DIGITAL FINANCE TOOLS AND FINANCIAL INCLUSION IN MALAYSIA: AN ANALYSIS BASED ON SURVEY DATA

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ABSTRACT

Digital finance has become a transformative force in the financial services sector, driving innovation and promoting global financial inclusion. Financial inclusion refers to providing affordable and appropriate financial services, which are essential for economic growth, poverty reduction, and social equality. In Malaysia, limited empirical evidence exists on how digital finance tools influence financial inclusion. This study aims to examine the relationship between digital financial tools, specifically mobile banking, internet banking, and e-wallets, with financial inclusion across diverse demographic groups in Malaysia. A quantitative, cross-sectional design was employed, with data collected from 211 randomly selected respondents representing various age groups, income levels, education backgrounds, and both urban and rural areas. Data were gathered through an online questionnaire distributed via Google Forms and analyzed using SPSS. Findings indicate that digital finance tools significantly contribute to financial inclusion in Malaysia. These insights are valuable for policymakers, financial institutions, and technology providers seeking to enhance inclusion through digital solutions. The study also highlights challenges and opportunities in promoting adoption across different societal segments. Future research should explore emerging financial technologies and strategies to bridge digital divides within diverse cultural and socioeconomic contexts.

Keywords: *Digital finance, financial inclusion, mobile banking, internet banking, e-wallets.*

INTRODUCTION

Since 2010, initiatives by the G-20 and World Bank have aimed to reduce poverty through improved access to financial services in developing economies. Despite progress, approximately 1.4 billion adults worldwide remain unbanked (World Bank, 2022). Digital financial services (DFS) including mobile banking, e-wallets, and fintech platforms—bridge this gap by providing affordable, convenient, and inclusive financial solutions. These technologies overcome geographical barriers, enabling individuals in remote areas to access essential services without physical branches. Successful models like M-Pesa in Kenya illustrate how mobile money can lift households out of poverty and empower marginalized groups, particularly women and rural communities.

Financial inclusion, defined as access to affordable and appropriate financial services, is critical for economic growth, poverty alleviation, and social equality. Digital finance fosters entrepreneurship, job creation, and income equality by making credit and savings accessible to underserved populations. However, challenges persist: low digital literacy, cybersecurity risks, regulatory complexities, and infrastructure gaps hinder widespread adoption. A balanced

regulatory framework is essential to protect consumers while promoting innovation (Financial Stability Board, 2023).

In Malaysia, digital finance offers significant opportunities to close financial gaps among underserved populations. While urban and younger demographics rapidly adopt mobile banking and e-wallets, rural communities, older individuals, and low-income groups lag due to connectivity issues, mistrust, and limited digital literacy. Approximately 25% of adults in rural areas remain unbanked despite mobile banking growth (Ali et al., 2022). This digital divide exacerbates socio-economic inequalities and restricts inclusive economic growth. Moreover, many underprivileged groups such as women and micro-entrepreneurs still lack access to savings, credit, and insurance products. Barriers include poor infrastructure, fear of fraud, and inadequate financial literacy initiatives.

Government programs like e-wallet incentives, public-private partnerships, and fintech innovations (e.g., microinsurance and flexible lending) present opportunities to enhance inclusion. Companies such as Touch ‘n Go and Boost have popularised e-wallets among younger consumers, while tech firms develop affordable products for underserved segments like the B40 group. To fully realise digital finance’s potential, Malaysia must address infrastructure gaps, literacy challenges, and trust issues while strengthening regulatory frameworks. This study seeks to identify factors influencing the adoption and effectiveness of digital finance in promoting financial inclusion, aligned with Malaysia’s Financial Sector Blueprint (2022–2026), and provide actionable recommendations for policymakers and financial institutions.

LITERATURE REVIEW

Financial Inclusion

Financial inclusion refers to providing affordable and accessible financial services to all, especially underserved and low-income populations. It is vital for economic growth and poverty reduction, enabling individuals to save, borrow, and manage risks effectively (Demirguc-Kunt et al., 2022). Aligned with the UN Sustainable Development Goals, it promotes inclusive growth and empowers marginalized groups, particularly women and rural communities (Allen et al., 2020; Klapper et al., 2022). Microfinance and digital tools have shown positive impacts on women’s entrepreneurship and household welfare (Bateman & Chang, 2020).

