

Determinants of Customers' Intention to Use the my TNB Mobile Application: Evidence from Malaysia's Electricity Utility Sector

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Abstract

Leveraging mobile application features, the utility industry chooses such an advantageous platform to enhance customer value, customer satisfaction, and long-term engagement through continuance usage intention. Tenaga Nasional Berhad (TNB), as the main electricity utility company in Malaysia, considers customer satisfaction one of its main concerns as an electricity energy provider, which led it to explore and adopt digitalization in its business strategy. MyTNB mobile applications, categorized under smart retail technologies, have been commercialized as a medium to provide excellent customer experiences by providing superior, personalized retail services. Continuous improvement and exceeding customers' expectations by providing mobile solutions lead to the necessity of this study, as it explores the status of the myTNB mobile applications and aligns with the company's profit and sustainability strategy. In addition, business strategy and business performance could be supported by understanding the driving factors of customers' mobile app use, including how they affect myTNB's usage intention. Hence, investigates the relationships among theory of Technology Acceptance Model (TAM), consist of Perceived Ease of Use (PEOU), Perceived Usefulness (PU) and Technological Readiness (TR) theory with customers' Attitude (ATT) and Intention to Use (ITU) myTNB mobile applications are the study focus. The data were collected from registered customers of TNB, and SmartPLS 4.0 was used for the analysis. PU and TR results positively influence the customer's ATT, which in turn influences their ITU of the myTNB mobile application. PEOU affects the customer's positive ATT. However, PEOU has no direct influence on the ITU of the myTNB mobile application.

Keywords: Utility Industry, Mytnb Mobile Applications, Usage Intention, Technology Acceptance Model (Tam), Technological Readiness (TR)

Introduction

Supported by the widespread use of the internet and mobile technologies, numerous service innovations are provided to customers today. In order to create competitive advantage in the

market, reduce costs and ultimately increase business profitability, the diversification of services offered has become increasingly important for companies, such as utility companies. Furthermore, the proliferation of smartphones drives the surge in mobile application downloads, and these programs are designed specifically for smartphone users and are becoming essential in the modern digital economy (Liu et al., 2023). Statistically, between 2016 and 2023, over 257 billion mobile applications were projected to be downloaded worldwide (Statista, 2023). Their mobility, wireless connectivity, and real-time nature are beneficial features, resulting in mobile applications gradually becoming an indispensable part of various industries. This is further compounded by the rapid growth of the mobile content market, where mobile applications have become a popular medium in the workplace, as they allow users to search the internet, manage billing, view outstanding amounts, access frequently asked questions, or submit feedback or complaints in utility service companies specifically. Moreover, 94.8% of internet users use smartphones according to the Malaysian Communications and Multimedia Commission (MCMC), as it indicates a tremendous increase in Malaysian technology awareness and familiarity with using digital tools like mobile applications. Such an increase is reflected directly in the most widely used communication and social networking platforms (Internet Users Survey, 2021). Consequently, new opportunities are undoubtedly created for many companies aligning with the remarkable growth in the mobile application market, including Tenaga Nasional Berhad (TNB). Capturing the opportunities mentioned, the myTNB mobile application offers various services as displayed on its homepage, allowing users to view their current and latest six-monthly electricity bills and even support making transactions directly via the app. Currently, for smart meter customers, they can even view the 30-minute consumption trends of their daily electricity usage. By allowing such features that cover real-time benefits, mobile payment is also available through the myTNB mobile applications, which improves customer experiences and increases TNB's collection efficiency. Hence, retailers' cash flow is more strongly affected by the higher collection efficiency they gain. The exploration of intention to use the myTNB mobile application through this study becomes significant given these business performances.

Only 6.2 million customers are recorded statistically as subscribing to the myTNB mobile application out of a total of 10.6 million customers of TNB (TNB, 2022). The balance of 4.4 million customers who are not yet considering the mobile application as a digitalization medium (TNB, 2022) might lead to communication breakdown due to less awareness or notifications that could be shared with them. In addition, TNB loses interaction with them while monitoring operations. Manual intervention still needs to be considered, which leads to higher costs than digital methods. Moreover, aligning the status of myTNB mobile applications with the company's strategies of gaining profit and sustaining in the market, knowing the factors leading to customers' mobile application usage and how it affects the usage intention of myTNB towards the company, makes this study necessary to conduct to assess the impact towards the intention of continuous improvement and exceeding their customers' expectations. In addition, this study is also significant as it allows for actions towards customers, whereby TNB can improve its mobile apps once the drivers of usage intention are assessed. This study further led to improvement of customers' experience, which makes them more likely to use the myTNB mobile app regularly with confidence due to clearer usage data, faster bill access and even more personalized features reflected by the insight from the research. Moreover, as customers can independently manage their electricity usage, payments and enquiries without a physical visit to TNB's service counter, customers'

trust towards the myTNB mobile app will increase. More customers and companies also have the visibility to obtain goods and services with transactions completed quickly and efficiently at a reduced cost of company operations, anticipated as a result of the research by the increase in mobile app users.

