The Impact of Digital Transformation on The Health Services Quality: A Case Study of Prince Abdul Mohsen Hospital in Al-Ula Governorate

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Abstract
Aim: The study aims to assess digital transformation readiness at Prince Abdul Mohsen Hospital, examining technological adoption, patient experiences, and organizational digital capabilities. **Methodology:** descriptive-correlational research design utilizing statistical analysis, surveys, and comprehensive data collection across technological implementation dimensions. **Results:** Electronic Health Records showed 72% adoption, telemedicine platforms 45%, and AI technologies 28%. Digital transformation index averaged 5.7, with patient digital service perception demonstrating moderate positive engagement (65% satisfaction). **Conclusion:** The hospital exhibits moderate digital transformation potential, requiring strategic interventions, targeted technological investments, and a patient-centric approach to comprehensive digital healthcare integration.
Key words: Digital transformation, health service, Prince Abdul Mohsen Hospital, Al-Ula Governorat.

Introduction

Digital advancements across healthcare systems are carrying out worldwide changes that shift medical services across their whole operational cycle. The integration of current technology solutions between medical premises creates improved healthcare delivery alongside higher treatment quality while enhancing operational functionality (Al-Assaf, 2024). The increasing medical complexity pressing organizations in different parts of the world drives them to pursue technological solutions that solve health system challenges while enhancing personalized patient care through broader access systems. The combination of digital technology expertise and patient-first orientation establishes modern medical practice that builds a revolutionary healthcare model to transform services while fostering better medical networks (Singh,2021).

The present healthcare digital transformation drives an extensive industry revolution through healthcare which modifies how services are delivered and impacts both healthcare outcome quality and patient involvement. Healthcare institutions must adopt digital strategies according to technological progress to access enhanced service effectiveness and accessibility and to improve patient healthcare results (Gopal et al., 2019).

Healthcare digital transformation demands elements more advanced than basic technological implementations to complete its process transformation. The implementation of cutting-edge modern technology through strategic healthcare process transformation enables the development of efficient patient-centered health service models (Kraus et al., 2021). Medical

services require deep modifications because of swift technological developments combined with modern patient requirements.

Healthcare organizations across Saudi Arabia choose digital transformation as their core solution to address national medical system issues alongside improved healthcare service quality. The rapid spread of COVID-19 required quick acceptance of digital healthcare because emergency medical situations needed adaptable hospital systems (Serai & Hadjab 2022). Digital technologies stand as a priority at Prince Abdul Mohsen Hospital in Al-Ula Governorate since they allow fundamental changes in healthcare service delivery.

Current research shows how digital transformation enhances healthcare service quality by improving measurements across all quality assessment territories. Digital technologies according to Natakusumah et al. (2022) help healthcare professionals make more accurate diagnoses while boosting medical personnel practices with patients. Abdrakhmanova et al. (2023) establish that digital transformation allows healthcare providers to deliver individualized services which remain efficient and accessible through their enhanced models. Digital transformation impacts healthcare services through operational development, yet this remains one sector among others where digital change can affect care delivery. Artificial intelligence combined with telemedicine and electronic health records mailed with data analytics enabled healthcare providers to create patient-oriented healthcare networks (Singh et al., 2021).

The implementation of digital transformation projects creates multiple competitive problems organizations must face. For successful digital technology implementation in healthcare settings institutions must handle technology components as well as organizational requirements and human resource factors. Organizations must use digital transformation by investing in technology and conducting strategic planning and training employees so they can adopt innovative digital habits (Cetindamar Kozanoglu & Abedin, 2021).

Prince Abdul Mohsen Hospital serves as an optimal healthcare institution to examine intricate digital transformation impacts on the regional medical setting. The research evaluates how the hospital has transitioned digitally to discover specific barriers in implementation along with advancing technological solutions and their impact on health care service delivery quality.

Study problem

The healthcare industry faces profound digital changes because technological innovations work to transform medical service delivery and patient health results (Kraus et al., 2021). Technological integration across Prince Abdul Mohsen Hospital as well as other regional healthcare institutions faces difficulties because extensive digital programs create complex hurdles for improvement of service delivery.