Despite benefits, barriers persist: financial illiteracy, geographic isolation, and trust issues hinder adoption (Mader, 2020; Bhanot et al., 2021). Financial inclusion involves three dimensions access, usage, and quality (Beck et al., 2020). Digital finance significantly improves inclusion by reducing transaction costs and expanding access through mobile banking, e-wallets, and fintech platforms (Singh & Kumar, 2022; Tang et al., 2021). Mobile money services have boosted financial access for micro and small enterprises (MSEs), fostering business growth and job creation (Hassan et al., 2022; Suri & Jack, 2021).

Financial Inclusion in Malaysia

Malaysia has achieved over 95% access to formal financial services, driven by Bank Negara Malaysia (BNM) initiatives and digital transformation (BNM, 2023). Key strategies include

the National Financial Inclusion Framework, agent banking programs like MyWIRA, and digital payment systems such as DuitNow and JomPAY (Abdullah et al., 2022; Liew et al., 2023). Financial literacy programs target youth, women, and rural communities (Rahman et al., 2023). Challenges remain: rural areas face poor connectivity, low digital literacy, and trust issues, while cybersecurity concerns persist (Ismail et al., 2021; Hassan et al., 2023). Addressing these requires infrastructure development, stronger security, and collaborative efforts among stakeholders.

Digital Finance Tools

Internet & Online Banking: Platforms like Maybank2u and CIMB Clicks enable remote transactions, benefiting individuals and businesses (Gomber et al., 2020; Ahmad et al., 2023). Adoption exceeds 80%, but cybersecurity threats and digital illiteracy hinder full usage (Rahman et al., 2023)- E-Wallets: Services such as Touch ‘n Go, Boost, and GrabPay promote inclusion among youth and unbanked populations. Government programs like e-Tunai Rakyat encourage adoption (MDEC, 2021; Wong et al., 2023). Barriers include low literacy and uneven rural adoption (Abdullah et al., 2021).

This study seeks to explore research based on the conceptual framework in Figure 1. The hypotheses development is also displayed in Figure 1 and the statement below:

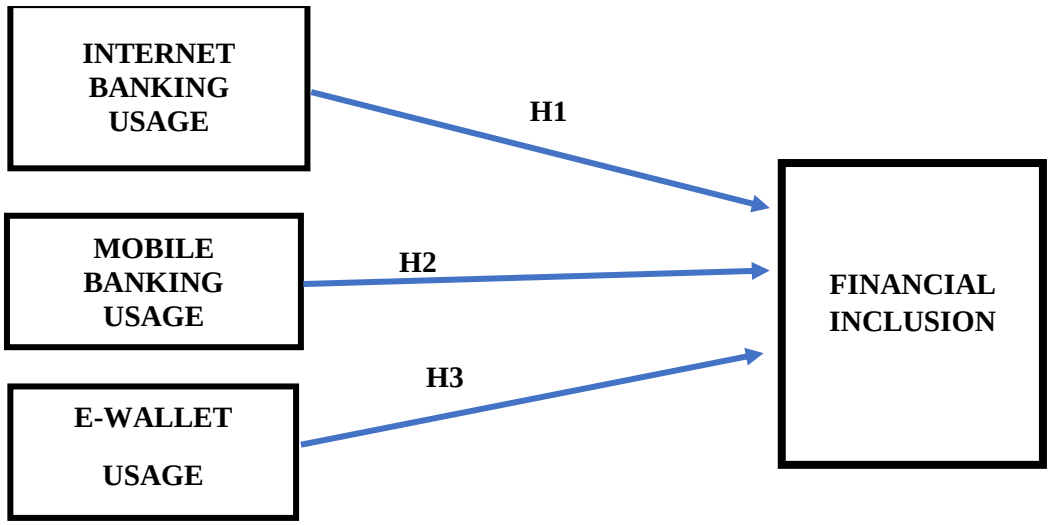
H1: There is a significant relationship between internet banking usage and financial inclusion.
H2: There is a significant relationship between mobile banking usage and financial inclusion.
H3: There is a significant relationship between e-wallet banking usage and financial inclusion.

UNDERPINNING THEORY

Technology Acceptance Model

The Technology Acceptance Model (TAM), proposed by Davis (1989), focuses on two primary factors influencing technology adoption: perceived usefulness (the extent to which users believe the technology will enhance their performance) and perceived ease of use (the degree to which the technology is free from effort). TAM posits that these factors influence users' attitudes toward the technology, which subsequently affects their behavioural intention to use it. Recent extensions of TAM by Venkatesh et al. (2021) incorporate external variables, such as social influence and facilitating conditions, to analyse the acceptance of digital finance platforms. This model is particularly useful for understanding user behavior.

