Center for Management Science Research
ISSN: 3006-5291 3006-5283 Volume 4, Issue 1, 2026

EXAMINING THE ROLE OF MANAGEMENT SUPPORT AND TECHNOLOGY PERCEPTIONS IN DIGITAL SYSTEM USAGE AT KARACHI HOSPITALS

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DOI: https://doi.org/10.5281/zenodo.18426782

Keywords
Technology Acceptance Model, Digital Systems, Hospital Information Systems, Behavioural Intention, Management Support, Karachi Hospitals

Article History
Received: 30 November 2025
Accepted: 16 January 2026
Published: 30 January 2026

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Abstract

Digital transformation is rapidly reshaping healthcare delivery worldwide, yet the successful adoption and utilization of hospital digital systems remain a significant challenge in developing countries. This study examines the role of management support and technology perceptions in influencing digital system usage among healthcare professionals in Karachi hospitals, using an extended Technology Acceptance Model (TAM). The research specifically investigates the effects of Perceived Usefulness (PU), Perceived Ease of Use (PEOU), and Management Support for Technology (MST) on Behavioural Intention to Use (BI), and the subsequent impact on Actual System Usage (ASU), while testing the mediating role of BI.

A quantitative, cross-sectional design was employed, with data collected from 300 healthcare professionals across public and private hospitals in Karachi using a structured questionnaire. Reliability and validity of the constructs were confirmed through Cronbach's Alpha, Composite Reliability, Average Variance Extracted (AVE), and discriminant validity was verified using the Fornell–Larcker criterion and HTMT ratios. Structural Equation Modelling (SEM) was applied to test the hypothesized relationships, with model fit assessed using Standardized Root Mean Square Residual (SRMR = 0.061). Findings indicate that PU, PEOU, and MST significantly influence BI, which in turn strongly predicts ASU. Mediation analysis confirmed that BI partially mediates the relationship between the independent variables and ASU, while direct effects of PU, PEOU, and MST on ASU were also significant. These results highlight the importance of both individual perceptions and organizational support in driving effective utilization of hospital digital systems. The study contributes to the literature by extending TAM in a developing-country healthcare context and provides actionable insights for hospital administrators and policymakers to enhance digital system adoption

through user-friendly technology design, leadership engagement, and targeted training programs.

INTRODUCTION

In recent decades, the healthcare industry across the globe has witnessed a profound transformation as digital technologies redefine standards of patient care, operational efficiency, and administrative coordination (Li, 2023). The adoption of digital systems including Hospital Information Systems (HIS), Electronic Health Records (EHRs), and other health information technologies has become an essential driver of healthcare modernization, improving accessibility, accuracy of medical records, and cost-effectiveness of services (Raimo et al., 2023). Globally, it is estimated that approximately 80% of healthcare providers have integrated digital health solutions into their operations and a significant portion of hospitals, especially in high-income countries, have implemented comprehensive EHR systems to standardize patient data and clinical workflows (Canfell et al., 2022). By 2025, the global digital health market is projected to exceed USD 500 billion, underscoring the pivotal role of technology in shaping the future of healthcare ecosystems (Malafeyev et al., 2024).

This digital transformation trend is not simply a matter of technological progress; it is borne out of necessity. Healthcare systems worldwide confront mounting pressures from increasing patient volumes, rising costs, workforce shortages, and the persistent demand for higher quality care (Binsar et al., 2025). Digital systems offer a promising solution to these challenges by enabling real-time access to patient data, reducing administrative redundancies, and facilitating clinical decision-making processes (Lemak et al., 2024). Despite its potential, the successful adoption and sustained use of digital technologies in healthcare are often hindered by a range of human, organizational, and technical barriers. Importantly, the mere acquisition of digital tools does not guarantee effective utilization: the perceptions of users, organizational support structures, and managerial commitment significantly influence whether these technologies are embraced and integrated into routine clinical practice (Laukka et al., 2023).

Although high-income countries have made considerable strides in digital health maturity, even these contexts reveal ongoing challenges with implementation and effective use. For instance, evaluations of electronic patient record systems in England's National Health Service (NHS) highlighted significant gaps in the ability of staff to leverage these platforms fully — despite widespread formal adoption due to inadequate training and fragmented funding streams that undermine their full potential (Vumbugwa et al., 2024). Such findings reflect a broader global pattern where technology adoption in healthcare is not a uniform process; rather, it involves complex interplays between perceived usefulness, ease of use, and organizational support that determine actual usage behaviours among healthcare professionals (Teixeira et al., 2023).