Existing literature centers on sectors such as banking, retail and healthcare in terms of mobile application usage. Yields strong and positive results via the Technology Acceptance Model (TAM) by Davis (1989), the area of technology adoption may not be adequate to explain on its own (Dash & Mohanty, 2023; Khashan et al., 2024). Recent studies also further suggested that behavioral intentions may not be sufficiently explained by PU and PEOU, particularly in populations with various digital readiness levels (Omar et al., 2023). Moreover, a better method of technology adoption measurement also expected when considering integrated model of TAM and technology readiness where in the situation of new technology stated by Kampa (2023). However, most of previous studies treat Technological Readiness into indirect antecedent compared to evaluated as directly influence the TAM constructs. Only limited studies assess the direct influence factors of TR toward their acceptance of technology offered such as mobile applications by Aini et al. (2024) and Ofosu-Ampong et al. (2023). This led to such limitations as Technological Readiness independent role have remained underdeveloped and insufficiently tested. In addition to the insufficiency mentioned, past studies which considered the integration of TAM and Technological Readiness (TR) into a single framework to assess mobile utility apps mentioned such limitations by particularly setting the focus on existing users who subscribe represent by Dash & Mohanty (2023), specific in m-health, followed by Kampa (2023) for m-learning subscribers. It shows that previous studies focuses on subscribers rather than the non-subscribers. This study includes both subscribers and non-subscribers, which offers a comprehensive view of perception from the customers. Compared to the study demonstrated by Cimbalević et al. (2023), which integrates the TR and Acceptance Model (TRAM), this study integrated the TR and TAM variables with technological readiness, perceived ease of use, and perceived usefulness as independent variables influencing the dependent variable, intention to use. Due to inconsistent role of attitude treated as secondary and partial mediator in past studies, further exploration with more theoretically consistent explanation required, attitude serves as the mediator in this study. Despite the practical significance earlier, the intention to use could be developed in future research, beneficial towards higher education. A more accurate measure of intention to use identified by allowing control the factors, as focusly applied single retail apps of myTNB as the study framework.

Literature Review

Underpinning Theory

TAM is one of the most common models used to examine the development of information technologies and the potential for end users to employ them (Davis, 1989, 1993; Davis et al., 1989). A cognitive model was refined by Davis (1989) through the Theory of Reasoned Action (TRA), from which TAM was proposed in the domain of information systems and shares similarities with the TRA (Fishbein and Ajzen, 1975). To evaluate an individual's acceptance of technology, including innovations such as electronic commerce, mobile commerce, social commerce, and electronic banking, TAM is commonly used based on TRA (Dash & Mohanty, 2023). Perceived ease of use and perceived usefulness are the two core cognitive components in TAM. Ferreira et al. (2023) identified the intention to use technology as determined by an

individual's acceptance of innovation, which, in turn, influences the two components. Furthermore, an individual's decision to accept and use technologies across different contexts is forecast in the most recent studies, emphasizing the significance of TR (Dash & Mohanty, 2023). In addition, the extent of TR includes capacity readiness, technology infrastructure, and innovation, which support technology adoption (Ofosu-Ampong et al., 2023). Hence, a theoretical model is conceptualized in this study by integrating TR as a general determinant into TAM to examine the potential antecedents of customers' usage intention for the myTNB mobile application in Malaysia.

Relationship between Perceived Ease of Use and Perceived Usefulness

The relationship between perceived ease of use and perceived usefulness is significant (Herzallah et al., 2022). Given their conceptual closeness yet distinct theoretical terms, an argument always arises over how to differentiate between perceived ease of use and perceived usefulness. Perceived ease of use refers to the effort required to use the system, whereas the benefits gained from using it relate to perceived usefulness. Herzallah et al. (2022) mentioned that the availability of easy-to-use websites on mobile devices attracts customers to frequently used ones, which customers readily understand. Consequently, perceived usefulness is enhanced whenever the technology or new system is found to be easy to use and understandable (Kim et al., 2023). Moreover, they found it helpful and demonstrated a positive attitude towards mobile application use when no extra effort was experienced by customers upon using the information system (S. ur Rahman et al., 2024). Hence, the following hypothesis was proposed for this study:

H1: Perceived ease of use has a positive and significant influence on perceived usefulness and intention to use the myTNB mobile application.