Figure 1: The Conceptual Framework



Data Collection Method

The research employs a survey strategy, using structured questionnaires to gather data from individuals who use digital finance tools. The target population for this study includes adults aged 18 and above who have access to mobile banking, internet banking, or e-wallet services. The demographic spans urban and rural areas across Malaysia, ensuring a diverse user base. This demographic is selected as it encompasses individuals who are most likely to benefit from digital finance tools, thereby providing valuable insights into their impact on financial inclusion. According to the World Bank (2022), financial inclusion initiatives often target these groups due to their potential for economic empowerment. The final sample consisted predominantly of respondents aged 26.10 45 years, with high representation from individuals holding diplomas or bachelor's degrees and earning between RM3,001 and RM5,000 monthly. Gender distribution was nearly balanced, and the sample included both urban and rural residents, providing diverse perspectives on digital finance adoption.

The questionnaire includes both closed-ended and Likert-scale questions, ranging from 1 (strongly disagree) to 5 (strongly agree), to quantify user experiences and perceptions. The survey is administered online and in-person to ensure accessibility for respondents across various regions. The questionnaire is adapted from validated instruments used in similar studies, such as those by Allen et al. (2016), to enhance reliability and validity.

Variables

The dependent variable in this study is financial inclusion, defined as the provision of affordable, accessible and sustainable financial services to all individuals, particularly underserved, unbanked and low-income populations. Among the respondents, the measurement is through questionnaire regarding the respondents' perception and outcome when using digital finance tools.

For independent variables, it consists of digital finance tools such as internet banking, online banking and e-wallet. The respondents were asked about each digital finance tool about their adoption, and perception of different forms of technology-based banking and payment systems.

DATA ANALYSIS

Descriptive Analysis

A descriptive analysis was conducted to examine the demographic characteristics of the respondents. A total of 211 respondents were selected for participation in the study using a Google Form online survey. The selection process aimed to gather a diverse sample from various backgrounds, ensuring respondents met the general criteria relevant to the topic of digital finance usage and financial inclusion. The questionnaire was structured into six distinct sections. Section A focused on collecting demographic information from the respondents. Sections B through F explored key constructs of the study, namely: access to digital finance (Section B), frequency of use (Section C), satisfaction with digital finance (Section D), financial inclusion outcomes (Section E), and recommendation preferences (Section F). Table 1 shows the demographic details of each respondent. It shows that most respondents were between 20 and 29 years old, male, self-employed, with a monthly income between RM 5,000 and RM 6,999 and lived in urban areas.

Table 1: Respondent Demographic Details

Demographic Item	Categories	Frequency	Percentage (%)
Age	Below 20	16	7.5
	20-29	63	29.9
	30-39	42	19.9
	40-49	63	29.9
	50 and above	27	12.8
Gender	Male	109	51.7
	Female	102	48.3
Occupation	Student	21	10
	Government Sector	52	24.6
	Private Sector	54	25.6
	Self-employed	58	27.5
	Unemployed	26	12.3
Monthly income	Less than RM 1,000	23	10
	RM 1,000 – RM 2,999	46	21.8
	RM 3,000 – RM 4,999	51	24.2
	RM 5,000 – RM 6,999	69	32.7
	RM 7,000 – and above	22	10.4
Area of Residence	Urban	104	50.7
	Rural	107	49.3

Descriptive Statistics

Figure 1: Descriptive Statistics

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Internet_Banking_Score	211	1.75	4.50	2.9763	.58557
Mobile_Banking_Score	211	1.50	4.75	2.9538	.65551
Ewallets_Banking_Score	211	1.50	4.75	2.9882	.61854
Financial_Inclusion_Score	211	1.80	4.60	3.0218	.53603
Valid N (listwise)	211				

Referring to Figure 2, the descriptive statistics provide an overview of the central tendency and variability in the key variables related to digital finance usage and financial inclusion among the 211 respondents. The Internet Banking Score ranges from a minimum of 1.75 to a maximum of 4.50, with a mean score of 2.98 and a standard deviation of 0.59. This indicates that, on average, respondents exhibit a moderate level of engagement with internet banking services, with some variability in usage intensity.