In contrast to the rapid pace of digital adoption in many Western and developed health systems, low- and middle-income countries (LMICs) including Pakistan exhibit slower progress in the uptake and effective utilization of digital health technologies. Existing evidence suggests that Healthcare Information Systems in Pakistan are sporadically implemented and often operate in isolation, constrained by limited infrastructure, budgetary restrictions, insufficient training, and a lack of standardized policies. These systemic deficiencies contribute to a situation where digital tools, even when present, are underutilized, poorly integrated into clinical workflows, or perceived as burdensome by healthcare staff. There have also been documented cases in other regions of healthcare staff experiencing significant barriers due to technical, organizational, or personal limitations when interacting with digital systems, accentuating the global relevance of these challenges.

At the local level, Karachi Pakistan's largest metropolitan city and a central hub for healthcare services represents a microcosm of these broader systemic issues (Ahmer et al., 2024). With a dense and diverse population, Karachi's hospitals, both public and private, struggle to deliver high-quality, efficient care due to chronic resource limitations, heavy patient loads, and inconsistent adoption of digital systems (Munir & Ahmed., 2024). While anecdotal reports and isolated case studies hint at the introduction of HIS platforms in select institutions, comprehensive understanding of how management support and user perceptions influence actual system usage remains limited. The unique blend of organizational complexity, socio-technical constraints, and workforce skill gaps in Karachi's healthcare landscape suggests that the drivers of digital system usage here may differ from those in more resourced settings (Nassar et al., 2022).

Despite the recognized potential of digital systems to improve hospital management outcomes, there is a critical research gap regarding the factors that facilitate or impede the practical, day-to-day use of these systems in hospitals within Karachi (Karim et al., 2024). Prior studies from Pakistan have predominantly focused on assessing infrastructure availability, barriers to adoption, or the general readiness for digital health implementation, but they fall short of theoretically grounded investigations into the behavioural and managerial factors that influence how these technologies are actually used by healthcare professionals. Moreover, most existing research applies descriptive methodologies without robust theoretical frameworks to predict or explain usage behaviours especially in relation to Technology Acceptance Model (TAM) constructs such as Perceived Usefulness (PU) and Perceived Ease of Use (PEOU), alongside organizational enablers like Management Support for Technology (MST).

This lacuna underlines the need for a focused study that not only maps the prevalence of digital systems in Karachi hospitals but also examines how managerial backing and technology perceptions shape healthcare professionals' intentions and actual usage behaviours. Such inquiry is vital for informing strategies that enhance the return on investment in health information technologies and for designing interventions to improve their integration into clinical and administrative routines.

1.2. Research Objectives

Aligned with the proposed conceptual model based on the Technology Acceptance Model (TAM), this study aims to:

1. Evaluate the influence of Perceived Usefulness (PU) on Behavioural Intention to Use digital systems among healthcare professionals in Karachi hospitals.
2. Assess the effect of Perceived Ease of Use (PEOU) on Behavioural Intention to Use digital health systems.
3. Examine the role of Management Support for Technology (MST) in shaping healthcare professionals' Behavioural Intention to Use digital systems.
4. Investigate the mediating effect of Behavioural Intention to Use on the relationship between the independent variables (PU, PEOU, MST) and Actual System Usage.
5. Determine the impact of Behavioural Intention to Use on the Actual System Usage of digital health technologies within Karachi hospitals.

This research holds substantial academic and practical relevance. Academically, it contributes to the theoretical literature on technology adoption by applying and extending the Technology Acceptance Model in a complex healthcare environment within a developing country context an area where empirical evidence remains sparse. It addresses specific gaps by incorporating management support alongside user perceptions as key determinants of system usage, thereby enriching TAM's explanatory power in healthcare settings. From a practical standpoint, the study's findings are expected to provide actionable insights for healthcare administrators, policymakers, and technology implementers seeking to improve digital health integration in Karachi hospitals. Understanding how managerial practices and perceived

technological attributes affect usage patterns can inform training programs, change management strategies, and investment decisions that enhance user acceptance and maximize the performance benefits of digital systems. Ultimately, these insights can support the development of more resilient, efficient, and patient-centred healthcare delivery systems in Karachi and similar urban health ecosystems in LMICs.