Relationship between Perceived Ease of Use, Attitude, and Intention to Use

Customers' attitude fundamentally shaped the relationship between perceived ease of use and intention to use mobile applications through its mediating role (Soodan et al., 2023). Furthermore, Soodan et al. (2023) specifically found that in agro-advisory mobile applications, attitude fully mediates the relationship between perceived ease of use and usage intention. By helping users stay focused on the transaction, prevent confusion, and reduce cognitive load, Anwar (2024) found that this results from a seamless experience, with smooth browsing of relevant products without transaction-related obstacles. Expanding the ease of use enables easier transactions while also resulting in a positive experience, which fosters a positive attitude towards mobile applications (Hasan 2022, Rahman et al. 2024). Moreover, in mobile applications, attitude plays a crucial role in usage intention (Soodan et al., 2023). By providing easy and less complicated features for customers, the intent to use them may increase. The following hypotheses were proposed for this study:

H3: Perceived ease of use has a positive and significant influence on intention to use the myTNB mobile application.

H7: Perceived ease of use has a positive and significant influence on the attitude of intention to use the myTNB mobile application.

H10: Attitudes positively and significantly mediate the influence of perceived ease of use on intention to use the myTNB mobile application.

Relationship between Perceived Usefulness, Attitude, and Intention to Use

Beyond the mediating role of attitude between perceived ease of use and intention to use, ElSayad (2024) noted the significant mediating role of customers' attitude between perceived usefulness and intention to use a mobile application, which forms individual intention towards actual usage. Prior to actual use, a positive attitude indicates that users are more likely to believe their lives improve, performance and usefulness through the technology (Khor et al., 2023). The perceived usefulness comes in various forms, such as through providing faster services at a lower price as compared to conventional methods (Almajal et al., 2023), health improvement through mobile health applications (Khor et al., 2023) and the structure, design and content associated with mobile applications offered (Kampa, 2023). Furthermore, Cimbaljević et al. (2023) have identified perceived usefulness as a key driver of attitudes toward technology use among individuals who feel insecure about using it. For individuals who do not perceive mobile applications or other technologies as useful, Khor et al. (2023) mentioned that they can still demonstrate a positive attitude toward them depending on the objective. Hence, a positive attitude from customers toward the usage of technology acts as an indicator of actual usage and acceptability of technology (Khor et al., 2023). Thus, the following hypotheses were proposed for this study:

H2: Perceived usefulness has a positive and significant influence on intention to use myTNB mobile application.

H6: Perceived usefulness has a positive and significant influence on the attitude of intention to use myTNB mobile application.

H9: Attitudes positively and significantly mediate the influence of perceived usefulness on intention to use the attitude of myTNB mobile application.

Relationship between Technological Readiness, Attitude, and Intention to Use

Customers' attitude further strengthens the relationship between technological readiness and intention to use mobile applications (Alhammad et al., 2023; Baltaci et al., 2024; Gopinathan, 2024). Cultural shifts in digitalization habits associated with technologies such as mobile devices and applications are cited as an effort to expand smart learning implementation (Alhammad et al., 2023). Furthermore, behavior and attitudes are influenced by the cultural shifts towards digital culture, which, in turn, shape the adoption and acceptance of new technologies (Alhammad et al., 2023). In addition, Ofosu-Ampong et al. (2023) stated that technology readiness acts as a driver of intention to use technology, and individuals are more likely to adopt technology when their level of readiness is high. It is also highlighted that managers need to deliver the essential tasks of earlier training to the required individuals for technology deployment, as it reflects the significance of technology readiness for users' behavioral intention (Ofosu-Ampong et al., 2023). Consequently, a robust theoretical framework indicates that TR alone does not directly translate into intention to use. Rather, a favorable attitude mediates this relationship. Hence, the following hypotheses were proposed for this study:

H4: Technological readiness has a positive and significant influence on intention to use the myTNB mobile application.

H8: Technological readiness has a positive and significant influence on the attitude of intention to use myTNB mobile application.

H5: Attitude has a positive and significant influence on intention to use the myTNB mobile application.

H11: Attitudes positively and significantly mediate the influence of technological readiness on intention to use the attitude myTNB mobile application.