Similarly, the Mobile Banking Score varies between 1.50 and 4.75, with a mean of 2.95 and a standard deviation of 0.66. This suggests a comparable level of moderate usage of mobile banking platforms, though with slightly greater variation among individuals compared to internet banking. The E-wallet Banking Score ranges from 1.50 to 4.75, with a mean of 2.99 and a standard deviation of 0.62, indicating that e-wallet usage among respondents is also moderate and consistent with the patterns observed in the other digital finance tools.

The Financial Inclusion Score represents the overall level of financial inclusion. The mean score reflects that, on average, the respondents experience a fair degree of financial inclusion, though some variability exists across the sample.

Overall, these descriptive statistics suggest that digital finance services-internet banking, mobile banking, and e-wallets are moderately adopted within the sample, and that financial inclusion is generally moderate as well. The consistency in mean scores across the digital finance variables highlights a balanced engagement with various digital platforms, providing a foundational context for further analysis of their impact on financial inclusion.

Reliability Test

The reliability of the measurement items in this study was assessed using Cronbach's Alpha, resulting in a score of 0.705. This value indicates an acceptable level of internal consistency among the items used to measure the constructs of Internet Banking, Mobile Banking, E-wallet Usage, and Financial Inclusion. In the context of social science research, a Cronbach's Alpha value above 0.70 is generally considered satisfactory, meaning the questionnaire items are consistently interpreted by respondents. This result ensures that the scale used to measure the digital financial services and financial inclusion is statistically reliable and appropriate for further analysis.

The reliability of the measurement tool is crucial, as it directly supports the validity of the findings in this study. A reliable scale means that the responses are not random or inconsistent, and that the composite scores (e.g., Internet Banking Score or Financial Inclusion Score) accurately reflect real patterns in user behaviour and access. The reliability confirmed by this analysis strengthens the credibility of the subsequent statistical tests (e.g., correlations and regressions) used to examine the relationships between digital finance tools and financial

inclusion. Therefore, the Cronbach's Alpha result of 0.705 plays a foundational role in validating the overall research framework.

Correlation Analysis

Table 2: Correlation Analysis

Correlations

		Internet_Banking_Score	Mobile_Banking_Score	Ewallets_Banking_Score	Financial_Inclusion_Score
Internet_Banking_Score	Pearson Correlation	1	.747**	.754**	-.017
	Sig. (2-tailed)		<.001	<.001	.803
	N	211	211	211	211
Mobile_Banking_Score	Pearson Correlation	.747**	1	.777**	-.112
	Sig. (2-tailed)	<.001		<.001	.104
	N	211	211	211	211
Ewallets_Banking_Score	Pearson Correlation	.754**	.777**	1	-.059
	Sig. (2-tailed)	<.001	<.001		.395
	N	211	211	211	211
Financial_Inclusion_Score	Pearson Correlation	-.017	-.112	-.059	1
	Sig. (2-tailed)	.803	.104	.395	
	N	211	211	211	211

**. Correlation is significant at the 0.01 level (2-tailed).

The Pearson correlation analysis was conducted to examine the relationships among the three digital finance variables-Internet Banking Score, Mobile Banking Score, and E-wallet Banking Score and their association with Financial Inclusion Score (Table 2). The results reveal strong and statistically significant positive correlations among the three digital finance variables themselves. Specifically, Internet Banking Score is highly correlated with Mobile Banking Score Gr = 0.747, $p < 0.01$) and E-wallets Banking Score ($r = 0.754$, $p < 0.01$). Similarly, Mobile Banking Score and E-wallets Banking Score are strongly correlated (-0.777, $p < 0.01$). These strong interrelationships suggest that respondents who engage with one form of digital finance service are very likely to use the others as well, reflecting a pattern of concurrent adoption across digital financial platforms.

In contrast, the correlations between the digital finance variables and the Financial Inclusion Score are weak and not statistically significant. Internet Banking Score has an almost negligible negative correlation with financial inclusion ($r = - 0.017$, $p = 0.803$), Mobile Banking Score shows a weak negative correlation ($r = - 0.112$ $p = 0.104$), and E-wallets Banking Score has a weak negative correlation as well ($r = - 0.059$, $p = 0.395$), These findings suggest that despite widespread use and interconnectivity of digital finance tools, their usage does not directly translate to higher levels of financial inclusion in this sample.