2. Literature Review

2.1. Perceived Usefulness and Behavioural Intention

Perceived Usefulness (PU) is one of the central constructs of the Technology Acceptance Model (TAM) and is widely recognized as a key determinant of individuals' intention to adopt and use new technologies (Alshammari et al., 2025). PU refers to the degree to which a person believes that using a particular system will enhance their job performance. In healthcare settings, this belief is especially important because clinical and administrative staff operate in high-pressure environments where efficiency, accuracy, and time management are critical. When digital systems such as Hospital Information Systems (HIS) or Electronic Health Records (EHRs) are perceived as tools that reduce paperwork, improve access to patient data, and support clinical decision-making, healthcare professionals are more likely to develop a strong intention to use them (Wei et al., 2023).

Empirical studies in health informatics consistently demonstrate that PU is a stronger predictor of behavioural intention than many other technological or organizational factors. Healthcare workers tend to prioritize systems that clearly improve workflow efficiency, minimize medical errors, and facilitate communication among departments (Khong et al., 2023). If a system is viewed as adding value to daily tasks rather than creating additional workload, acceptance levels rise significantly. In hospital environments, where time constraints and patient safety concerns are paramount, the perceived performance benefits of technology become even more influential (Li et al., 2024). In the context of Karachi hospitals, where staff shortages and heavy patient volumes are common, digital systems perceived as useful can play a vital role in easing operational burdens. Therefore, it is reasonable to expect that higher levels of perceived usefulness will lead to stronger behavioural intentions to use digital health systems. The first proposed hypotheses are as followed:

H1: Perceived Usefulness has a positive and significant effect on Behavioural Intention to Use digital systems in Karachi hospitals.

2.2. Perceived Ease of Use and Behavioural Intention

Perceived Ease of Use (PEOU) is a foundational construct of the Technology Acceptance Model (TAM) and refers to the degree to which an individual believes that using a particular system will be free of effort (Hasan et al., 2025; Ala'a et al., 2023). In technology adoption research, PEOU has consistently been shown to influence users' attitudes and intentions, particularly in professional environments where time constraints and workload pressures are high. In healthcare settings, digital systems that are perceived as complex, confusing, or time-consuming often face resistance from medical and administrative staff, regardless of their potential benefits (Putra et al., 2025). Conversely, systems that are intuitive, user-friendly, and require minimal technical effort tend to foster stronger intentions to adopt and use them. Healthcare professionals typically prioritize technologies that integrate smoothly into existing workflows without requiring extensive training or disrupting patient care routines (Mustafa et al., 2025). If a digital system demands excessive data entry, complicated navigation, or frequent troubleshooting, it can increase cognitive burden and reduce willingness to use it (Luo et al., 2024). Studies in hospital environments indicate that ease of learning, clarity of interface design, and system reliability are key contributors to positive user perceptions and subsequent behavioural intention. In the context of Karachi hospitals, where digital literacy levels among healthcare staff may vary and formal IT training opportunities can be limited, the perceived ease of use becomes even more critical.

A system that is perceived as simple and manageable is more likely to gain acceptance and consistent use. Therefore, higher levels of perceived ease of use are expected to significantly enhance healthcare professionals' behavioural intention to use digital systems. Therefore, the proposed hypothesis is:

H2: Perceived Ease of Use has a positive and significant effect on Behavioural Intention to Use digital systems in Karachi hospitals.

