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Determinants of Intention to Use E-Health Technology Systems in Malaysia

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Abstract

This study investigates determinants of Malaysian patients' intention to use e-health technology systems (EHTS), with Remote Patient Monitoring (RPM) as a representative application. Grounded in UTAUT2 and informed by contextual factors, we examine performance expectancy, effort expectancy, social influence, facilitating conditions, and health awareness as key predictors of intention to use. Trust is modeled as a mediator that channels the effects of these determinants toward intention. A quantitative, cross-sectional survey using closed-ended items was administered to patients with mild chronic conditions. Data analysis comprises reliability and validity checks, correlation, and multiple regression with a bootstrapped indirect-effects test for mediation. We expect performance expectancy and health awareness to show the strongest positive relationships with intention to use, while trust partially mediates the relationships between determinants and intention. The findings aim to guide healthcare providers and policymakers on usability, patient education, and infrastructure investments to accelerate meaningful EHTS uptake and reduce avoidable hospital utilization. The study contributes empirical evidence on patient-side adoption of IoT-enabled healthcare in Malaysia and offers a practical framework for scaling EHTS (e.g., RPM) across public and private settings.

Keywords: e-health technology systems; intention to use; UTAUT2; trust; health awareness; Malaysia

1. Introduction

Malaysia's healthcare system is experiencing rising demand from chronic, lifestyle-related conditions and an increasing need for continuous monitoring outside hospital settings. E-health technology systems (EHTS) such as remote patient monitoring (RPM), teleconsultation, and patient portals—offer timely data sharing, earlier interventions, and greater convenience. Despite these advantages, patient uptake remains uneven. Many potential users have limited awareness of what EHTS can do, how difficult they are to learn, and what support

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is available. Perceptions of usefulness and effort, social encouragement from family and clinicians, and access to resources (devices, connectivity, assistance) vary widely. As a result, intention to use EHTS often falls short of what is needed to realize system-level benefits.

1.1. Statement of problem

Several studies have explored the determinants influencing the adoption of telehealth and IoT-based healthcare services in Malaysia. For instance, Yin et al. (2024) investigated factors affecting telehealth adoption among Malaysian consumers, focusing on elements such as effort expectancy, performance expectancy, computer self-efficacy, and trust. Their findings suggest that these factors significantly impact users' intentions to engage with telehealth services. Similarly, Jawad et al. (2023) examined the behavioral intentions of chronic illness patients in Malaysia to utilize IoT-based healthcare services, identifying key determinants that influence patient adoption. These studies highlight the multifaceted nature of technology adoption in healthcare, encompassing user-related factors, technological attributes, and trust considerations.

Despite these insights, there remains a paucity of research specifically addressing the factors influencing the adoption of RPM systems within the Malaysian healthcare setting. RPM systems, distinct from general telehealth services, involve continuous real-time monitoring, necessitating a unique set of technological infrastructures and user engagement strategies. The absence of targeted research on RPM adoption presents a critical gap, as the factors influencing its uptake may differ from those affecting broader telehealth services. Addressing this gap is essential for tailoring interventions that effectively promote RPM system adoption, thereby enhancing patient outcomes and optimizing healthcare resources in Malaysia.

1.2. Purpose of the research

The adoption of Real-Time Remote Patient Monitoring (RPM) systems in Malaysia has the potential to revolutionize healthcare services, particularly for chronic disease patients who require continuous monitoring. However, despite the increasing integration of Internet of Things (IoT) technologies in healthcare, the adoption of RPM systems remains relatively low in Malaysia. This research aims to examine the key factors influencing the adoption of RPM systems among chronic disease patients by applying the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) model. Understanding these factors is crucial for improving healthcare accessibility, enhancing patient outcomes, and informing policymakers and healthcare providers on strategies to increase adoption rates.

This research aims to identify the key factors affecting RPM adoption, analyze the most significant determinants influencing patients' intention to use these systems, and explore whether trust mediates the relationship between these factors and adoption intention. The findings will provide valuable insights for healthcare providers, policymakers, and technology developers to enhance the implementation and acceptance of RPM systems in Malaysia. This study will contribute to the growing body of literature on health technology adoption in developing countries while providing practical recommendations for policymakers, healthcare providers, and technology developers to enhance the successful implementation of RPM systems in Malaysia. The findings of this study will not only help bridge the gap between technological advancements and healthcare accessibility but also improve the quality of life for chronic disease patients through more efficient and proactive healthcare monitoring.