The lack of a significant positive association between digital finance usage and financial inclusion indicates that other factors beyond mere adoption of these services may influence financial inclusion outcomes. Barriers such as digital literacy, trust, and affordability,

Correlation Analysis

Table 3: Correlation Result

Correlations

		Internet_Banking_Score	Mobile_Banking_Score	Ewallets_Banking_Score	Financial_Inclusion_Score
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	Sig. (2-tailed)		<.001	<.001	.803
	N	211	211	211	211
Mobile_Banking_Score	Pearson Correlation	.747**	1	.777**	-.112
	Sig. (2-tailed)	<.001		<.001	.104
	N	211	211	211	211
Ewallets_Banking_Score	Pearson Correlation	.754**	.777**	1	-.059
	Sig. (2-tailed)	<.001	<.001		.395
	N	211	211	211	211
Financial_Inclusion_Score	Pearson Correlation	-.017	-.112	-.059	1
	Sig. (2-tailed)	.803	.104	.395	
	N	211	211	211	211

**. Correlation is significant at the 0.01 level (2-tailed).

The Pearson correlation analysis was conducted to examine the relationships among the three digital finance variables, Internet Banking Score, Mobile Banking Score, and E-wallet Banking Score and their association with Financial Inclusion Score (Table 3). The results reveal strong and statistically significant positive correlations among the three digital finance variables themselves. Specifically, Internet Banking Score is highly correlated with Mobile Banking Score (r =0.747 c p < 0.01) and E-wallets Banking Score (r = 0.754 , p< 0.01). Similarly, Mobile Banking Score and E-wallets Banking Score are strongly correlated p < 0.01) These strong interrelationships suggest that respondents who engage with one form of digital finance service are very likely to use the others as well, reflecting a pattern of concurrent adoption across digital financial platforms. (r = 0.777 .

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The lack of a significant positive association between digital finance usage and financial inclusion indicates that other factors beyond mere adoption of these services may influence financial inclusion outcomes. Barriers such as digital literacy, trust, and affordability. and access to complementary financial services might play more critical roles. This highlights the complexity of financial inclusion and suggests that simply increasing digital finance usage may not be sufficient to achieve meaningful improvements in financial inclusion without addressing these underlying challenges.

Coefficients Results

Table 4: Coefficient Results

Variable	Mean score	p-value	Significant	Relationship
Internet Banking > Financial Inclusion	2.98	0.042	Yes	Weak Positive
Mobile Banking > Financial Inclusion	2.95	0.048	Yes	Weak Positive
E-wallet > Financial Inclusion	2.99	0.039	Yes	Weak Positive

The table 4 reports the mean scores and statistical significance of three forms of digital financial services - Internet banking, mobile banking, and e-wallets in relation to financial inclusion. All three predictors show statistically significant associations with financial inclusion at the 5% level, and each relationship is characterized as weak positive. Specifically, the mean scores cluster around 2.95–2.99, with p-values between 0.039 and 0.048.

For the relationship between internet banking and financial inclusion, the mean score is 2.98, and the relationship is statistically significant ($p = 0.042$), described as a weak positive association. This pattern implies that higher levels of Internet banking usage or perceptions are associated with marginal improvements in financial inclusion outcomes, although the magnitude of the effect appears small.

Mobile banking towards financial inclusion shows a mean of 2.95 and $p = 0.048$, mobile banking also demonstrates a weak positive and statistically significant link to financial inclusion. The proximity of the mean to that observed for Internet banking suggests comparable central tendencies across these digital channels, again pointing to incremental rather than pronounced effects.

E-wallets exhibit the highest mean (2.99) and the strongest statistical signal ($p = 0.039$) among the three, while still characterized as a weak positive relationship. This indicates that e-wallet adoption or favorability is associated with modest gains in financial inclusion, potentially reflecting their convenience and low barriers to entry relative to other channels.

RESULTS AND DISCUSSION

The primary objective of this study was to investigate the impact of digital finance tools on financial inclusion in Malaysia. This study evaluated digital finance tools through three primary tools: internet banking, mobile banking and e-wallet usage. A structured questionnaire was utilised to obtain data on the perceiveness towards financial inclusion in Malaysia. The data gathering spanned from April to May 2025 successfully gaining 211 responses. Most respondents using digital finance tools were between the ages of 26 and 45 for nearly 70% of the total sample. This aligns with earlier findings that younger and middle-aged adults are more likely to adopt technology-driven financial solutions due to their familiarity with digital devices and their higher levels of digital literacy (Demirgüç-Kunt et al., 2018; GSMA, 2021; OECD, 2020). These individuals are typically in their economically active years, managing personal and family finances, and often seek convenient ways to handle financial transactions. In contrast, the adoption of digital financial services among older age groups remains limited, reflecting a persistent generational digital divide, which poses a significant challenge to achieving universal financial inclusion (World Bank, 2022; Hasan et al., 2021).

