FACTORS AFFECTING THE BEHAVIORAL INTENTION TO USE IOT-BASED PATIENT MANAGEMENT SYSTEMS BY HEALTHCARE PROFESSIONALS IN SRI LANKA

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Abstract

Internet of things (IoT) can greatly enhance service quality, boost operational efficiency, and improve patient outcomes in healthcare. This study examines the factors influencing healthcare professionals in Sri Lanka regarding the adoption of IoT-based patient management systems, utilising the Technology Acceptance Model (TAM) and incorporating organisational and technological aspects to develop a contextual framework. We surveyed 170 respondents, comprising doctors, nurses, and consultants, using a structured questionnaire. The study used correlation and regression analyses to explore the relationships among perceived usefulness (PU), perceived ease of use (PEOU), perceived challenges (PC), perceived benefits (PB), technological factors (TF), and organisational factors (OF). In this framework, attitude toward technology acted as a mediator, while behavioural intention was the dependent variable. Findings show that perceived usefulness and ease of use significantly impact attitude and behavioural intention, confirming the mediating role of attitude. Organisational and technological factors were not very effective in predicting outcomes, highlighting the infrastructural and managerial challenges in Sri Lanka's healthcare system. Successful IoT implementation hinges on technological readiness, organisational support, and staff training. This study enhances the Technology Acceptance Model by incorporating contextual factors relevant to developing nations, providing valuable insights for healthcare administrators and policymakers to inform improved IoT adoption strategies. The findings clarify how perceived ease, usefulness, and organisational readiness influence behavioural intention towards IoT healthcare innovations.

***Keywords**:* Attitude toward technology, behavioural intention, internet of things, Sri Lankan healthcare sector, Technology Acceptance Model

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Introduction

Adopting new technology in healthcare is crucial for enhancing service quality, improving operational efficiency, and improving the patient experience. The internet of things (IoT) represents a significant digital leap, facilitating real-time data monitoring, decision-making, and remote patient management through connected devices and smart systems (Lakra, 2024). IoT adoption in Sri Lanka's healthcare is nascent yet holds significant promise for enhancing hospital operations and clinical care. The sector faces challenges such as inadequate infrastructure, insufficient managerial support, and inadequate staff training (Perera, 2009). A base hospital in Kegalle District, Sabaragamuwa Province, is ideal for examining the adoption of IoT-based patient management systems among healthcare professionals, providing insights into local behaviours. IoT patient management systems leverage smart sensors, cloud applications, and real-time analytics to enhance diagnostic accuracy and emergency response, while also reducing clinical workload and improving patient safety (Bae et al., 2016). Many studies have explored the adoption of IoT in healthcare worldwide, with a primary focus on developed countries and broader institutional perspectives. There has been a lack of focus on the micro-level behavioural factors affecting healthcare professionals' willingness to adopt IoT in developing countries such as Sri Lanka, where technological infrastructure and institutional support vary greatly. The Technology Acceptance Model (TAM) offers a valuable theoretical lens; however, aspects such as organisational and technological readiness are frequently neglected in adoption frameworks within healthcare in developing nations (T. Dutta et al., 2020). This study examines the factors affecting healthcare professionals' intention to adopt IoT-based patient management systems. Key areas include usefulness, ease of use, benefits, challenges, organisational factors, and technological factors. Attitude toward technology (ATT) mediates the relationship between these constructs and behavioural intention. This study evaluates healthcare professionals' awareness and perception of IoT patient management systems, analyses the connections among perceived usefulness, ease of use, benefits, challenges, organisational factors, and technological factors related to attitude and behavioural intention, and assesses how views on technology influence the likelihood of adopting IoT systems. This study enhances the Technology Acceptance Model for developing countries, offering practical insights into addressing adoption barriers through management support, infrastructure upgrades, and workforce training.

Literatyre Review

The IoT represents a significant technological advancement in multiple industries, enabling seamless data exchange and facilitating prompt decision-making. In healthcare, IoT applications, referred to as the internet of medical things (IoMT), have become essential for digital transformation, facilitating patient monitoring, diagnosis, and personalised care delivery (Li et al., 2024). This review summarises existing research on IoT adoption in healthcare and analyses the theoretical frameworks that clarify behavioural intentions and attitudes towards technology adoption. The review is structured around key variables from the TAM and further elaborated through organisational and technological factors, highlighting the empirical relationships among these constructs.