1.3. Objective of the research

To identify the key determinants influencing the intention to use e-health systems among patients with mild chronic diseases in Malaysia.

To examine the relationship between these determinants and trust among patients with mild chronic diseases in Malaysia.
To analyze the mediating effect between these determinants and the intention to use e-health systems among these patients.

1.4. Research questions

What are the key determinants influencing the intention to use e-health systems among patients with mild chronic diseases in Malaysia?
What is the relationship between these determinants and trust among patients with mild chronic diseases?
Does trust mediate the relationship between these determinants and the intention to use e-health systems among these patients?

1.5. Scope of the research

This study focuses on the adoption of Real-Time Remote Patient Monitoring (RPM) systems leveraging Internet of Things (IoT) technology within Malaysia's healthcare sector, with a particular emphasis on chronic disease patients. RPM systems have the potential to enhance patient outcomes, reduce hospital readmissions, and improve chronic disease management. However, adoption remains relatively low due to various technological, social, and regulatory challenges. Thus, this research seeks to identify the key factors influencing RPM adoption, analyze the most significant determinants shaping patient intention, and examine whether trust mediates the relationship between these factors and adoption intention.

The study employs the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) model to investigate determinants such as performance expectancy, effort expectancy, hedonic motivation, habit, security, privacy, availability and facilitating conditions. By doing so, the first objective of this research is to identify key factors that influence the intention to use e-health systems in Malaysia. The second objective is to analyze which factors have the strongest influence on chronic disease patients' intention to use e-health systems solutions. The third objective is to examine whether trust mediates the relationship the relationship between these determinants and the intention to use e-health systems among these patients, providing deeper insights into the role of education and familiarity with IoT-based healthcare solutions.

The scope extends across both public and private healthcare sectors, analyzing their roles in the implementation and adoption of RPM technologies. A key focus of this study is the experiences and perceptions of chronic disease patients, particularly their willingness to adopt and engage with RPM systems. Additionally, the research will evaluate the perspectives of healthcare providers, examining their readiness to integrate RPM technologies, as well as the challenges they face related to technical infrastructure, training, and workflow adaptation.

Finally, this study will provide insights into strategies to enhance RPM adoption in Malaysia by addressing key challenges and identifying practical solutions. This includes such improving trust, strengthening healthcare infrastructure, and developing policies that facilitate seamless integration of RPM systems. The findings will provide valuable insights for policymakers, healthcare providers, and technology developers, offering strategic recommendations to promote the sustainable and effective implementation of RPM systems, ultimately improving healthcare accessibility and patient outcomes in Malaysia.

1.6. Significance of the research

This research will make a significant contribution to the existing body of knowledge by providing empirical insights into the factors influencing the adoption of Real-Time Remote Patient Monitoring (RPM) systems in Malaysia. By utilizing the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) model, this study extends the literature on healthcare technology adoption by examining the role of key factors such as performance expectancy, effort expectancy, hedonic motivation, habit, security, privacy, availability and facilitating conditions in shaping user acceptance of IoT-enabled healthcare solutions. Additionally, this research explores the mediating role of trust, which has been relatively underexplored in the context of intention to use e-health systems in Malaysia, adding a new dimension to the understanding of digital healthcare implementation.

The findings of this study will be particularly beneficial to healthcare providers, policymakers, technology developers, and researchers. For healthcare providers, understanding the critical factors influencing inteiton to use e-health systems can help in designing more effective strategies for integrating IoT-based monitoring solutions into patient care, ultimately enhancing disease management, reducing hospital readmissions, and improving patient outcomes. Policymakers can leverage the findings to develop targeted policies and regulatory frameworks that promote digital healthcare initiatives while addressing concerns related to privacy, security, and accessibility.

Technology developers and industry players in the healthcare IoT sector will also benefit from this research by gaining insights into user expectations, perceived challenges, and adoption barriers, allowing them to improve system design, user experience, and support services. Additionally, the study's findings can inform future innovations in RPM technologies, ensuring they are aligned with user needs and healthcare infrastructure requirements.

