

From Technology to Quality: The Mediating Role of Change Management in Healthcare Digital Transformation

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DOI Link: <http://dx.doi.org/10.6007/IJARBSS/v16-i9/29058>

Published Date: 24 September 2026

Abstract

Healthcare digital transformation is increasingly central to modernising health systems, yet technology investment alone does not guarantee better service quality. This study investigates the organisational mechanism through which digital transformation contributes to healthcare service quality, focusing on the mediating role of change management at King Abdulaziz University Hospital in Jeddah, Saudi Arabia. Drawing on the Technology-Organization-Environment (TOE) framework and established change-management perspectives, the study examines the direct effect of Healthcare Digital Transformation (HDT) on Healthcare Service Quality (HSQ), the effect of HDT on Change Management (CM), the effect of CM on HSQ, and the mediating role of CM in the HDT-HSQ relationship. We conducted a quantitative, cross-sectional survey using stratified random sampling. Of 400 questionnaires distributed, 358 were returned, and 340 were usable. We analysed the data using Partial Least Squares Structural Equation Modelling (PLS-SEM) with SmartPLS 4 and 5,000 bootstrap resamples. The results show significant positive effects of HDT on HSQ ($\beta = 0.383$, $p < .001$), HDT on CM ($\beta = 0.539$, $p < .001$), and CM on HSQ ($\beta = 0.461$, $p < .001$). The indirect effect of HDT on HSQ through CM is also significant ($\beta = 0.248$, $p < .001$), while the direct effect remains significant, indicating partial mediation. The model explains 62% of the variance in HSQ, and the reported VAF of 39.3% indicates a substantial mediating contribution by change management. The study demonstrates that digital transformation creates value through both technological improvements and organisational processes that enable workforce adaptation, communication, training, and workflow redesign.

Keywords: Healthcare Digital Transformation, Change Management, Healthcare Service Quality, Mediation, PLS-SEM, Saudi Arabia, Saudi Vision 2030

Introduction

Saudi Arabia is undertaking a substantial transformation of its healthcare system under Saudi Vision 2030, with digitalisation positioned as a key route to improved health outcomes, operational efficiency, and patient-centred services (Chowdhury et al., 2021). Hospitals have

consequently expanded their use of electronic health records, telemedicine, clinical decision support systems, analytics, and interconnected information platforms (Asem et al., 2024). However, implementing digital technologies should not automatically be equated with service-quality improvement.

Digital transformation changes not only technological infrastructure but also how healthcare professionals communicate, make decisions, document care, coordinate services, and interact with patients. Without systematic organisational preparation, these changes can create resistance, learning requirements, workflow disruption, and uncertainty. The literature therefore increasingly recognises that digital-health benefits depend on organisational capabilities that translate technology into everyday practice (Stoumpos et al., 2023; Harrison et al., 2021).

Change management is particularly important because professional specialisation, hierarchical structures, established routines, and strict patient-safety requirements characterise healthcare organisations. Effective change management can support leadership commitment, communication, training, employee participation, resistance management, and workflow redesign (Harrison et al., 2021). These processes help employees understand why transformation is necessary and develop the capability to use new technologies effectively.

The present study examines change management as a mediating mechanism between healthcare digital transformation and service quality at King Abdulaziz University Hospital in Jeddah. Rather than treating digital transformation as a simple technology-to-performance relationship, the study asks how technology translates into organisational and service outcomes.

The study contributes a mechanism-based explanation of digital transformation and service quality, extends the application of the TOE framework to post-adoption value realisation, and offers evidence from a Saudi healthcare institution operating within the Vision 2030 policy environment.

Problem Statement and Research Gap

Although digital-health adoption has expanded rapidly, healthcare organisations may not achieve equivalent quality improvements from similar technology investments. Existing research often emphasises adoption, acceptance, or direct performance outcomes, while paying less attention to the organisational processes that translate technology into sustainable service improvements (Stoumpos et al., 2023).