IoT adoption in healthcare

The medical and healthcare sectors are experiencing rapid growth, with researchers continually creating new trends through innovative methods (Devadharshini & Anitha, 2019). Healthcare is leveraging IoT technology to enhance patient care and outcomes, creating new avenues for efficient delivery and remote monitoring of personalised treatment plans (Li et al., 2024). The swift expansion of the IoT has increased the potential use of the IoMT, as many consumer mobile devices now incorporate Near Field Communication (NFC) radio frequency identification (RFID) tags, enabling data transfer with IT systems. The implementation of the IoT may significantly enhance patients' quality of life (Alanazi & Soh, 2019).

Behavioural intention (BI)

Behavioural intention can be defined as an indication of an individual's willingness to engage in a specific behaviour (Acikgoz et al., 2023). Behavioural intention (BI) is crucial in assessing an individual's intention to use an information system, defined as the strength of one's intention to perform a specific behaviour (Zhao et al., 2018). The effort required to learn a new technology often outweighs the perceived benefits, making perceived usefulness and ease of use crucial for influencing behavioural intention (Alanazi & Soh, 2019).

Technological factors (TF) and organisational factors (OF)

Organisational readiness, or the factors influencing the adoption of information systems, refers to the commitment and capability of an organisation concerning the thoughts and behaviours associated with information systems (IS) adoption. Successful technology implementation in healthcare management relies on key organisational factors, including culture and leadership support, training and education, interoperability and data integration, workflow redesign and process optimisation, privacy and security, cost and return on investment (ROI), and user acceptance and change management (Bhatia, 2023). Executive management support simplifies service unification, resource sharing, and process re-engineering, which are crucial organisational factors in adopting the internet of

things. Eight key technological factors influence medical professionals' adoption of IoT-based healthcare systems: usefulness, ease of use, design, compatibility, technical challenges, content, personalisation, and convenience (Jacob et al., 2020).

H1 – *TF positively affects the ATT in IoT-based patient management system adoption*.

H2 – *OF positively affects the ATT in IoT-based patient management system adoption*.

Perceived ease of use (PEoU)

Perceived ease of use (PEOU) refers to the extent to which a person believes using a specific technology requires little to no effort (Zhao et al., 2018). Perceived ease of use is a key component of the TAM, affecting user perceptions of technology or information systems' usability (Augusta et al., 2024). Perceived ease of use in digital health management indicates how easily users adopt and utilise health management technologies on the IoT platform (Liu et al., 2022).

H3 – *PEoU positively affects the ATT in IoT-based patient management system adoption.*

Perceived usefulness (PU)

Perceived usefulness refers to the extent to which users believe a specific technology (such as a platform or application) can improve their overall performance (Liu et al., 2022). The perceived usefulness in the TAM mediates the relationship between PEOU and behavioural intention. The ease of use directly enhances perceived usefulness, influencing the user's willingness to adopt the technology (Caleb, 2024).

H4 – *PU positively affects the ATT in IoT-based patient management system adoption.*

Perceived benefits (PB)

Perceived benefits refer to the advantages the IoT offers to organisations, leading to positive outcomes (Ahmetoglu et al., 2022). The consumer's view of the benefits of a system reflects their subjective assessment of the trade-off between the advantages gained from using the system and the sacrifices made for those benefits. End users are willing to overlook potential challenges due to the perceived benefits they receive (Alviyendra & Pardede, 2024).

H5 – *PB positively affects the ATT in IoT-based patient management system adoption.*

Perceived challenges (PC)

The internet of things offers many advantages, but it remains in its early development, facing several challenges that need to be resolved before widespread implementation (Ahmetoglu et al., 2022). IoT improves organisational efficiency and performance but introduces significant security and privacy challenges due to the increasing number and variety of connected devices (Ahmetoglu et al., 2022). The perceived challenge significantly influences individuals' acceptance of new medical innovations (Qi et al., 2021).