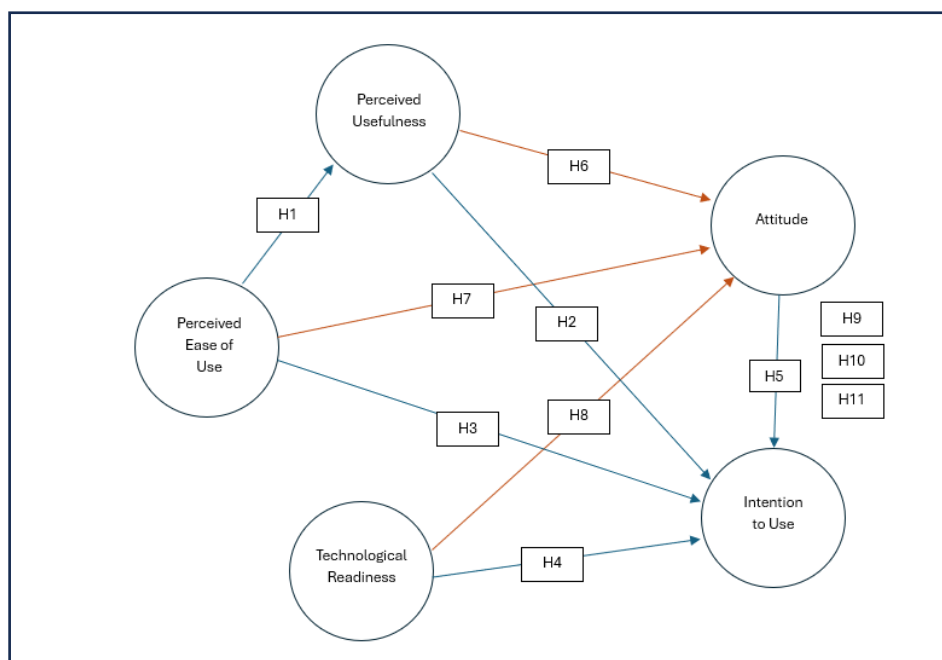


Figure 1 Research Framework

Methodology

The study investigated the direct relationships between perceived usefulness, perceived ease of use, technological readiness, and intention to use, with attitude serving as a mediator among customers of TNB. Data were collected using survey questionnaires developed to measure the constructs. The items were adapted from established scales to ensure reliability. A purposive sampling technique was employed due to the absence of a complete sampling frame. Surveys were distributed electronically via WhatsApp, email, and the Quick Response Code (QR Code) medium. A cross-sectional design was used for this study as it provides a snapshot of the population or phenomenon at a given time and offers the benefit of being time- and resource-efficient (Creswell, 2014). The target population comprises registered residential customers of TNB, 8.9 million as per TNB's annual report (TNB Annual Report, 2023). All constructs were measured using a 5-point Likert scale, which is a reliable measurement item suggested in existing literature (Jiang et al., 2021), ranging from "strongly disagree" (1) to "strongly agree" (5). Of the 533 questionnaires, 415 usable responses were obtained, yielding a high response rate. PLS-SEM using SmartPLS 4 was employed following recommended procedures for predictive modeling and mediation analysis (Hair et al., 2022; Ringle et al., 2022).

Data Analysis

Respondent's Profiles

This analysis of the respondent demographic profile for the 276 participating customers of Tenaga Nasional Berhad reveals a predominantly male sample with 157 respondents (56.9%) compared to female respondents with 119 reflects 43.1%, with the age distribution reflects the largest group was aged of 31-40 years (121, 43.8%) followed by those aged 41-50 years

(82, 29.7%), the older group of 51 years and above with 37 respondents results, 13.4%. Finally, the youngest results in the largest group age of 18-30 years (36, 13%). This was further reflected in their occupation, where the majority of respondents were company staff, the largest segment (219, 79.3%), followed by self-employed (25, 9.1%), while those were fewer represented by government staff and others, with the same number of respondents with 13 respondents for each group (4.7%), and students, with six respondents (2.2%) as minorities. In term of monthly income, the sample was overwhelming composed of income group above RM5000 (120, 43.5%) followed by the monthly income group of between RM3000 to RM5000 (92, 33.3%), between RM1500 to RM2999 with 43 respondents (15.6%) and below RM1500 constituting only a small portion of it by 21 respondents with 7.6%, indicating that higher monthly income perspective are most representative in the findings.

Measurement Model Assessment

Prior to evaluating structural relationships, the measurement model was assessed to ensure the reliability and validity of the constructs through internal consistency, convergent validity, and discriminant validity. All variables, as summarized in Table 1, had Cronbach's alpha coefficients greater than 0.70, exceeding the recommended threshold of 0.70 (Hair et al., 2021) and indicating satisfactory item reliability.

For the composite reliability (CR), the internal consistency reliability was evaluated composite reliability results were greater than 0.70, confirming adequate reliability. For convergent validity, the average variance extracted (AVE) was assessed, with all constructs exceeding the recommended threshold of 0.50. Thus, the constructs explained more than half of the variance of their respective indicators.