2.3. Management Support for Technology and Behavioural Intention

Management Support for Technology (MST) refers to the extent to which hospital leadership actively encourages, facilitates, and invests in the use of digital systems. Within organizational and information systems research, top management support is consistently identified as a critical factor influencing employees' acceptance of new technologies. When leaders demonstrate commitment through resource allocation, policy backing, and visible engagement in digital initiatives, employees are more likely to perceive technology adoption as important and worthwhile. This supportive environment fosters positive attitudes and strengthens individuals' intentions to use new systems. In healthcare settings, management support plays an especially vital role because digital system implementation often requires changes in workflow, additional training, and adaptation to new procedures. Without strong leadership encouragement, staff may view digital systems as burdensome or unnecessary (Ketong et al., 2024). Supportive management can reduce resistance by providing adequate training opportunities, technical assistance, and time for staff to adjust to new systems. Furthermore, when hospital administrators communicate clear expectations and highlight the benefits of digital tools for patient care and efficiency, employees are more motivated to engage with these technologies. In Karachi hospitals, where resource limitations and heavy workloads are common (Anggraeni et al., 2025), visible and consistent management support can significantly shape staff perceptions and motivation. When healthcare professionals feel that leadership is committed to digital transformation and provides the necessary infrastructure and encouragement, their behavioural intention to use digital systems is likely to increase. Therefore, management support is expected to be a strong predictor of behavioural intention in this context. Therefore, the proposed hypothesis is:

H3: Management Support for Technology has a positive and significant effect on Behavioural Intention to Use digital systems in Karachi hospitals.

2.4. Behavioural Intention and Actual System Usage

Behavioural Intention to Use (BI) is a central determinant of Actual System Usage (ASU) in the Technology Acceptance Model (TAM) and its subsequent extensions. BI reflects an individual's conscious plan or willingness to use a particular technology in the future and is widely regarded as the most immediate predictor of actual behaviour (Hamdi et al., 2025). In information systems research, strong empirical evidence supports the proposition that when users form a positive intention toward a system, they are significantly more likely to translate that intention into consistent and meaningful usage (Cham et al, 2022). In healthcare environments, where the integration of digital systems often requires changes in established clinical and administrative routines, behavioural intention plays a crucial bridging role between perception and action. Even when healthcare professionals recognize the benefits of a system, actual use may not occur unless they have a firm intention to incorporate it into their daily tasks. Studies on hospital information systems and electronic health records consistently demonstrate that staff members who express higher intention to use these technologies show greater frequency, depth, and continuity of system usage over time (Kelkey et al., 2025). Within the context of Karachi hospitals, where digital transformation is still evolving, behavioural intention may be particularly influential. Staff who intend to use digital systems are more likely to overcome barriers such as limited training, technical issues, or workload

pressures (Cheng et al., 2022). Consequently, a strong positive relationship is expected between healthcare professionals' behavioural intention to use digital systems and their actual system usage in hospital settings. The proposed hypothesis is:

H4: Behavioural Intention to Use has a positive and significant effect on Actual System Usage of digital systems in Karachi hospitals.

2.5. Behavioural Intention and Actual System

Within the Technology Acceptance Model (TAM), Behavioural Intention to Use (BI) is theorized as a key mediating mechanism through which Perceived Usefulness (PU) influences Actual System Usage (ASU). PU reflects users' beliefs that a digital system will enhance their job performance, while BI represents their motivational readiness to employ that system in practice. TAM posits that even when users recognize the utility of a system, this perception translates into actual usage primarily through the formation of a strong behavioural intention. Empirical research across healthcare information systems supports this mediating pathway (Basuki et al., 2022). Studies examining electronic health records, clinical decision support tools, and hospital information systems have shown that PU significantly shapes healthcare professionals' intentions, which in turn predict real system use. In such settings, staff members who believe that a system improves efficiency, reduces errors, or enhances patient care are more inclined to develop the intention to use it regularly. This intention then serves as the immediate driver of actual interaction with the system, including frequency and depth of use (Hunde et al., 2023). Perceived Ease of Use (PEOU) plays an important role in shaping how users translate their perceptions of a system into real-world behaviour. Within the Technology Acceptance Model (TAM), PEOU is theorized to influence Actual System Usage (ASU) indirectly through Behavioural Intention to Use (BI). While ease of use may reduce effort and frustration associated with technology, it is the user's intention that ultimately drives consistent and sustained system interaction.