The gap is especially relevant in Saudi Arabia. Vision 2030 creates strong policy momentum for healthcare digitalisation, but the speed and scale of transformation require organisations to simultaneously modify workflows, employee roles, communication routines, and service processes (Mani & Goniewicz, 2024). Evidence on the organisational mechanisms connecting digital transformation with service quality remains comparatively limited.

Change management provides a theoretically plausible mechanism because it encompasses leadership support, communication, training, workforce adaptation, and resistance management. These activities determine whether staff accept, integrate, and embed digital

technologies in clinical work. Prior studies have examined change management in healthcare and related digital contexts, but the source study identifies limited evidence on comprehensive digital transformation and service quality in Saudi hospitals (Abutaleb et al., 2025; Basulo-Ribeiro et al., 2026).

Accordingly, the study addresses four questions concerning the direct HDT-HSQ relationship, the HDT-CM relationship, the CM-HSQ relationship, and whether CM mediates the HDT-HSQ relationship.

Research Objectives and Hypotheses

The study aims to examine the direct impact of healthcare digital transformation on healthcare service quality; assess the influence of digital transformation on change management; evaluate the effect of change management on service quality; and determine whether change management mediates the digital transformation-service quality relationship.

Hypothesis	Relationship	Expected direction
H1	HDT → HSQ	Positive
H2	HDT → CM	Positive
H3	CM → HSQ	Positive
H4	HDT → CM → HSQ	Positive mediation

Literature Review

Healthcare Digital Transformation

Healthcare digital transformation refers to integrating digital technologies into healthcare delivery and the organisational systems that support it. Relevant technologies include electronic health records, telemedicine, artificial intelligence, clinical decision support, analytics, and interoperable information systems (Stoumpos et al., 2023). Transformation goes beyond installing technology because it changes workflows, organisational routines, service models, and professional interactions.

Digital transformation can improve access to information, coordination, decision support, patient engagement, and operational efficiency. In healthcare, these benefits can contribute to fewer documentation errors, better continuity of care, faster information retrieval, and improved patient experience (Al-Assaf et al., 2024). However, benefits depend on effective implementation and user adoption.

H1: Healthcare digital transformation positively affects healthcare service quality.

Digital Transformation and Change Management

Implementing technology requires organisations to change routines and employee behaviour. Digital transformation may therefore catalyse change management because new systems create requirements for training, communication, leadership, workflow redesign, and adaptation. Harrison et al. (2021) emphasise that healthcare change initiatives require structured approaches that can address professional and organisational barriers.

The Saudi context intensifies this relationship because digital transformation is occurring at substantial speed under Vision 2030. Hospitals must introduce technologies while also building the organisational capability to use them effectively.

H2: Healthcare digital transformation positively affects change management.

Change Management and Healthcare Service Quality

Change management can influence service quality by reducing resistance, improving staff competence, clarifying new responsibilities, and embedding transformed processes into routine practice. Leadership support communicates priorities, training builds user capability, communication reduces uncertainty, and feedback mechanisms help organisations correct implementation problems (Harrison et al., 2021).

In healthcare, these processes are particularly important because changes must occur without compromising patient safety or continuity of care. Effective change management can therefore improve reliability and responsiveness while enabling professionals to exploit digital-system capabilities.

H3: Change management positively affects healthcare service quality.

Change Management as a Mediator

The central proposition is that digital transformation improves service quality partly through change management. The logic is sequential: technology creates the need for organisational change; change management prepares employees and restructures workflows; and effective implementation enables digital technologies to produce quality benefits.

Evidence from healthcare and related digital settings suggests that organisational readiness and change processes can mediate technology-performance relationships (Dahlia et al., 2025; Wulansari et al., 2026). The source study identifies limited evidence using a comprehensive digital-transformation construct in Saudi healthcare, providing the basis for the mediation hypothesis.

H4: Change management mediates the positive relationship between healthcare digital transformation and healthcare service quality.