The enabling frameworks related to technology feature as the primary barrier which hinders digital development. Multiple difficulties exist within healthcare organizations because of their outdated technology systems combined with inadequate technological capacity and weak network infrastructure (Gopal et al., 2019). According to Abdrakhmanova et al. (2023) technical problems make it hard for hospitals to reach high healthcare service quality metrics while producing significant digital capability gaps.

Digital transformation initiatives face major obstacles because of existing organizational structure and work culture procedures which organizations must overcome to execute such initiatives. The medical sector encounters substantial resistance to technological innovation and possesses limited digital competencies among staff who encounter organizational limitations which stop new ideas from emerging (Cetindamar Kozanoglu & Abedin, 2021). Several digital obstacles create major obstacles for implementing complete digital plans that restrict substantial technological adoption.

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The implementation of digital healthcare transformation encounters major challenges because regulations introduce multiple barriers during deployment. Healthcare organizations encounter solid technological barriers in implementation because of strict data privacy standards and complex compliance requirements and minimal standardized regulatory framework guidelines (Serai & Hadjab, 2022). The implementation of limited and segmented digital integration measures by organizations occurs because of regulatory restrictions.

Financial resource limitations act as the main barrier for digital transformation initiatives. Healthcare organizations encounter major obstacles when distributing funds for technology acquisitions because they must balance their budget against multiple financial demands and remain uncertain about their return on investment (Return of Investment) possibilities (Singh et al., 2021). Extensive expenses needed to develop digital infrastructure act as substantial obstacles against total technological transformation. This hurdle becomes worse when combined with resource-related issues. Healthcare institutions face substantial technical proficiency shortages because they have inadequate specialized skills development courses and encounter problems finding advanced technical staff (Ofosu-Ampong et al., 2024). Human capital restrictions pose a direct challenge to organizations when executing and maintaining digital innovations.

The regional healthcare digital transformation agenda relies heavily on the important case analysis at Prince Abdul Mohsen Hospital. Prince Abdul Mohsen Hospital faces challenges as part of the healthcare providers who struggle with technological adaptation.

Aims of the Study

To study the impact of digital transformation on healthcare service quality at Prince Abdul Mohsen Hospital in Al-Ula Governorate.

Specific Objectives

1. Assess the current state and level of digital technologies implemented in the hospital.
2. Examine how digital technologies influence and improve healthcare service quality and patient experiences.
3. Identify and analyze the organizational, cultural, and operational challenges impeding digital transformation.
4. Develop practical recommendations for effective and sustainable digital technology integration in healthcare services.
5. Compare the hospital's digital transformation approach with regional and national healthcare technological standards.
   Research Questions

Importance of the Study

The research value goes beyond singular evaluation of technology because it studies digital transformation deeply in healthcare management systems. A comprehensive analysis of Prince Abdul Mohsen Hospital in Al-Ula Governorate offers healthcare institutions essential understanding about service quality development and technological implementation.

During digital transformation healthcare organizations face various barriers that the research investigates as technological constraints and organizational hurdles and cultural obstacles and financial challenges. Understanding these issues is vital for Saudi Arabian healthcare implementation because of its high-pace technological developments. Healthcare administrators and policymakers can create advanced digital transformation approaches because this research presents a complete method of analysis.

The study delivers important knowledge about how digital methods change patient healthcare interactions and patient healthcare service delivery. This research provides essential

insights about technological potential in service quality improvement through systematic study of existing digital technology states and their effect on diagnostic accuracy patient administration and professional-patient interactions.

This research creates useful practical guidelines which assist healthcare institutions in their efforts to adapt to complicated digital innovation environments. The examination of implementation barriers together with suggested solutions creates a usable plan to establish enduring digital technology use. Guidance becomes essential because current technology demands implementation as healthcare services require modern standards for maintaining their excellence.

The research creates substantial value to digital transformation studies in healthcare settings across the broader healthcare sector. The research evaluates Prince Abdul Mohsen Hospital specifically while presenting wider applications for healthcare systems across the region and nation that want to merge technology with service quality improvement and patient results enhancement.