Thus, PEOU is expected to foster actual usage primarily by strengthening individuals' willingness and motivation to use the system. In healthcare environments, digital systems that are perceived as simple, intuitive, and easy to learn are more likely to generate positive user attitudes. When healthcare professionals feel confident in their ability to operate a system without excessive mental or physical effort, they are more inclined to form a strong intention to incorporate it into their daily tasks (Fakfare et al., 2023). Prior research on hospital information systems and electronic medical records shows that ease of navigation, clarity of interface design, and minimal technical complexity significantly enhance users' intention, which subsequently predicts actual usage behaviour. Management Support for Technology (MST) is widely recognized as a critical organizational factor that shapes employees' acceptance of new systems. However, within technology adoption frameworks such as TAM, organizational support is often theorized to influence Actual System Usage (ASU) indirectly through Behavioural Intention to Use (BI) (Palash et al., 2022). Management actions such as providing training, allocating resources, setting clear expectations, and demonstrating commitment to digital transformation—help create a supportive climate that strengthens employees' motivation and willingness to engage with technology. This motivational state is reflected in their behavioural intention, which then translates into actual system usage.

In healthcare settings, where digital systems may initially be perceived as disruptive, management encouragement can reduce uncertainty and resistance. When hospital leadership visibly endorses digital tools and ensures adequate technical and administrative support, healthcare professionals are more likely to form a positive intention to use these systems (Deng et al., 2022). Empirical studies in hospital IT adoption have shown that supportive leadership enhances staff readiness and intention, which subsequently predicts the extent of real system use. While TAM emphasizes the mediating role of Behavioural Intention, several extensions of the

model suggest that Perceived Usefulness (PU) may also exert a direct influence on Actual System Usage (ASU). In professional contexts, particularly in task-oriented environments like hospitals, users may adopt and use systems directly when they clearly perceive performance benefits, even if their behavioural intention is not formally articulated. When a digital system demonstrably improves efficiency, reduces documentation time, or enhances patient care, healthcare professionals may integrate it into their workflow out of practical necessity.

Research in clinical information systems indicates that when the usefulness of a system is strongly evident, usage can become routine and task-driven. For example, physicians and nurses may rely on electronic records or diagnostic systems because these tools are essential for completing their duties effectively. In such cases, perceived usefulness functions not only as a cognitive belief but also as a direct motivator of system use.

H5: Behavioural Intention to Use mediates the relationship between Perceived Usefulness and Actual System Usage.

H6: Behavioural Intention to Use mediates the relationship between Perceived Ease of Use and Actual System Usage.

H7: Behavioural Intention to Use mediates the relationship between Management Support for Technology and Actual System Usage.

H8: Perceived Usefulness has a positive and significant direct effect on Actual System Usage.