Theoretical Foundation

Technology-Organization-Environment Framework

The TOE framework explains technology adoption and its consequences through technological, organisational, and environmental contexts (Baker, 2011). In this study, HDT represents the technological context, CM represents a central organisational capability, and HSQ represents the organisational outcome. Saudi Vision 2030 provides an important environmental context by creating policy pressure and institutional support for healthcare digitalisation.

The study extends the TOE logic by positioning change management as an active mechanism through which technology generates value. This shifts the emphasis from whether organisations adopt digital technologies to how they realise benefits after adoption.

Lewin, Kotter and ADKAR

Lewin's three-stage model conceptualises change through unfreezing, changing, and refreezing (Burnes, 2004). Kotter's framework emphasises urgency, leadership coalitions, vision, communication, empowerment, short-term wins, consolidation, and institutionalisation (Appelbaum et al., 2012). ADKAR complements these organisational perspectives by emphasising individual Awareness, Desire, Knowledge, Ability, and Reinforcement (Agazu et al., 2022). Together, these theories explain why technology investment requires coordinated organisational and individual change processes.

Conceptual Framework

The framework specifies HDT as the exogenous construct, CM as the mediator, and HSQ as the endogenous outcome. HDT is expected to influence HSQ directly and indirectly through CM.

Construct	Operational dimensions	Items
HDT	Clinical systems interconnection; interoperability; data analytics capability; staff digital competence	15
CM	Leadership support; communication effectiveness; training adequacy; resistance management	12
HSQ	Reliability; responsiveness; empathy; process quality	13

Conceptual path model: HDT → HSQ; HDT → CM; CM → HSQ; and HDT → CM → HSQ.

Research Methodology*Research Design*

The study employed a quantitative, cross-sectional design using a self-administered questionnaire and a positivist epistemological orientation. The methodology consisted of instrument development, measurement-model assessment, structural-model evaluation, and mediation analysis.

Instrument Development

The instrument comprised 40 indicators across three constructs. HDT was measured with 15 items covering clinical systems interconnection, interoperability, data analytics capability, and staff digital competence. CM contained 12 items covering leadership support, communication, training, and resistance management. HSQ contained 13 items derived from HEALTHQUAL- and SERVQUAL-based approaches and focused on reliability, responsiveness, empathy, and process quality.

We translated items through an English-Arabic back-translation procedure. Content validation involved three academic researchers and two hospital administrators. A pilot test involving 30 healthcare professionals produced Cronbach's alpha values of 0.882 for HDT,

0.873 for CM, and 0.798 for HSQ, supporting acceptable internal consistency for instrument development.

Population, Sampling and Data Collection

The target population comprised approximately 3,000 healthcare providers and associated employees at King Abdulaziz University Hospital, including physicians, nurses, pharmacists, laboratory technologists, radiology personnel, allied health professionals, and administrative employees who interact directly with digital healthcare systems.

We used stratified random sampling to obtain proportional representation across professional groups. Based on the study's stated 10-observations-per-indicator guideline, 340 observations were targeted for the 40-item instrument. To account for non-response, the study distributed 400 questionnaires from March to April 2024 in paper and electronic formats. A total of 358 questionnaires were returned; 340 were complete and usable, yielding an effective response rate of 85%.

Measurement Model Assessment

We evaluated the reflective measurement model using SmartPLS 4. All outer loadings exceeded 0.70. Cronbach's alpha values exceeded 0.85, and composite reliability values exceeded 0.90. AVE values were 0.62 for HDT, 0.58 for CM, and 0.64 for HSQ, all above the 0.50 criterion.

Discriminant validity was assessed using HTMT, with all values below 0.90 and the highest reported value being 0.78 between HDT and CM. Indicator VIF values were below 5.0, with a maximum of 3.42, indicating no serious multicollinearity.