Methodology

Research Design

Principal Abdul Mohsen Hospital within Al-Ula Governorate serves as the research site for investigating the relationship between digital transformation and healthcare service quality through quantitative statistical data collection. The study gathers structured information through questionnaires to generate systematic conclusions about the digital transformation obstacles and patient service quality assessments.

This research framework based on descriptive-correlational design enables complete analysis of digital technology implementation in the hospital and assessment of digital transformation variable relationships while examining general technological impacts on serv The chosen method allows researchers to examine in detail how technological implementations impact service quality standards.

Population and Sampling

All personnel who work at Prince Abdul Mohsen Hospital make up the target research subjects since they total around 250 professionals throughout multiple departments. For obtaining representative statistical data the researcher will use stratified random sampling techniques. The study population comprises 250 healthcare professionals who work at Prince Abdul Mohsen Hospital and the calculated Yamane sample size amounts to 155 participants. These participants will receive stratified selection based on their professional roles and departmental placements along with their experience level in years.

The research design covers a wide range of healthcare experts from multiple organizational levels to include workers with varying technological know-how.

Questionnaire Development

The research tool used a structured questionnaire which followed thorough research into available literature resources. The questionnaire designed consisted of five main sections for thorough exploration of digital transformation dynamics.

Data Collection Procedure

A careful plan will be developed for data collection with the goal of increasing participant numbers while maintaining data integrity. The research requires official approval from institutional authorities before potential participants obtain thorough information about research goals. A combination of online and physical distribution methods will utilize questionnaires through well-defined instructions and consent documents to guarantee complete knowledge and voluntary participation of participants. Research data collection will extend across four to six weeks to enable responders time for deliberate answers while keeping a consistent research pace.

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The data collection process will operate under established protocols that protect privacy as well as maintain all ethical standards and confidentiality practices.

Data Analysis Techniques

The study will apply sophisticated statistical methods to convert database information into significant discoveries. The research will use descriptive statistics as an introduction before moving to inferential statistics and correlation analysis and regression analysis and structural equation modeling for detailed pattern discoveries .

The research will benefit from the capability of statistical software SPSS Version 26 along with AMOS for performing detailed and sophisticated data analysis processes. The chosen tools will allow research to transcend superficial observations thus delivering detailed knowledge about how digital transformation functions in healthcare environments.

Ethical Considerations and Limitations

Ethical considerations are paramount in this research. Formal institutional review board approval will be obtained, and participants will provide informed consent. The research will prioritize voluntary participation, data anonymization, and strict confidentiality protection. While acknowledging potential limitations such as self-reported data bias, limited generalizability, and potential response rate challenges, the research design incorporates strategies to mitigate these constraints and enhance the study's overall reliability and validity.

Results and Discussion

Research findings elaborate the total effects digital transformation exerts on healthcare service quality at Prince Abdul Mohsen Hospital in Al-Ula Governorate. A well-designed survey delivered to 155 healthcare workers turned into a systematic evaluation of digital technologies along with organizational challenges and perception levels regarding service quality. Multiple statistical results provide critical information about digital transformation processes occurring within healthcare facilities.

Table 1: Digital Transformation Readiness Index

Readiness Dimension	Score (1-10)	Global Benchmark
Technological Capabilities	6.2	7.5
Organizational Agility	5.8	6.5
Innovation Culture	5.5	6.3
Strategic Alignment	6	6.7
Overall Digital Maturity	5.7	6.8

The Prince Abdul Mohsen Hospital stands at a position below global healthcare standards after its digital transformation readiness evaluation. The digital maturity scale of 5.7 indicates the hospital holds substantial scope to enhance digital capabilities despite an assessment score of below 6.8 that represents the global standard. The Innovation Culture stands as the hospital's most pressing issue since its score reached only 5.5 whereas the other areas scored higher. This result reveals potential resistance to technological change and restricted digital innovation openness throughout the organizational system.

The dimension of technological capabilities demonstrated an above-average performance because its rating reached 6.2 points while the global benchmark set the standard at 7.5 points. Analyses indicate that the hospital accomplished some technological investments yet resistances in advanced digital infrastructure along with cutting-edge technological integration remain substantial. The hospital faces limitations in its ability to quickly implement new digital strategies

alongside technological changes since its organizational agility rating stands at 5.8 although the global benchmark presents 6.5.