Furthermore, this research will serve as a valuable reference for academicians and future researchers exploring digital healthcare adoption in Malaysia and beyond. By providing a comprehensive analysis of intention to use e-health systems drivers and barriers, it will open new avenues for further research on IoT-based healthcare solutions, patient engagement strategies, and the role of emerging technologies in improving healthcare accessibility. Ultimately, this study aims to bridge the gap between technological advancements and practical healthcare applications, fostering the successful adoption of RPM systems and contributing to the digital transformation of Malaysia's healthcare sector

2. Literature review

The relevant literature the real-time remote patient monitoring system, as well as the key factors that influence intention to use IoT technology in Malaysia, will be discussed. This opens with a brief overview of Real-Time Remote Patient Monitoring Systems and the key factors, including their definitions, classifications, benefits, and implementation issues. The author will then examine the Unified Technology Acceptance (UTAUT2) Model theory and the factors that influence the adoption of the real-time remote patient monitoring system, all of which contribute to the suggested conceptual framework and discussion of the previous study.

2.1 Internet of things (IoT) in Malaysia

"Things" or "smart objects" are entities that possess physical attributes, communication capabilities, unique identification, a name and address, some processing power, the ability to perceive physical phenomena in the actual world, and the ability to initiate activities that impact physical reality (Miorandi, Sicari, De

Pellegrini, and Chlamtac, 2012). Internet of Things (IoT) consists of sensing device, a routing and communicating device, and a cloud-based application. The concept of Internet of Things (IoT) is a broad category of applications based on a network of sensing and actuating devices which self-configure and can be remotely controlled through the cloud (Marston, Li, Bandyopadhyay, Zhang, and Ghalsasi, 2011).

The Internet of Things (IoT) has emerged as a transformative technology across various industries in Malaysia, enabling the interconnection of devices and systems to enhance efficiency and automation. IoT encompasses a network of physical devices embedded with sensors, software, and connectivity capabilities that facilitate data collection and exchange. As a result, IoT applications have expanded into domains such as healthcare, manufacturing, transportation, and smart cities, significantly influencing operational processes and decision-making in Malaysia (Alansari et al., 2017).

In the Malaysian healthcare sector, IoT has revolutionized patient monitoring, remote diagnostics, and personalized treatment plans. IoT-enabled wearable devices, such as smartwatches and fitness trackers, provide real-time health data, improving patient outcomes and preventive care. According to recent studies, IoT-based healthcare applications enhance medical service efficiency, reduce hospital readmissions, and optimize resource allocation (Mohamad et al., 2022). However, the adoption of IoT in healthcare is accompanied by challenges such as data privacy concerns, interoperability issues, and cybersecurity risks, particularly in compliance with Malaysia's Personal Data Protection Act (PDPA).

Malaysia's manufacturing sector has also witnessed significant advancements with IoT integration, leading to the development of Industry 4.0. The Malaysian government has initiated policies such as the National Policy on Industry 4.0 (Industry4WRD) to encourage smart factories leveraging IoT sensors and automation to optimize production processes, enhance predictive maintenance, and reduce downtime (Masmali & Miah, 2019). The implementation of IoT-driven solutions in supply chain management has improved inventory tracking, logistics efficiency, and overall cost reduction. Nevertheless, challenges such as high implementation costs, data integration complexity, and security vulnerabilities remain critical considerations for manufacturers in Malaysia.

In the transportation sector, IoT has facilitated the development of smart transportation systems that improve traffic management, vehicle tracking, and fleet efficiency in Malaysia. The country has adopted IoT-enabled solutions such as Intelligent Transport Systems (ITS) and smart traffic management to reduce congestion in urban areas like Kuala Lumpur (Doualeh et al., 2021). Connected vehicles equipped with IoT sensors enable real-time data collection for predictive maintenance and enhanced safety measures. Despite these advancements, concerns related to data governance, privacy, and infrastructure scalability continue to pose challenges for widespread IoT adoption in Malaysia.

Smart cities represent another key domain benefiting from IoT technology in Malaysia, integrating connected infrastructure for efficient energy management, waste management, and public safety. IoT-based smart grids enhance energy distribution and consumption monitoring, reducing energy wastage and improving sustainability. The Malaysian government has been promoting smart city initiatives in cities like Cyberjaya and Johor Bahru, leveraging IoT to enhance urban mobility, security, and disaster response (El Majdoubi et al., 2021). However, the successful implementation of IoT in smart cities requires robust regulatory frameworks, standardized protocols, and secure data management practices tailored to Malaysia's digital ecosystem.