Construct	Cronbach's α	Composite reliability	AVE
HDT	> 0.85	> 0.90	0.62
CM	> 0.85	> 0.90	0.58
HSQ	> 0.85	> 0.90	0.64

Structural Model and Hypothesis Testing

Structural Model

We estimated the structural model using the PLS algorithm and 5,000 bootstrap resamples. The model explained 62% of the variance in HSQ ($R^2 = 0.62$) and 29% in CM ($R^2 = 0.29$). Predictive relevance was supported by Q^2 values of 0.41 for HSQ and 0.18 for CM. SRMR was 0.06, below the stated 0.08 criterion.

Relationship	β	SE	t	p	95% CI	Decision
HDT $\rightarrow$ HSQ	0.383	0.052	7.365	< .001	[0.281, 0.485]	Supported
HDT $\rightarrow$ CM	0.539	0.041	13.146	< .001	[0.459, 0.619]	Supported
CM $\rightarrow$ HSQ	0.461	0.049	9.408	< .001	[0.365, 0.557]	Supported

Effect Sizes

The reported effect sizes indicate a large effect of HDT on CM ($f^2 = 0.41$), a medium effect of CM on HSQ ($f^2 = 0.28$), and a small-to-medium direct effect of HDT on HSQ ($f^2 = 0.15$). This pattern suggests that digital transformation is particularly strongly related to the organisational change processes required to implement it.

Mediation Analysis

We assessed mediation through bootstrapping with 5,000 resamples and bias-corrected 95% confidence intervals. The indirect effect of HDT on HSQ through CM was $\beta = 0.248$, $SE = 0.034$, $t = 7.294$, $p < .001$, with a 95% confidence interval of [0.182, 0.314]. Because the interval excludes zero, the indirect effect is statistically significant.

Effect	β	SE	t	p	95% CI	VAF
Direct: HDT → HSQ	0.383	0.052	7.365	< .001	[0.281, 0.485]	—
Indirect: HDT → CM → HSQ	0.248	0.034	7.294	< .001	[0.182, 0.314]	39.3%
Total: HDT → HSQ	0.631	0.038	16.605	< .001	[0.557, 0.705]	—

Because the direct effect remains significant after including CM, while the indirect effect is also significant, the study classifies the result as partial mediation. The reported VAF of 39.3% indicates that approximately two-fifths of the total effect of digital transformation on service quality operates through change management.

Discussion

The results support all four hypotheses and reinforce the argument that digital transformation should be understood as an organisational transformation rather than a technology-acquisition exercise. The positive HDT-HSQ relationship indicates that digital technologies can improve service quality directly through better information access, coordination, operational efficiency, and support for clinical decisions (Al-Assaf et al., 2024).

The strongest structural path is HDT-CM ($\beta = 0.539$). This result indicates that digital transformation is strongly associated with the organisational activities needed to manage change. New technologies alter workflows, roles, competencies, and communication requirements, thereby activating change-management processes (Harrison et al., 2021).

The positive CM-HSQ relationship ($\beta = 0.461$) shows that organisational change processes are associated with service-quality improvement. Leadership support, training, communication, resistance management, and workflow adaptation can help healthcare professionals translate technology into reliable, patient-centred practice.

Most importantly, the significant indirect effect establishes change management as a mechanism, not merely a contextual variable. The partial mediation finding indicates that digital transformation creates service-quality benefits through two routes: a direct technology route and an organisational-change route. The direct route may reflect immediate operational gains, while the indirect route reflects employees' and organisational routines' ability to absorb and sustain the transformation.

This result is consistent with the TOE framework because it shows the importance of organisational capability in realising technological value (Baker, 2011). It is also consistent with Lewin, Kotter, and ADKAR because successful transformation requires preparation, implementation, reinforcement, leadership, communication, and individual capability development.

Theoretical Implications

The study contributes to digital-health theory by extending the TOE framework toward post-adoption value realisation. Rather than treating the organisational context simply as a set of conditions influencing technology adoption, the findings position change management as an active mechanism through which technological investment becomes service value.