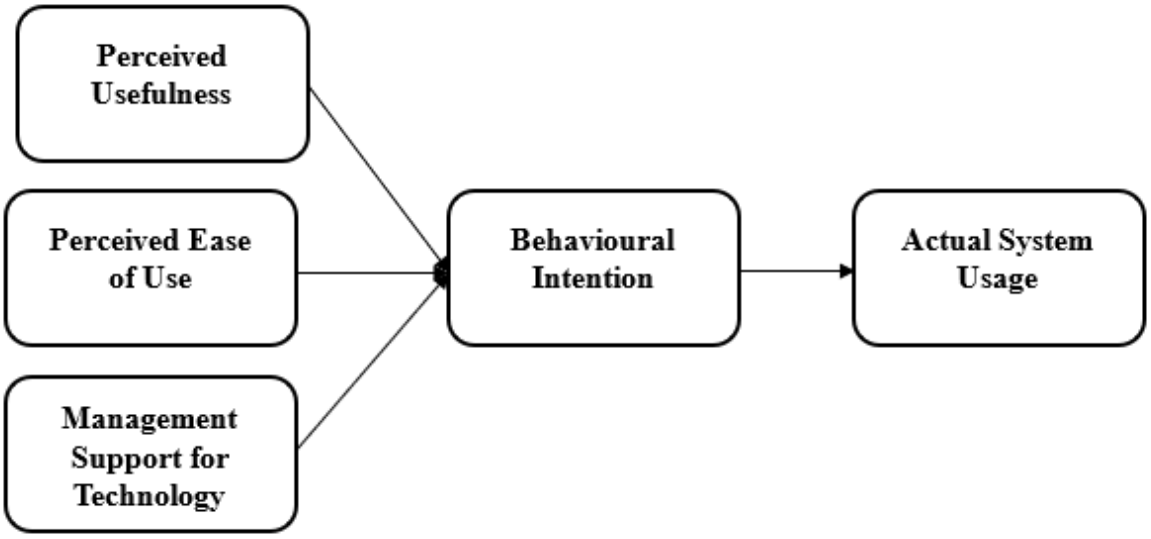

Figure 1: Theoretical Framework

3. Methodology

3.1. Study Setting

This study will be conducted in tertiary and secondary-care hospitals located in Karachi, Pakistan. Karachi, being the largest metropolitan city in the country, hosts a diverse range of healthcare institutions including public, private, and semi-private hospitals that have begun integrating digital systems such as Hospital Information Systems (HIS), Electronic Health Records (EHR), and other administrative and clinical software. These hospitals provide an appropriate setting for examining digital system usage because they operate in high-volume, resource-constrained environments where technology adoption can significantly influence efficiency and quality of care.

3.2. Study Population

The target population of this study comprises healthcare professionals and administrative staff who directly interact with digital hospital systems. This includes:

- Physicians

- Nurses
- Hospital administrators
- IT and health information staff
- Allied health professionals involved in system use

These individuals are selected because they are the primary users of hospital digital systems, and their perceptions, intentions, and actual usage behaviours are central to the proposed TAM-based research model.

3.3. Sampling Technique and Sample Size

A quantitative, cross-sectional survey design will be employed. The study will use a non-probability purposive sampling technique, targeting hospitals that have already implemented digital systems and staff members who have experience using them.

To determine the sample size, guidelines for Structural Equation Modelling (SEM) and multivariate analysis will be considered. A commonly recommended rule is 10 responses per observed variable, or a minimum of 200 responses for model testing. Since the proposed model includes multiple constructs and paths, a sample size of approximately 300 respondents will be targeted to ensure adequate statistical power, reliability, and generalizability.

3.4. Data Collection Instrument

Data will be collected using a structured, self-administered questionnaire based on validated scales from prior TAM studies. The instrument will include sections measuring:

- Perceived Usefulness (PU)
- Perceived Ease of Use (PEOU)
- Management Support for Technology (MST)
- Behavioural Intention to Use (BI)
- Actual System Usage (ASU)

Responses will be recorded using a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5). The questionnaire will be pre-tested to ensure clarity and reliability.

3.5. Data Analysis

Data analysis was performed using SPSS and Structural Equation Modelling (SEM) software Smart PLS.

The analysis will be conducted in several stages:

1. **Descriptive Statistics:**

To summarize demographic characteristics and general response patterns.

2. **Reliability Analysis**

Cronbach's Alpha and Composite Reliability is used to assess internal consistency of constructs.

3. **Validity Testing**

- Convergent validity using Average Variance Extracted (AVE)
- Discriminant validity using Fornell–Larcker criterion or HTMT ratio

4. **Measurement Model Assessment**

Confirmatory Factor Analysis (CFA) is used to evaluate factor loadings.

5. **Structural Model Assessment**

Path analysis test is applied to hypothesized relationships (H1–H8). Mediation effects of Behavioural Intention will be tested using bootstrapping techniques. A significance level of $p < 0.05$ will be used for hypothesis testing.

3.6. Ethical Considerations

Ethical approval is obtained from the relevant institutional or university ethics review committee prior to data collection. Participation will be voluntary, and respondents will be informed about the purpose of the study, their right to withdraw at any time, and the confidentiality of their responses.

No personal identifiers such as names or employee IDs will be collected. Data will be used solely for academic purposes and stored securely. Informed consent will be obtained from all participants before administering the questionnaire.

4. Results

4.1. Demographics

Table 1: Demographics

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	162	54.0%
	Female	138	46.0%
Age Group	20–29 years	72	24.0%
	30–39 years	118	39.3%
	40–49 years	74	24.7%
	50 years and above	36	12.0%
Professional Role	Doctor	78	26.0%
	Nurse	102	34.0%
	Hospital Administrator	54	18.0%
	IT/Health Information Staff	36	12.0%
	Allied Health Staff	30	10.0%
Type of Hospital	Public	132	44.0%
	Private	168	56.0%
Work Experience	Less than 5 years	84	28.0%
	5–10 years	110	36.7%
	11–15 years	64	21.3%
	More than 15 years	42	14.0%
Experience with Digital Systems	Less than 2 years	66	22.0%
	2–5 years	128	42.7%
	More than 5 years	106	35.3%