While IoT offers numerous benefits across industries in Malaysia, its adoption is hindered by significant challenges, including security vulnerabilities, interoperability concerns, and data management complexities. Ensuring secure communication between IoT devices and mitigating potential cyber threats are crucial for maximizing the potential of IoT. Moreover, the integration of artificial intelligence (AI) and blockchain technology with IoT presents promising opportunities for enhancing data security, automation, and decision-making capabilities in Malaysia (Charyyev et al., 2021).

In conclusion, IoT continues to drive innovation and efficiency across multiple sectors in Malaysia, providing valuable insights through real-time data analytics and automation. Despite the challenges associated with security, interoperability, and infrastructure development, ongoing research and government initiatives are expected to address these concerns, paving the way for broader IoT adoption and integration in Malaysia's future.

2.2 Overview of RPM systems

Remote Patient Monitoring (RPM) is one of the most impactful applications of IoT in healthcare. Using smart devices and cloud-based platforms, RPM allows healthcare providers to monitor patients outside traditional clinical settings, ensuring continuous care. This approach is particularly beneficial for managing chronic diseases, reducing the burden on hospitals, and improving patient adherence to treatment plans (Sethi et al., 2022).

RPM systems are an evolving healthcare technology designed to bring medical care beyond the walls of hospitals and clinics, directly into patients' homes. According to Patel et al. (2015), RPM systems allow doctors and nurses to continuously track patients' vital signs and health conditions in real time, using a network of digital devices and communication technologies.

In Malaysia, the use of RPM devices is growing as the nation works to update its healthcare system. These systems utilize digital technologies, including wearable devices, cloud computing, and real-time data transmission, to monitor patients' health conditions remotely. Given Malaysia's diverse geography and the significant urban-rural healthcare divide, RPM has emerged as a viable solution to bridge gaps in healthcare accessibility. Studies highlight that RPM reduces hospital congestion, enhances patient convenience, and improves chronic disease management (Mohammed & Alzubaidi, 2015).

More than just a technological solution, RPM represents a human-centric approach to healthcare. For elderly patients or those with limited mobility, RPM offers a sense of security, knowing that their health is being monitored even from a distance. It reduces the burden of frequent hospital visits while allowing them to receive timely medical advice from the comfort of their homes. One study even explored RPM's role in elderly patients with chronic obstructive pulmonary disease (COPD), identifying both its potential and the challenges in digital literacy, data privacy, and ethical concerns surrounding automated healthcare (Uka & Okunji, 2023.)

2.3 Conceptual Framework

This study proposed a framework, as seen in figure below. The theoretical framework is constructed based on the relationship between the independent variables (performance expectancy, effort expectancy, hedonic motivation, habit, security, privacy, availability, and facilitating conditions), dependent variables (intention to use ehealth and RPM), and the mediator (trust).