The findings integrate organisational and individual change perspectives. Lewin explains the transition of organisational routines, Kotter emphasises leadership and institutionalisation, and ADKAR explains individual readiness and capability. Together, they provide a richer account of why healthcare digitalisation can produce different outcomes depending on how change is managed.

Finally, the mediation result supports a mechanism-based research agenda. Future digital-health models should not assume that technology has uniform direct effects on performance; instead, they should examine organisational learning, readiness, change capability, knowledge transfer, and employee adaptation as possible pathways.

Practical and Policy Implications

For hospital administrators, plan digital transformation and change management as interdependent activities rather than sequential projects. Leadership sponsorship, communication plans, structured training, employee participation, and feedback mechanisms should accompany technology deployment.

For healthcare professionals, training should extend beyond technical instruction to include workflow integration and practical problem-solving. Staff should understand how digital systems change clinical processes and how their feedback can improve implementation.

For policymakers under Saudi Vision 2030, digital-health programs should include explicit organisational-readiness and change-management requirements. Funding decisions should consider not only hardware and software acquisition but also leadership development, workforce training, implementation support, and evaluation.

For King Abdulaziz University Hospital and comparable institutions, the reported 39.3% mediated proportion suggests that a meaningful component of digital transformation's service-quality value depends on organisational change processes. Technology investment should therefore be accompanied by equivalent attention to the people and processes responsible for implementation.

Limitations

The cross-sectional design captures relationships at one point in time and therefore limits strong causal inference. Although the theoretical sequence places digital transformation

before change management and service quality, reciprocal relationships cannot be completely excluded. Hospitals with better service quality may also possess greater readiness and resources to adopt digital technologies.

The single-hospital setting limits generalizability to private hospitals, primary care centres, other Saudi regions, and other national contexts. Reliance on self-reported responses may also introduce common-method and social-desirability bias. Objective service-quality indicators and multi-source data would strengthen future validation.

Although 340 observations are adequate for the reported PLS-SEM model, a larger sample could improve statistical power for more complex models. Finally, change management is only one possible mechanism; organisational learning, innovation culture, knowledge management, employee engagement, and leadership style may also explain digital-transformation outcomes.

Future Research

Future studies should employ longitudinal designs that collect data before, during, and after major digital-transformation initiatives. Such designs could provide stronger evidence about temporal ordering and show how the mediation mechanism evolves across implementation stages.

Replication across multiple Saudi hospitals would improve external validity and allow comparison by ownership type, hospital size, geographic location, and digital maturity. Comparative studies across Gulf Cooperation Council countries could identify institutional conditions that strengthen or weaken the mediation effect.

Researchers should incorporate objective indicators such as patient satisfaction, clinical outcomes, error rates, waiting times, operational efficiency, and system-use metrics alongside employee perceptions. Multi-source designs involving patients, administrators, clinicians, and external evaluators would reduce common-method concerns.

Future models may also test organisational learning, knowledge management, innovation culture, leadership style, employee resistance, and external regulatory pressure as additional mediators or moderators. Research should compare the organisational consequences of specific technologies, such as electronic health records, telemedicine, artificial intelligence, and clinical decision support systems.

Conclusion

This study demonstrates that healthcare digital transformation contributes to service quality through both direct and organisational pathways. At King Abdulaziz University Hospital, HDT has a significant positive effect on HSQ, a strong positive effect on CM, and CM has a significant positive effect on HSQ. The significant indirect effect confirms that change management partially mediates the relationship between digital transformation and service quality.

The central implication is that digital transformation is not simply a technology project. Its value depends largely on how organisations prepare people, redesign workflows,

communicate objectives, build competence, manage resistance, and institutionalise new practices. The reported 39.3% VAF highlights the practical importance of this organisational mechanism.

Within Saudi Vision 2030, the findings support a balanced transformation strategy in which investments in digital infrastructure match investments in change-management capability. This approach can help healthcare organisations move from technology adoption to sustainable improvements in service quality.

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