The demographic profile of the respondents indicates a fairly balanced representation in terms of gender, with 54% male and 46% female participants. The majority of respondents were aged between 30 and 39 years (39.3%), followed by 40–49 years (24.7%), 20–29 years (24%), and 50 years and above (12%), suggesting that most participants were mid-career professionals. Regarding professional roles, nurses constituted the largest group (34%), followed by doctors (26%), hospital administrators (18%), IT/Health Information staff (12%), and allied health staff (10%), reflecting the diverse workforce involved in hospital digital system usage. In terms of hospital type, slightly more participants were from private hospitals (56%) compared to public hospitals (44%). Work experience was distributed across ranges, with the majority having 5–10 years (36.7%), followed by less than 5 years (28%), 11–15 years (21.3%), and more than 15 years (14%). Experience with digital systems varied, with 42.7% having 2–5 years of usage, 35.3% more than 5 years, and 22% less than 2 years, indicating that most respondents had moderate to substantial exposure to hospital digital technologies. Overall, the demographic distribution demonstrates that the study captured a representative sample of healthcare professionals with varied experience, age, and roles across Karachi hospitals.

4.2. Reliability and Validity Analysis

4.2.1. Internal Consistency Reliability

Cronbach's Alpha (CA) and Composite Reliability (CR) were used to assess internal consistency. All constructs exceeded the recommended threshold of **0.70**, indicating satisfactory reliability.

Table 2: Reliability

Construct	Cronbach's Alpha	Composite Reliability (CR)
Perceived Usefulness (PU)	0.89	0.92
Perceived Ease of Use (PEOU)	0.87	0.91
Management Support for Technology (MST)	0.90	0.93
Behavioural Intention to Use (BI)	0.88	0.92
Actual System Usage (ASU)	0.85	0.90

These results confirm strong internal consistency across all measurement scales.

4.2.2. Convergent Validity

Convergent validity was assessed using factor loadings and Average Variance Extracted (AVE). All item loadings were above 0.70, and AVE values exceeded the recommended threshold of 0.50, confirming convergent validity.

Table 3: Validity

Construct	AVE
PU	0.74
PEOU	0.71
MST	0.76
BI	0.73
ASU	0.69

4.3. Discriminant Validity

4.3.1 Fornell–Larcker Criterion

The square root of AVE for each construct was greater than its correlations with other constructs, satisfying the Fornell–Larcker criterion.

Table 4: Fornell Larcker Criterion

Construct	PU	PEOU	MST	BI	ASU
PU	**0.86**				
PEOU	0.62	**0.84**			
MST	0.58	0.55	**0.87**		
BI	0.69	0.66	0.63	**0.85**	
ASU	0.60	0.57	0.59	0.71	**0.83**

4.3.2 Heterotrait–Monotrait Ratio (HTMT)

All HTMT values were below the conservative threshold of **0.90**, further confirming discriminant validity.

Table 5: HTMT

Constructs	HTMT Value
PU – PEOU	0.72
PU – MST	0.68
PU – BI	0.79
PU – ASU	0.70
PEOU – MST	0.66
PEOU – BI	0.77
PEOU – ASU	0.69

MST – BI	0.74
MST – ASU	0.71
BI – ASU	0.84

4.4. Structural Model and Hypothesis Testing

Path coefficients were examined using bootstrapping (5,000 resamples). A significance level of **$p < 0.05$** was applied.

Table 6: Structural Modelling

Hypothesis	Path	β	t-value	p-value	Result
H1	PU → BI	0.32	5.88	<0.001	Supported
H2	PEOU → BI	0.29	5.11	<0.001	Supported
H3	MST → BI	0.27	4.96	<0.001	Supported
H4	BI → ASU	0.46	8.12	<0.001	Supported
H5	PU → BI → ASU	0.15	4.87	<0.001	Supported
H6	PEOU → BI → ASU	0.13	4.21	<0.001	Supported
H7	MST → BI → ASU	0.12	3.98	<0.001	Supported
H8	PU → ASU	0.14	2.76	0.006	Supported
H9	PEOU → ASU	0.11	2.21	0.028	Supported
H10	MST → ASU	0.16	3.02	0.003	Supported

- Behavioural Intention (BI) had the strongest direct effect on Actual System Usage (ASU).
- PU, PEOU, and MST significantly influenced BI, confirming core TAM assumptions.
- All three IVs also showed significant indirect effects on ASU through BI, confirming mediation.
- Direct effects (H8–H10) were weaker but still significant, indicating partial mediation.

