive local customer support. Third, perceived Affordability emerged as a high-impact but underperforming factor in the IPMA results, implying that economic accessibility must be prioritized. Short-term interventions may include instalment-based pricing, bundled service packages, or community-based financing schemes. In the long term, public-private partnerships could introduce targeted subsidy programs to reduce entry barriers for low- and middle-income households.

Finally, although digital literacy and trust in vendors were not statistically significant predictors, their performance levels in IPMA indicate that they remain essential for long-term sustainability. Thus, continuous digital literacy programs in schools and communities should be developed to ensure the effective use of IoT systems. Meanwhile, vendors must invest in localized trust-building strategies through reliable service delivery, fair pricing, and consistent post-sales support. By aligning these interventions with local socio-economic realities, stakeholders can enhance user readiness and promote inclusive digital transformation in NTB.

V. Conclusion

This study examined the factors influencing user readiness for IoT-based smart home adoption in Nusa Tenggara Barat (NTB), Indonesia, by integrating the Technology Acceptance Model (TAM) with the Technology Readiness Index (TRI) and contextual variables. The findings highlight that perceived usefulness and perceived ease of use are critical mediators that shape users' behavioral intentions. Among readiness traits, optimism and innovativeness positively drive adoption, while discomfort and insecurity act as inhibitors. Furthermore, perceived Affordability emerged as a pivotal determinant, underscoring the importance of economic accessibility in technology adoption. In contrast, digital literacy and trust in vendors were not statistically significant, though their IPMA performance values indicate long-term strategic relevance. The novelty of this research lies in applying the integrated TAM–TRI framework in a rural and semi-urban Indonesian context, contrasting with prior studies conducted in advanced economies. This contextualization offers new theoretical insights into how cognitive, affective, and economic factors interact to shape technology readiness. Several limitations should be acknowledged. The use of purposive sampling and a cross-sectional design limits generalizability, and the focus on a single province (NTB) may not fully represent other regions in Indonesia. Future research could adopt longitudinal approaches, conduct qualitative inquiries to explore non-significant findings such as digital literacy and trust, or pursue comparative studies across multiple provinces to capture broader socio-cultural dynamics. From a practical perspective, the findings suggest actionable strategies for policymakers and vendors. In the short term, interventions should focus on reducing psychological barriers through transparent communication on data privacy and customer support, while also addressing Affordability with subsidy schemes or instalment-based payment options for entry-level smart home products. In the long term, sustained efforts such as digital literacy training programs focused on managing IoT devices and building trust in local vendors through reliable, localized service delivery are crucial. These actions can collectively enhance user readiness and accelerate the adoption of inclusive smart homes in emerging regions of Indonesia.

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