Table 1
Construct Reliability & Validity and Item Loadings

Construct	Items	Loadings	CR	CA	AVE
Perceived Usefulness	USE1	0.737	0.863	0.860	0.642
	USE2	0.800			
	USE3	0.850			
	USE4	0.798			
	USE5	0.818			
Perceived Ease of Use	EOU1	0.673	0.851	0.844	0.619
	EOU2	0.804			
	EOU3	0.830			
	EOU4	0.762			
	EOU5	0.852			
Technological Readiness	TR1	0.811	0.851	0.840	0.611
	TR2	0.752			
	TR3	0.684			
	TR4	0.833			
	TR5	0.817			
Attitude	ATT1	0.866	0.893	0.892	0.699
	ATT2	0.825			
	ATT3	0.861			
	ATT4	0.811			
	ATT5	0.814			
Intention to Use	ITU1	0.796	0.863	0.852	0.628
	ITU2	0.725			
	ITU3	0.828			
	ITU4	0.775			
	ITU5	0.832			

Notes: CA= Cronbach's Alpha CR= Composite Reliability AVE= Average Variance Extracted

Both the Fornell-Larcker criterion and Heterotrait-Monotrait (HTMT) ratios were used to verify the discriminant validity. As presented in Table 2, the square roots of AVE for each construct were greater than the inner-construct correlations. This indicates that the Fornell-Larcker requirement is satisfied. Furthermore, as depicted in Table 3, the Heterotrait-Monotrait (HTMT) ratio values were below the threshold of 0.90. Thus, the discriminant validity is confirmed.

In addition, variance inflation factors (VIF) were used to assess multicollinearity. As illustrated in Table 4, all the inner VIF values presented were within 1.000 and 2.910, which are less than 3.0 (Hair et al., 2020a), indicating the absence of multicollinearity concerns. Satisfactory reliability and validity were demonstrated based on the measurement model. Structural model evaluation progression was supported.

Table 2

Fornell-Larcker Criterion

	ATT	EOU	ITU	TR	USE
ATT	0.836				
EOU	0.727	0.787			
ITU	0.808	0.673	0.792		
TR	0.734	0.714	0.702	0.781	
USE	0.683	0.668	0.638	0.628	0.801

Table 3

Heterotrait-Monotrait (HTMT) Ratios

	ATT	EOU	ITU	TR	USE
ATT					
EOU	0.836				
ITU	0.855	0.724			
TR	0.836	0.836	0.760		
USE	0.777	0.779	0.707	0.732	

Table 4

Inner VIF Values

Path	Inner VIF	Decision
ATT -> ITU	2.910	< 5 -> Acceptable
EOU -> ATT	2.438	< 5 -> Acceptable
EOU -> ITU	2.700	< 5 -> Acceptable
EOU -> USE	1.000	< 5 -> Acceptable
TR -> ATT	2.229	< 5 -> Acceptable
TR -> ITU	2.601	< 5 -> Acceptable
USE -> ATT	1.971	< 5 -> Acceptable
USE -> ITU	2.164	< 5 -> Acceptable

Structural Model Assessment

This study evaluated the structural model through a simultaneous assessment of pathway coefficients (β) AND R-squared (R^2) values, employing the methodological framework established by Hair et al. (2017). Utilizing the Partial Least Squares (PLS) approach, the analysis applied a bootstrap resampling procedure with 10,000 iterations to determine the statistical significance of the path coefficients. Table 5 comprehensively summarizes hypothesis-testing outcomes, including the beta values, t-statistics, p-values and corresponding confidence intervals. These values provide robust evidence of the magnitude, direction, and statistical reliability of the proposed relationships. The overall validity and explanatory power of the research model are supported by the rigorous analytical process, as the substantive connection between constructs is confirmed. Demonstrating a clear pattern of relationships, the hypothesis results reveal: *H1* (EOU -> USE) was accepted with a significant positive effect ($\beta = 0.668$, $t = 19.898$, $p = 0.001$, CI: 0.597 to 0.729), confirming that Perceived Ease of Use enhances Perceived Usefulness with a strong direct effect. *H2* (USE -> ITU) was accepted with a significant positive effect ($\beta = 0.125$, $t = 2.013$, $p = 0.044$, CI: 0.006 to 0.247), confirming that Perceived Usefulness enhances Intention to Use. *H6* (USE -> ATT) was accepted ($\beta = 0.258$, t