H6 – *PC positively affects the ATT in IoT-based patient management system adoption.*

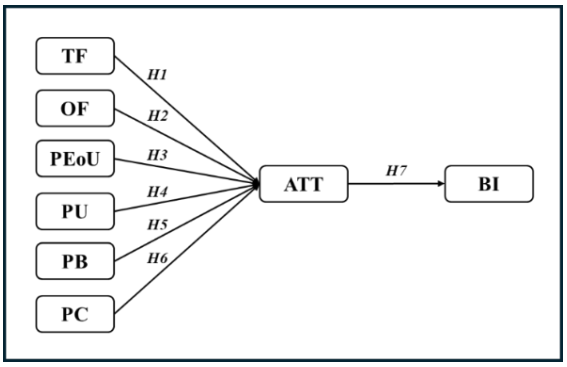
Attitude towards technology (ATT)

The intention to use a system is primarily influenced by a person's attitude, which reflects their positive or negative evaluation of the relevant behaviour (Karahoca et al., 2018). Attitude mediates the relationship between PEOU and BI, highlighting a key connection where PU enhances the user's perception of technology's usefulness, thus fostering a positive attitude towards its use (Caleb, 2024). This mediating relationship supports the theoretical foundations of the Technology Acceptance Model, the Theory of Reasoned Action (TRA), and the Theory of Planned Behaviour (TPB), while adding relevance through organisational and technological readiness from the Technology-Organisation-Environment (TOE) framework. (A. Dutta et al., 2023).

H7 – *ATT positively affects the BI in IoT-based patient management system adoption.*

Conceptual Framework

Figure 1
Conceptual model



(*Source: Author's Compilation*)

Methodology

Data collection

A Google Forms questionnaire was created and shared with selected participants via email, WhatsApp, and Facebook Messenger. The instrument was adapted from prior scales and evaluated for clarity and relevance by five healthcare professionals. Terminology was adjusted to align with Sri Lankan healthcare standards. The questionnaire comprised three sections: demographic information, independent and mediating variables (perceived usefulness, perceived ease of use, perceived benefits, perceived challenges, organisational factors, technological factors, and attitude toward technology), and the dependent variable (behavioural intention). Participants were informed about the study's purpose, the voluntary nature of their involvement, and the confidentiality of their responses prior to data collection. Informed consent was obtained electronically prior to the commencement of the questionnaire. Participants could exit at any time without consequences. Data were anonymised and analysed solely for academic purposes.

Participants

The study included 307 healthcare professionals, 175 nurses, 120 doctors, and 12 consultants from a base hospital in Kegalle District, Sabaragamuwa Province. Sample size was set at 172, with a 5% margin of error (Saunders et al., 2012). A total of 170 valid responses were collected, representing 98.84% of the target sample size. The survey results showed that 71.2% of respondents were female, and 28.8% were male. Nurses comprised 62.9% of participants, doctors 34.1%, and consultants 2.9%. 45.3% of respondents were aged 31 to 40 years. Participants were recruited via hospital channels and professional WhatsApp groups, with administrative approval obtained. Invitations featured an information sheet and a link to the consent form. Eligibility was limited to staff at the selected hospital engaged in patient care. The study employed purposive sampling due to time and resource limitations. This method was selected to confirm participants' relevant experience with IoT technologies. This method may limit generalisability but offers valuable insights for exploratory research in new contexts.

Research methodology and sampling technique

This study employed a cross-sectional design to collect data at a single point in time. A deductive approach was employed to formulate hypotheses based on established theories (TAM and TOE) and test them using empirical data. A quantitative method was selected for the objective measurement of variable relationships. A structured questionnaire was utilised, employing a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Data analysis was conducted using SPSS, Version 26. While advanced methods, such as structural equation modelling (SEM), are ideal for complex mediating relationships, regression analysis was chosen due to the sample size and exploratory nature of the study. Regression yields reliable results for small samples and simplifies the interpretation of individual variable effects on attitude and behavioural intention. Future studies could utilise SEM for model validation with larger and more diverse datasets. Cronbach's Alpha assessed internal consistency, with all variables surpassing the 0.7 threshold, ensuring reliability. Hypotheses were tested and mediation effects assessed using Pearson correlation and linear regression analyses.