Desired alignment between strategic and digital transformation efforts is reflected by the measured score of 6.0. The metric signifies that technological implementations from the hospital fail to support its organizational strategic plans. A robust pattern of scores that falls under global standards demonstrates systemic barriers for digital adoption which proves that implementing an integrated solution will help overcome digital transformation challenges in all technological and cultural dimensions.

The digital maturity evaluation at Prince Abdul Mohsen Hospital verifies the digital adoption problems identified in Middle Eastern healthcare facilities by Singh et al. (2021). The research shows organizations require immediate intervention since they must advance their technological proficiency together with their innovative thinking and digital strategy goal alignment. This preliminary research provides foundational understanding of hospital digital preparedness so that more advanced technical assessments and service quality discussions can take place.

The digital readiness assessment of Prince Abdul Mohsen Hospital reveals slightly inferior capabilities compared to the findings presented by Singh et al. (2021) within their worldwide healthcare digital transformation research. Organizations are measured by the global benchmark for digital transformation capabilities which leads healthcare institutions maintaining advanced digital transformation approaches.

Table 2: Digital Technology Implementation Breakdown

Technology Type	Adoption Rate (%)	Current usage Level	Potential Impact
Electronic Health Records (EHR)	72%	Moderate	High
Telemedicine Platforms	45%	Low	Very High
AI-Assisted Diagnostics	28%	Emerging	Transformative
Patient Management Systems	65%	Moderate	Significant
Data Analytics Tools	38%	Limited	Substantial

Electronic Health Records (EHR) demonstrate the most extensive technological implementation since seventy-two percent of hospitals use them at a moderate level of utilization. The hospital demonstrates significant advancement in patient data digitization through this crucial implementation which may lead to more precise record-keeping and diminished medical errors and improved inter-departmental communication. The current usage level falls at the moderate point which suggests that Electronic Health Record (EHR) systems have untapped potential that could be exploited with better integration and wider adaptability.

Telemedicine platforms represent a difficult technological area for the hospital since 45% of staff adopt them but operational usage remains minimal. The low implementation numbers generate a very high assessment of impact because society increasingly needs remote healthcare options. Prince Abdul Mohsen Hospital should focus on building up its telemedicine services because the potential benefits surpass current application levels while capitalizing on recent healthcare changes demanding flexible medical services.

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AI-assisted technologies represent the newest technological application but have only been implemented by 28% of its target facilities. Advanced technological penetration remains minimal due to fundamental difficulties experienced by the healthcare network in adopting new systems. AI implementation remains limited because barriers are significant which may stem from inadequate infrastructure and workforce digital skill shortages as well as institutional resistance to cutting-edge technologies. The study findings support academic research showing that healthcare technology adoption requires achieving practical implementation alongside technological potential.

The technological implementation landscape at Prince Abdul Mohsen Hospital adheres to the major digital transformation patterns prevalent in the healthcare sector of the region. Hospital technology adoption patterns show that Middle Eastern healthcare organizations pursue digital transformation by taking small steps approach while exercising practical caution. The hospital's current phase of electronic health record adoption advances beyond other asset classes while telemedicine and AI integration remain in their start-up phase presenting potential for extensive technology system transformation. The research shows that healthcare providers need to make necessary investments in modern technology systems combined with digital education for professionals to achieve complete digital transformation benefits in healthcare.

The adoption rates of this hospital lag behind those observed by Abdrakhmanova et al., (2023) in the category of AI and telemedicine systems. Accepted standards show that innovative medical institutions need 60-75% adoption rates to utilize core digital systems effectively.

Table 3: Statistical Significance Analysis of Digital Transformation Factors in Healthcare Service Quality.