= 4.526, $p = 0.001$, CI: 0.146 to 0.370), confirming that it boosts Attitude, leading to the accepted mediation in *H9* (USE → ATT → ITU; $\beta = 0.131$, $t = 3.975$, $p = 0.001$, CI: 0.074 to 0.207). *H3* (EOU → ITU) was rejected due to statistical insignificance ($\beta = 0.041$, $t = 0.570$, $p = 0.569$, CI: -0.101 to 0.176), indicating no direct effect of Perceived Ease of Use on Intention to Use. Meanwhile, *H7* (EOU → ATT) was accepted with a positive effect ($\beta = 0.300$, $t = 4.914$, $p = 0.001$, CI: 0.182 to 0.422), confirming that Perceived Ease of Use enhances Attitude. *H10* (EOU → ATT → ITU) was accepted, indicating a significant indirect effect ($\beta = 0.152$, $t = 3.839$, $p = 0.001$, CI: 0.087 to 0.245), establishing Attitude as a full mediator. *H4* (TR → ITU) was accepted with a positive effect ($\beta = 0.169$, $t = 2.023$, $p = 0.043$, CI: 0.004 to 0.330), confirming the direct effect of Technological Readiness on Intention to Use. *H8* (TR → ATT) was accepted with the strongest effect on the mediator ($\beta = 0.357$, $t = 5.786$, $p = 0.001$, CI: 0.234 to 0.475), establishing Technological Readiness as a key driver of Attitude. *H5* (ATT → ITU) was accepted with the model's strongest direct effect ($\beta = 0.507$, $t = 6.308$, $p = 0.001$, CI: 0.349 to 0.664), solidifying Attitude as the paramount predictor of Intention to Use. *H11* (TR → ATT → ITU) was accepted ($\beta = 0.181$, $t = 3.888$, $p = 0.001$, CI: 0.100 to 0.284), demonstrating Attitude's partial mediation between Technological Readiness and Intention to Use. All accepted hypotheses were validated by p -values < 0.05 and confidence intervals excluding zero.

Table 5

Hypothesis Testing Results

Hypothesis	Beta	T-statistics	p-values	2.50%	97.50%	Decision
H1: EOU → USE	0.668	19.898	0.001	0.597	0.729	Accepted
H2: USE → ITU	0.125	2.013	0.044	0.006	0.247	Accepted
H3: EOU → ITU	0.041	0.570	0.569	-0.101	0.176	Rejected
H4: TR → ITU	0.169	2.023	0.043	0.004	0.330	Accepted
H5: ATT → ITU	0.507	6.308	0.001	0.349	0.664	Accepted
H6: USE → ATT	0.258	4.526	0.001	0.146	0.370	Accepted
H7: EOU → ATT	0.300	4.914	0.001	0.182	0.422	Accepted
H8: TR → ATT	0.357	5.786	0.001	0.234	0.475	Accepted
H9: USE → ATT → ITU	0.131	3.975	0.001	0.074	0.207	Accepted
H10: EOU → ATT → ITU	0.152	3.839	0.001	0.087	0.245	Accepted
H11: TR → ATT → ITU	0.181	3.888	0.001	0.100	0.284	Accepted

Note: Significance < 0.05

Effect Sizes (f^2)

Table 6 presents the effect sizes (f^2) interpreted using Cohen's (1992) guidelines, which reveal varying magnitudes of influence among the constructs. Perceived Ease of Use (EOU) demonstrates negligible effects on Intention to Use (ITU, $f^2 = 0.001$) while small effects on Attitude (ATT, $f^2 = 0.107$). Technological Readiness (TR) exhibits small effects on ITU ($f^2 = 0.027$) and a medium effect on ATT ($f^2 = 0.166$). Perceived Usefulness (USE) exerts a small effect on

both ITU ($f^2 = 0.017$) and ATT ($f^2 = 0.098$). Most notably, Attitude (ATT) has a large effect on Intention to Use ($f^2 = 0.215$), underscoring its substantial predictive power in the model.

Table 6

Effect Sizes (f^2)

	ITU	ATT
EOU	0.001	0.107
TR	0.027	0.166
USE	0.017	0.098
ATT	0.215	

PLSpredicts

Following Shmueli et al. (2016, 2019), the predictive power of the model was assessed following the PLSpredict procedure. The column PLS-LM showed that 10 items have negative values out of 14, which reflects that more than 50% of the results are negative values. The negative sign is caused by the lower RMSE values of PLS than LM. Shmueli et al. (2019) stated that PLS-SEM analysis (compared to LM) yields lower prediction errors in terms of RSME, resulting in high predictive power. Thus, this provides strong evidence that the model possesses high predictive relevance, confirming its robustness for explaining the endogenous constructs.