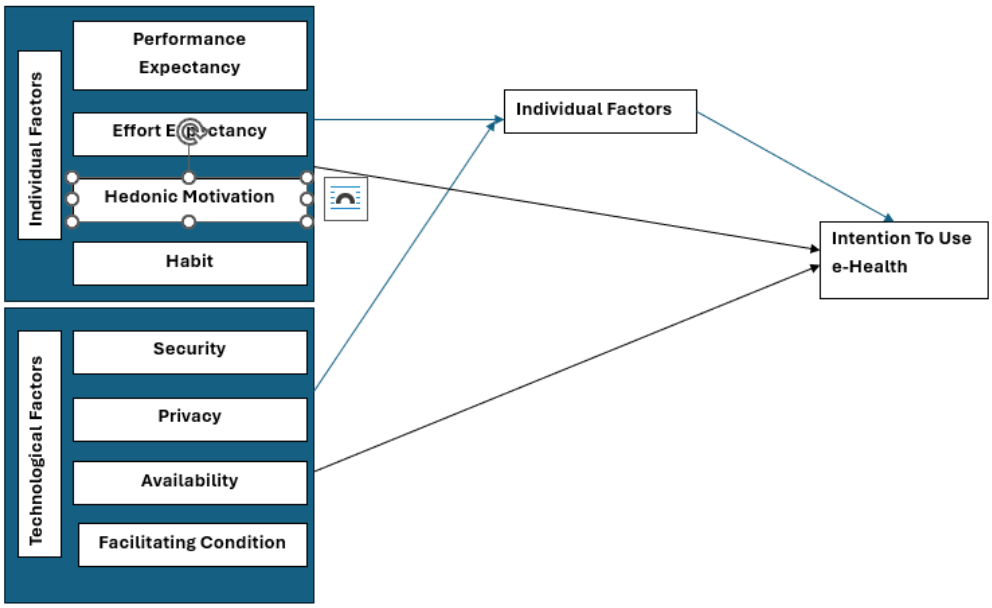

Figure 1: Conceptual Framework (Adaptation from UTAUT2 Venkatesh et al.)

3. Research Methodology

3.1 Research Design

This study adopts a quantitative, cross-sectional descriptive research design to examine the factors influencing patients' intention to use e-health services, with particular emphasis on Remote Patient Monitoring (RPM) systems in Malaysia. A quantitative approach is appropriate as it enables systematic measurement of user perceptions, behavioural intentions, and relationships among latent constructs related to digital healthcare adoption.The target population comprises patients diagnosed with mild chronic diseases, specifically Type 2 diabetes mellitus, controlled hypertension, and stable cardiovascular conditions, who require routine monitoring but are not hospitalised, do not require intensive care, and are able to manage their condition in outpatient or home-based settings. Inclusion criteria for participation are as follows, that is adults aged 18 years and above, clinically diagnosed with a mild or stable chronic condition for at least six months, currently receiving outpatient care or self-monitoring treatment, and possessing basic exposure to or awareness of digital health technologies such as mobile health applications, teleconsultation platforms, or RPM devices. Patients with severe, unstable, or critical chronic conditions were excluded, as their care requirements differ substantially from the intended scope of RPM adoption.

A purposive sampling technique was employed to ensure that respondents possessed relevant experience and contextual understanding of e-health services. This approach is appropriate for technology adoption

studies where specific user characteristics are required to meaningfully evaluate behavioural intention.The minimum sample size was justified using the 10-times rule commonly applied in Partial Least Squares Structural Equation Modeling (PLS-SEM). According to this rule, the required sample size should be at least ten times the maximum number of structural paths directed at any endogenous construct (Hair et al., 2021). In this study, the endogenous construct *intention to use e-health/RPM* receives paths from multiple predictors, including availability, privacy, security, habit, hedonic motivation, facilitating conditions, and the mediating variable trust. As the maximum number of arrows pointing to a single construct is fewer than 20, a minimum sample size of 200 respondents is considered adequate and statistically robust. This sample size also exceeds the threshold recommended for achieving stable parameter estimates and sufficient statistical power in PLS-SEM analyses. Data were collected using a structured questionnaire consisting of three main sections. The first section captured respondents' demographic information. The second section measured the independent variables that is performance expectancy, effort expectancy, facilitating condition, availability, privacy, security, habit, and hedonic motivation while the third section assessed the mediating variable (trust) and the dependent variable (intention to use e-health/RPM). All measurement items were adapted from validated prior studies and assessed using a five-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

Data collection was conducted through both online and offline modes, including distribution via healthcare centres, patient support groups, and digital platforms. Participation was voluntary, informed consent was obtained, and respondents' confidentiality and anonymity were strictly maintained in accordance with ethical research standards. Data analysis was performed in two stages. First, SPSS was used for descriptive analysis, data screening, and reliability testing using Cronbach's alpha, with values exceeding 0.70 indicating acceptable internal consistency (Pallant, 2020). Second, SmartPLS 4 was employed to conduct PLS-SEM, which is suitable for exploratory research models, mediation analysis, and non-normally distributed data (Hair et al., 2021). The measurement model was evaluated based on established criteria is indicator reliability (outer loadings ≥ 0.70), internal consistency reliability (Composite Reliability ≥ 0.70), convergent validity (Average Variance Extracted ≥ 0.50), and discriminant validity using the Fornell–Larcker criterion and Heterotrait–Monotrait (HTMT) ratio. The structural model was assessed by examining path coefficients, coefficient of determination (R^2), effect sizes (f^2), and predictive relevance (Q^2). The mediating effect of trust between the independent variables and intention to use e-health/RPM was tested using the bootstrapping procedure with 5,000 resamples in SmartPLS. Mediation was established by assessing the significance of indirect effects and comparing direct and indirect path coefficients, following the recommendations of Hair et al. (2021). This approach provides robust statistical inference without relying on distributional assumptions.