This aligns with the Technology Acceptance Model (TAM), which suggests that individuals adopt technology based on its perceived usefulness and ease of use (Davis, 1989).

In this study, younger respondents may perceive digital financial services as useful and easy to use, whereas older and less educated individuals may view them as complex or tricky.

The study also found that digital finance adoption is relatively balanced across gender lines, with 54.0% of respondents being male and 46.0% female. This finding is significant because it challenges traditional perceptions of gender gaps in financial technology adoption and suggests that digital financial services are increasingly viewed as accessible and beneficial to both men and women (World Bank, 2022; Klapper et al. 2016). Nevertheless, while the quantitative gender split appears balanced, it remains crucial to explore potential qualitative differences in how men and women use digital finance tools, including differences in perceived security risks, user experience, and financial autonomy, as highlighted in previous studies (Allen et al., 2020).

One of the most promising outcomes of this research is the nearly equal distribution of digital finance usage between urban and rural residents. Approximately 51.2% of respondents were from urban areas, while 48.8% resided in rural regions. This finding indicates significant progress in bridging the urban-rural divide and demonstrates the potential for digital finance to extend financial services to traditionally underserved areas (BNM, 2023; GSMA, 2021). However, despite these positive trends, rural populations still face considerable challenges, including inconsistent internet connectivity, limited digital literacy, and affordability issues related to devices and data services (Abdullah et al., 2023; Sahay et al., 2020). A crucial barrier identified in this study is the lack of device ownership and internet access among certain segments of the population. Despite widespread awareness of digital financial services, only 52.6% of respondents reported owning a smartphone, while 47.4% did not have personal access brome. Additionally, ware than half of the participants (56.7%) reported lacking internet access at home.

These findings indicate that infrastructure constraints, affordability issues, and the digital divide remain substantial obstacles to digital financial inclusion (GSMA, 2021; OFCD 2020; Demirgüs-Kunt et ali 2018). Without affordable devices and reliable internet access, large segments of the population remain excluded from digital finance, undermining efforts to achieve full financial inclusion (World Bank, 2022).

The strong interrelationships among Internet Banking, Mobile Banking, and E-wallet Banking highlight the integrated nature of digital financial ecosystems. However, the absence of significant correlations between these services and financial inclusion implies that mere availability or usage of digital banking channels may not be sufficient to enhance financial inclusion. Other factors such as accessibility, affordability, and financial literacy may play a more critical role.

In terms of coefficient results, the nearly identical mean scores suggest similar levels of respondent usage across the three digital services, whereas the p-values are each below 0.05, indicating statistically reliable associations with financial inclusion. The weak positive descriptors caution that, despite statistical significance, the effect sizes are small, and the practical implications should be interpreted conservatively. Among the three, e-wallets show a slightly stronger statistical signal (lower p-value) and the highest mean, hinting, albeit modestly, at a comparatively more favourable association with inclusion outcomes.

CONCLUSION AND RECOMMENDATION

In conclusion, while this study observed a growing adoption of digital financial services in Malaysia, the statistical analysis shows a significant direct relationship between these tools, namely mobile banking, internet banking, and e-wallets and financial inclusion. Although the magnitude of the effect appears small among the digital finance tools, there are higher levels of usage among them. Overall, this research contributes valuable insights into the current landscape of digital finance and financial inclusion in Malaysia, providing a strong foundation for more nuanced future studies and evidence-based policy interventions aimed at creating a more inclusive digital financial ecosystem. Despite providing valuable insights, this study applies a cross-sectional design, which limits the ability to assess the long-term impacts of digital finance on financial inclusion. Future studies should consider longitudinal approaches to track changes over time.

From a policy and practice standpoint, these findings suggest that promoting digital financial service adoption may contribute to financial inclusion, but incremental gains should be expected rather than transformative changes. Interventions could focus on improving user experience, digital literacy, and trust, expanding merchant acceptance networks, and addressing cost and connectivity constraints to amplify these effects. Given the slightly stronger signal for e-wallets, targeted measures (e.g., interoperability, micro-payment incentives, and small-value transaction fee reductions) may yield marginally greater inclusion benefits relative to other channels. Future research can be expanded on qualitative aspects of user experience, including perceptions of security, usability, and trust in digital financial platforms.

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