Table 7

PLSpredicts

	Q ² predict	PLS-RMSE	LM-RMSE	PLS-LM
USE1	0.197	0.625	0.623	0.002
USE2	0.248	0.645	0.65	-0.005
USE3	0.297	0.501	0.494	0.007
USE4	0.335	0.546	0.543	0.003
USE5	0.321	0.489	0.486	0.003
ATT1	0.468	0.431	0.438	-0.007
ATT2	0.373	0.521	0.532	-0.011
ATT3	0.447	0.417	0.431	-0.014
ATT4	0.425	0.517	0.529	-0.012
ATT5	0.411	0.442	0.447	-0.005
ITU2	0.213	0.689	0.713	-0.024
ITU3	0.385	0.568	0.571	-0.003
ITU4	0.248	0.63	0.65	-0.02
ITU5	0.325	0.497	0.503	-0.006

Discussion & Conclusion

Discussion

Based on the empirical findings of this study, Tenaga Nasional Berhad (TNB), as a dominant institution in the electricity industry in Malaysia, must adopt a comprehensive strategy to enhance the intention to use of myTNB mobile applications. This aligns with its business and marketing strategy objectives by leveraging the significant mediating role of attitude, which demonstrated the strongest direct effect on intention to use ($\beta = 0.507$). This indicates that targeting attitude among Tenaga Nasional Berhad customers will yield the most substantial improvements in their intention to use myTNB mobile applications. The results confirm that both perceived usefulness and technological readiness significantly support the intention to use myTNB mobile applications, either directly or indirectly through customers' attitudes.

Customers are more willing to use the application when they perceive that it improves their performance through convenient features, including bill payment, consumption monitoring, outage notifications, and other features that support their daily activities. Furthermore, individuals with higher technological readiness tend to embrace digital utility services more readily due to their mental preparedness and comfort with new technologies. Emerged as the strongest predictor of intention to use, indicating that favorable evaluations and positive feelings toward myTNB will substantially increase adoption intentions. Institutions like TNB must establish robust, supportive frameworks to amplify technological readiness among individuals in Malaysia, specifically by considering collaborations with the government and other business players in the electrical industry. This is evidenced by the strongest direct effect on attitude ($\beta = 0.357$) alongside a significant direct effect on intention to use ($\beta = 0.169$). Furthermore, although perceived ease of use did not directly influence the intention to use ($\beta = 0.041$), it significantly boosted attitude ($\beta = 0.300$), which subsequently enhanced intention to use through mediation. Theoretically, the evolving role of usability in technology usage can explain the insignificance of perceived ease of use towards intention to use. Ease of use could be one of the critical barriers in earlier stages of digital adoption, where it determines whether engagement exists within the system. However, aligning with the increase in smartphone penetration, customers are more familiar with mobile applications, thus reducing the ease of use as a differentiating factor. Therefore, TNB should systematically demonstrate the digital tools that are compatible with usage to reduce the complexity customers might experience when considering using their mobile application platform, myTNB. The lack of a direct relationship between perceived ease of use and intention to use may also indicate that perceived ease of use operates indirectly through perceived usefulness to shape usage intention. This supports the context of myTNB that ease of use alone is not sufficient to secure intention, but that the benefits behind it should be highlighted as the primary reason for usage.

Theoretical Implications

This study offers significant theoretical implications by successfully integrating the Technology Acceptance Model (TAM) (Davis, 1989) with the Technology Readiness Theory to create a more nuanced understanding of intention to use in mobile application settings. While both theories have been applied independently, their synthesis provides novel insights into how technology perceptions and individuals' readiness toward technology function within broader utility industry frameworks. The findings demonstrate that the integration addresses an important theoretical gap by offering a more comprehensive understanding of how

technology acceptance factors act as psychological mechanisms that interact to influence behavioral intention through attitude as a mediating variable. The non-significant direct relationship between perceived ease of use and intention to use suggests that, even when technologies are perceived as easy to use, hidden cognitive demands may simultaneously emerge and mitigate behavioral intention. Despite the existing integration of both models in the Technology Readiness and Acceptance Model (TRAM), this study broadens the theoretical understanding of how technologically ready individuals develop stronger intentions to use mobile applications through positive attitude formation. Additionally, the strong influence of technological readiness support underscores the importance of relational aspects in mobile application behavioral intention environments, expanding TAM's classification to include readiness resources as critical components in mediated settings for future theoretical development.