4. Expected Outcomes

4.1 The Expeted Factors Influencing intention to use e-health and RPM

This study is expected to identify the most significant factors that influence users' intention to use e-health and Remote Patient Monitoring (RPM) systems. Based on previous literature and theoretical models such as UTAUT2 framework, factors such as availability, privacy, security, trust, habit, and hedonic motivation are anticipated to play major roles in shaping users' behavioral intention.

It is expected that availability and system reliability will have a strong positive effect on users' willingness to adopt e-health and RPM technologies, as consistent system access enhances user confidence. Privacy and security are also predicted to significantly influence trust, which acts as a key mediator between technological quality and behavioral intention. Furthermore, habit and hedonic motivation are expected to positively influence continuous use by increasing users' comfort and satisfaction with digital health tools.

Overall, the study anticipates that users who perceive e-health and RPM systems as secure, reliable, and enjoyable will show a higher intention to use them. The findings are expected to contribute to improving digital health adoption strategies in Malaysia by guiding policymakers, healthcare providers, and system developers in strengthening the most influential factors for sustainable e-health implementation.

4.2 The Mediating Role of Trust

This study seeks to examine whether trust is expected to act as a mediating factor in the relationship between key adoption determinants and patients' intention to adopt Remote Patient Monitoring (RPM) systems. Drawing on prior literature, trust may influence how factors such as performance expectancy, effort expectancy, social influence, facilitating conditions, and health awareness are translated into behavioural intention. Patients who report higher levels of trust are expected to be more likely to perceive RPM systems as useful and easy to use, which may contribute to a stronger intention to adopt such technologies (Chauhan et al., 2021).

Conversely, limited trust may weaken these relationships, particularly among patients who are less familiar with IoT-based healthcare solutions or who have concerns regarding data security and system reliability. Insufficient awareness of how RPM systems operate and the benefits they offer may reduce patients' confidence and willingness to engage with such technologies, especially among individuals with lower digital literacy. Accordingly, this study anticipates that interventions such as educational initiatives, awareness programs, and digital literacy support may be important in enhancing patient understanding and trust in RPM systems. While these measures are not empirically tested in the present study, they are expected to be relevant for informing future strategies aimed at improving patient acceptance and sustained use of RPM technologies.

5.0 Conclusion

This study aimed to explore the factors influencing the intention to use e-health technology systems in Malaysia with trust as a mediating factor. Based on the research framework, it is expected that Performance Expectancy and Security and Hedonic Motivation will have the most significant impact on intention to adopt RPM systems, as patients who recognize the benefits of continuous health monitoring and proactive disease management are likely to be more open to using RPM technology. Effort Expectancy and Social Influence may also play a role, particularly among older patients or those with limited exposure to digital healthcare technologies, where ease of use and encouragement from healthcare professionals could influence adoption.

Another key expectation of this study is the role of trust as a mediator in the intetion to use process. It is anticipated that patients with higher awareness and familiarity with digital health solutions will perceive RPM systems as more useful, reliable, and easy to use, thereby strengthening their intention to adopt these technologies. Conversely, low awareness levels may hinder adoption, as patients unfamiliar with IoT-based healthcare solutions may lack the confidence or understanding needed to fully engage with RPM systems These findings, if confirmed, would highlight the importance of educational programs, digital literacy initiatives, and public awareness campaigns to enhance understanding and trust in RPM technologies. Additionally, healthcare providers and policymakers would need to focus on strengthening infrastructure, providing technical support, and developing regulatory policies to ensure seamless integration and widespread intention to use of RPM systems in Malaysia.

While this study provides valuable insights, some limitations must be acknowledged. The research was conducted within Malaysia, limiting its applicability to rural populations where healthcare infrastructure and digital literacy levels may differ. Future research should explore additional mediating factors such as perceived risk, privacy concerns, or healthcare provider engagement, which may further shape adoption behaviors. Ultimately, increasing awareness, accessibility, and user confidence in RPM technology will be

essential for driving digital healthcare transformation in Malaysia, improving patient outcomes, reducing hospital burdens, and fostering a more connected and efficient healthcare ecosystem.

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