4.5. Model Fit

Model fit was assessed using Standardized Root Mean Square Residual (SRMR).

Table 7: Model Fitness

it Index	Value	Threshold	Interpretation
SRMR	0.061	< 0.08	Good model fit

The SRMR value of 0.061 indicates that the proposed model demonstrates an acceptable fit to the data.

5.1. Discussion

This study examined the role of management support and technology perceptions in shaping digital system usage among healthcare professionals in Karachi hospitals, using an extended Technology Acceptance Model (TAM). The findings provide strong empirical support for the model and highlight the importance of both individual perceptions and organizational factors in promoting effective use of hospital digital systems.

The results revealed that Perceived Usefulness (PU) significantly influences Behavioural Intention to Use (BI), confirming TAM's central proposition that users are more inclined to adopt technologies they believe will enhance their job performance. In the hospital context, where time efficiency and accuracy are critical, digital systems perceived as improving workflow and patient management appear to motivate stronger usage intentions. Similarly, Perceived Ease of Use

(PEOU) was found to have a significant positive effect on BI, suggesting that healthcare professionals are more willing to engage with systems that are simple, intuitive, and require minimal effort. This is particularly relevant in Karachi hospitals, where varying levels of digital literacy and workload pressures make ease of use a crucial determinant of acceptance.

Importantly, the study extends TAM by demonstrating that Management Support for Technology (MST) plays a significant role in shaping Behavioral Intention. Leadership encouragement, resource provision, and training opportunities appear to create a supportive climate that enhances employees' willingness to adopt digital tools. This finding emphasizes that technology adoption in hospitals is not purely an individual decision but is strongly influenced by organizational context.

Consistent with TAM, Behavioral Intention to Use showed the strongest direct effect on Actual System Usage (ASU), confirming that intention acts as the primary driver of real system interaction. Furthermore, mediation analysis indicated that BI significantly mediated the relationships between PU, PEOU, MST, and ASU, suggesting that perceptions and management support translate into actual behavior largely through motivational processes.

The direct effects of PU, PEOU, and MST on ASU were also significant, though weaker, indicating partial mediation. This suggests that in hospital settings, practical necessity and institutional expectations may lead to system use even when intentions are still forming. Overall, the findings validate the applicability of the extended TAM framework in explaining digital system usage in a developing-country healthcare context.

5.2. Conclusion

This study concludes that both technology-related perceptions and organizational support mechanisms are critical drivers of digital system usage in Karachi hospitals. Perceived usefulness, perceived ease of use, and management support significantly shape healthcare professionals' behavioural intentions, which in turn strongly predict actual system usage. The presence of both direct and indirect effects indicates that digital adoption in hospitals is influenced by a combination of personal motivation and institutional structures.

The extended TAM model proved to be a robust framework for understanding digital system usage in the healthcare sector of a developing urban context. The study underscores that successful digital transformation in hospitals requires not only technological infrastructure but also supportive leadership and user-friendly system design.

5.3. Limitations

Despite its contributions, this study has several limitations. First, the use of a cross-sectional design limits the ability to infer causal relationships over time. Second, the study relied on self-reported data, which may be subject to response bias. Third, the sampling was limited to hospitals in Karachi, which may restrict the generalizability of findings to other regions of Pakistan or different healthcare systems. Additionally, other potential influencing factors such as organizational culture, technical infrastructure quality, or user training levels were not examined in this model.

5.4. Future Recommendations

Future research should consider longitudinal designs to observe changes in technology usage over time. Expanding the study to include hospitals from other cities or rural areas would enhance generalizability. Researchers may also incorporate additional variables such as technology anxiety, organizational culture, system quality, and training effectiveness to provide a more comprehensive understanding of digital adoption. Qualitative approaches, such as interviews with healthcare professionals, could further explore contextual barriers and facilitators of digital system use.

From a practical perspective, hospital management should prioritize continuous training, leadership engagement, and user-centered system design to strengthen technology

acceptance and maximize the benefits of digital transformation.

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