Practical Implications

This section provides important practical implications for Tenaga Nasional Berhad (TNB). It strengthens the adoption and utilization of the myTNB mobile application among its customers. Throughout the study, the findings suggest that understanding the determinants of customers' intention to use the application is crucial in designing more effective digital engagement strategies. As a key channel for customer interaction, TNB can use the study's insights to improve the myTNB mobile application experience, increase adoption, and strengthen long-term customer relationships. Furthermore, the study findings align directly with TNB's digitalization agenda, supporting its commitment to achieving Net Zero 2050 goals by encouraging customers to actively monitor and manage their electricity consumption through digital platforms. In addition, such promotion of greater usage of myTNB and paperless transactions can be facilitated by TNB to align with energy awareness improvement and encourage customers to be responsible for their consumption behavior, which could contribute to environmental sustainability and carbon footprint reduction. Additionally, several opportunities for functionality enhancement and the attractiveness of the myTNB mobile application were also highlighted through the study findings. Customer attitude was identified as a key factor influencing usage intention. Prioritizing user-centric innovations could improve customer perceptions and experiences. Gamification, reward mechanisms, energy-saving challenges, and personalized consumption insight features can encourage greater engagement and behavioral change among users. An increase in myTNB mobile application adoption could generate significant operational benefits for TNB, which come from reducing physical billing dependency, manual meter reading, and conventional customer service channels through operational cost reduction, service delivery improvement, and enhanced organizational performance. Moreover, aligning with the regulatory requirements is supported by the myTNB mobile application usage, such as e-invoicing initiatives, while enabling customers, including smart meter users and solar energy prosumers, to effectively manage their energy usage, achieving greater value for both customers and TNB.

Industrial Implications

In a broader view, the findings of this study provide implications for the electricity utility industry and other service sectors undergoing digital transformation. The findings emphasize the need for organizations to adopt a customer-centric approach when developing and implementing mobile applications as part of their business strategy. Instead of focusing only

on technology capabilities such as system performance, compatibility, and functionality, industry players should not overlook customers' attitudes, emotions, beliefs, and needs. The results indicate that the success of digital transformation depends not only on technological advancement but also on digital platforms' ability to create meaningful, engaging user experiences. Moreover, mobile applications can serve as strategic tools and media for sustainable energy behaviors, boost customer participation in energy management, and directly support the national aspiration for a cleaner energy transition in the utility sector. This positions mobile applications as a value-creation mechanism that drives long-term customer engagement, rather than a transactional service medium. Beyond the utility sector, the study demonstrates the potential of mobile applications to evolve into an integrated digital ecosystem that provides comprehensive customer solutions through cross-industry collaborations. Creating partnerships with financial institutions could be considered by utility providers or even other industry players, such as automotive companies and smart home technology providers, to offer bundled and value-added services that enhance customer convenience and experiences. However, cybersecurity and data protection remain critical concerns as digitalization expands, exposing organizations to data breaches and cyber threats. Furthermore, investing in technological capabilities, employee training, and change management initiatives that address these challenges holistically helps maximize the benefits of mobile technologies and maintain long-term competitiveness in an increasingly digital economy.

Suggestions for Future Studies

Based on this study, several directions for future research are proposed. First, the adoption of longitudinal research designs is encouraged to overcome the limitation of cross-sectional studies, as the examination of behavioral changes over time is possible with a longitudinal approach. It provides stronger evidence of causal relationships and a more comprehensive understanding of the evolving nature of mobile application adoption. Second, future researchers should adopt mixed-method or qualitative approaches, such as interviews and focus group discussions, to gain deeper insights into customers' perceptions, emotions, experiences, and motivations for mobile application adoption. Third, the existing research model should be extended for future research by incorporating other relevant variables, such as subjective norms, trust, loyalty, enjoyment, rewards and organizational perceptions of innovation, to achieve a more comprehensive understanding of related factors influencing attitude, behavior, and intention toward adoption. Fourth, investigating continuance usage behavior is the next suggestion for future research, as it allows identification of factors that drive long-term engagement with mobile applications. This suggested future study will further contribute to customer satisfaction and loyalty. Finally, a comparative study involving other utility providers will provide broader practical insights for such industries, particularly those operating in more competitive environments, as well as different application domains.

Conclusion

This study successfully establishes that perceived usefulness and technological readiness significantly influence both attitude and customers' intention to use myTNB mobile applications. Integrating TAM and TR theory provides a robust framework showing that attitude emerged as a strong predictor of intention to use and a significant mediator linking perceived ease of use and intention to use. While perceived ease of use boosts attitude, its lack of direct effect on intention to use underscores the complex nature of technology

adoption. Moreover, knowing that technological readiness is the strongest predictor of attitude, such investments that boost technological readiness among customers influence the customers' intention to use myTNB mobile applications. Consequently, this research suggests that strategies to increase customers' behavioral intention to use myTNB mobile applications should simultaneously build technology perceptions, whether system-specific or personality-based, to foster a positive attitude that translates into more mobile application subscribers. Thus, more customers and businesses can access goods and services conveniently.

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