Measures

Table 1 illustrates that all parameters used to evaluate the variables in this study were derived from previous research and adapted to the current context. All items had a Cronbach's alpha score above 0.7, showing strong internal consistency in assessing the study's variables. A five-point Likert scale was used to evaluate items related to each variable, with 1 representing strongly disagree and 5 representing strongly agree.

Table 1

Source and Cronbach's Alpha value of measures

Variable	PEoU	PU	PB	PC	OF	TF	ATT	BI
Number of Items	4	4	3	3	6	5	3	3
Source	(Alloghani et al., 2016)		(Alqudah et al., 2021)					(Alloghani et al., 2016)
Cronbach's alpha value	0.779	0.811	0.760	0.771	0.787	0.845	0.871	0.780

(*Source: Author's Compilation)*

Findings of the Study

Correlation analysis

When the assumptions of Pearson's correlation analysis are violated, researchers may choose to employ Spearman's rank correlation analysis as a non-parametric alternative.

Table 2

Correlation analysis summary

Independent Variables	PU	PeoU	PB	PC	TF	OF	ATT
Dependent Variable	ATT					BI	
Spearman's Rank Correlation	0.617	0.494	0.419	0.183	0.07	0.059	0.903
Significance of the relationship	0	0	0	0.017	0.366	0.446	0

(*Source: Author's Compilation)*

The Spearman's rank correlation values indicated a weak positive correlation between TF – ATT and OF–ATT. Significance values exceeding 0.05 indicate that the relationships between TF – ATT and OF–ATT were not significant in the sample analysed. All other relationships between the independent and dependent variables are significant with positive correlations. A significance level of 0.000 and a high Spearman's rank correlation of 0.903 indicate that the relationship between ATT and BI is consistent with previous studies. The findings align with recent studies and provide a solid framework for future research in this area.

Regression analysis and hypothesis testing

Assessing the direct impacts of the independent variables, PU, PeoU, PB, PC, TF, and OF, on the mediating variable, ATT, is crucial. This study examines how ATT and independent variables affect BI, emphasising ATT's mediating role. Analysing regression coefficients, p-values, and R-squared values is essential for evaluating the strength and significance of relationships. A higher R-squared indicates a better model fit, with values over 0.5 considered acceptable. A p-value of less than 0.05 indicates statistical significance in hypothesis testing. The regression analysis predicting ATT yielded an R-squared value of 0.857, showing that the model explains 85.7% of the variance in ATT. This outcome shows that PU, PeoU, PB, PC, and OF have a significant positive influence on ATT. TF was not a significant predictor, with a p-value of 0.192, failing to reach the threshold for statistical significance.

Table 3

Regression analysis summary (IVs – ATT)

Independent Variables	PU	PEoU	PB	PC	TF	OF
Dependent Variable	ATT					
β-value	0.603	0.502	0.453	0.21	0.04	0.097
p-value	0	0	0	0	0.192	0.002

(*Source: Author's Compilation)*

The analysis showed an R-square value of 0.861 for the impact of independent variables and ATT on BI. The independent variables and ATT explain 86.1% of the variance in BI. The analysis reveals that PU, PEoU, PB, PC, TF, and ATT are significant predictors of BI, with each relationship yielding acceptable p-values in the model. The Organisational Factors (OF) had a p-value of 0.284, surpassing the 0.05 significance threshold, making it statistically non-significant.

Table 4

Regression analysis summary (IVs + ATT – BI)

Independent Variables	PU	PEoU	PB	PC	TF	OF	ATT
Dependent Variable	BI						
β-value	0.251	0.258	0.259	0.12	0.088	-0.033	0.486
p-value	0	0	0	0	0.004	0.284	0

(*Source: Author's Compilation)*

After evaluating the hypotheses in this study, all were accepted except for one. The analysis shows that TF is not a significant predictor of ATT in this context, with a p-value of 0.192, which does not meet the accepted criteria.

Table 5

Hypothesis testing summary

Hypothesis	H1	H2	H4	H3	H5	H6	H7
β-value	0.04	0.097	0.603	0.502	0.453	0.21	0.486
p-value	0.192	0.002	0	0	0	0	0
Decision	Rejected	Accepted	Accepted	Accepted	Accepted	Accepted	Accepted

(*Source: Author's Compilation)*

The analysis showed that healthcare professionals at a major base hospital in the Kegalle district were significantly influenced by various factors in their intention to use an IoT-based healthcare management system. In this study, ATT serves as a crucial mediator between the independent and dependent variables, influencing their relationships. The findings support previous studies, emphasising the significance of a positive attitude towards technology for adopting healthcare technologies in the sector. Results show that PU and PEoU significantly affect user attitude and adoption intention, consistent with the TAM. The model shows a strong fit with an R-squared value of 0.857, indicating that it effectively captures the factors influencing healthcare professionals' behavioural intentions and highlights the mediating effect of attitude.

Conclusion

Discussion

The Internet of Things has transformed healthcare through improved digital connectivity and real-time data systems. This study explored factors affecting healthcare professionals' readiness to adopt IoT-based patient management systems in a Sri Lankan-based hospital, emphasising the mediating role of attitude toward technology. Findings indicate that perceived usefulness and perceived ease of use significantly impact ATT and behavioural intention, supporting essential aspects of the Technology Acceptance Model. Healthcare professionals are more inclined to adopt IoT systems when they see them as advantageous and user-friendly, particularly in resource-constrained settings. Perceived benefits and challenges impact professionals' attitudes toward adoption. The limited predictive capacity of technological and organisational factors highlights contextual challenges in Sri Lanka's healthcare system, including inadequate infrastructure, insufficient management support, and limited training opportunities. Successful IoT adoption in healthcare in developing countries hinges on institutional commitment, workforce readiness, and effective integration into existing clinical workflows, beyond just technology design. Attitude is crucial for linking individual perceptions with organisational readiness and behavioural intention. This mediating relationship supports the theoretical foundations of TAM, TRA, and TPB, while adding relevance through organisational and technological readiness from the TOE framework.

Conceptual contributions and practical implications

This research presents three key theoretical contributions: 1. It enhances the Technology Acceptance Model by integrating organisational and technological factors (OF and TF), providing a comprehensive approach to studying technology adoption in healthcare within developing. This study provides evidence that attitude toward technology mediates the relationship between individual perceptions (PU, PEOU, PB, PC) and behavioural intention. This study adds to the literature on digital health adoption in the Global South, demonstrating that the traditional TAM model is still relevant but requires adaptation to local infrastructural, managerial, and cultural contexts. The findings underscore the need for targeted strategies to enhance the technological readiness of

healthcare professionals. Hospital leaders and policymakers should prioritise training, enhance digital infrastructure, and establish clear guidelines for IoT integration to enhance confidence and usability. Insights can guide policymakers in crafting national e-health strategies to address infrastructure gaps, establish effective cybersecurity policies, and enhance capacity-building initiatives. Establishing a supportive institutional environment can enhance Sri Lanka's healthcare systems by adopting IoT, leading to better operational efficiency and patient care outcomes.

Limitations and future works

This study recognises limitations that could impact the generalisability of its findings. The main limitation is the small sample size from a single hospital, which affects the generalizability of the findings. Future studies should involve a variety of hospitals, both public and private, to enhance representativeness. Self-reported data can introduce bias, and the cross-sectional design limits the ability to observe changes in adoption behaviour over time. Future studies may investigate the evolving attitudes and continued use of IoT among healthcare professionals. This study excluded factors like age, gender, and professional experience, which can significantly impact technology adoption behaviours. Future studies should consider these demographic and contextual factors to gain a better understanding. This study employed regression analysis; however, future work could utilise structural equation modelling to investigate complex relationships and enhance validation of the extended TAM framework.

This study offers a model grounded in empirical evidence, elucidating healthcare professionals' intentions to adopt IoT-based patient management systems in a developing country. Findings show that a technological design alone isn't sufficient for adoption; success depends on user attitudes, perceived usefulness, managerial support, and workforce capability. This study enhances the existing model by incorporating contextual variables and validating it through empirical research in Sri Lanka, offering insights into digital health transformation in resource-limited healthcare settings.

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