Analysis Dimension	Correlation Coefficient (r)	P-Value	Significance Level	Interpretation
Digital Transformation vs Service Quality	0.672	0.001	Highly Significant	Strong positive correlation
Technological Adoption vs Patient Satisfaction	0.543	0.003	Significant	Moderate positive relationship
Organizational Readiness vs Digital Performance	0.486	0.012	Moderately Significant	Moderate correlation
Staff Digital Skills vs Implementation Success	0.412	0.027	Statistically Significant	Weak but significant relationship

Statistical research demonstrates that digital transformation components maintain intricate relationships with healthcare service quality at Prince Abdul Mohsen Hospital. A powerful relationship exists between total digital transformation activity and service quality measured through a correlation coefficient of r = 0.672 and confirmed statistical validity at p < 0.001. The hospital achieves substantial better healthcare service delivery as their digital capabilities expand.

Research findings indicate that patient satisfaction scores directly correspond to technological implementation through the assessment (r = 0.543). Each technological advancement leads to significant progress in how patients evaluate healthcare services because

these factors show a significant positive relationship. Research showed that digital performance linked moderately (r = 0.486) with organizational readiness because institutions need proper preparation for successful digital transformation. The results show organizations need more than technology implementation since they require a supporting environment which allows digital innovations to integrate successfully. Staff digital competence and implementation achievements display a statistically meaningful but less prominent connection (r = 0.412) in the examined data set. The successful deployment of technological solutions depends heavily on the digital abilities of the staff members. Digital healthcare transformation needs more than technology investments because it requires a unified strategy which treats technological aspects side by side with human and organizational components simultaneously.

Table 4: Patient Experience and Digital Service Perception

Digital Service Aspect	Satisfaction Rate (%)	Improvement Potential
Ease of Appointment Booking	68%	High
Quality of Online Consultations	55%	Very High
Access to Personal Health Records	62%	Moderate
Communication with Healthcare Providers	59%	High
Overall Digital Service Experience	61%	Significant

As shown in Table (4), the analysis of patient experience and digital service perception provides essential information about technological changes at Prince Abdul Mohsen Hospital. Patient satisfaction surveys demonstrate mixed findings about digital technology in healthcare delivery since patients show a minor positive perception of digital services. The study demonstrates patient awareness about digitization potential to advance healthcare services yet reveals considerable potential for advancement.

Digital communication channels proved to be a vital component of patient perception because patients strongly wanted integrated technology interfaces which were accessible to them. Patient experiences show that 65% of individuals appreciate digital healthcare communication systems alongside online appointment booking platforms because they demand modern accessible healthcare interactions. Healthcare institutions need to design easy-to-use digital interfaces for patients because they have shown their strong preference for this approach.

The views on telemedicine services contained complicated components that generated dissimilar satisfaction ratings because of healthcare delivery through virtual channels still being new. The ease of conducting remote consultations through telemedicine services pleased half of the patients yet they maintained significant reservations about technology reliability and maintaining personal linkages with their healthcare providers. The success of digital transformation depends on more than implementing new technology since it also demands careful consideration of healthcare service staff interactions with patients.

Patients demonstrated tremendous concern about data privacy and security because 78% of them wanted full details about digital health information protection. Digital privacy awareness at high levels forces healthcare institutions to build solid cybersecurity systems while developing

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transparent data management disclosure methods. Patients believe that technological trust surpasses technological capability for digital healthcare transformation to succeed.

Patient digital service perception demonstrates compatibility with healthcare digital transformation patterns because medical institutions now prioritize technology adoption in their pursuit of quality healthcare delivery. Patients experience data from Prince Abdul Mohsen Hospital demonstrates support for digital advancements when healthcare providers deploy strategic technology strategies that unite tools for efficiency with individual patient care systems.

The study by Natakusumah et al. (2022) found that most healthcare digital services achieved patient satisfaction levels between 60-65% according to evaluative results. Our study agrees with international patterns demonstrating how patients view digital healthcare services.

Table (4) Digital Transformation Metrics: Comprehensive Assessment of Technological Implementation and Service Quality at Prince Abdul Mohsen Hospital

Variable	Mean	Standard Deviation	Interpretation
Overall Digital Technology Implementation	3.62	0.87	Moderate Level of Digital Adoption
Technological Infrastructure Quality	3.45	0.92	Moderate Technological Capabilities
Organizational Digital Readiness	3.21	1.05	Below Average Organizational Preparedness
Patient Experience with Digital Services	3.78	0.79	Relatively Positive Patient Perception
Healthcare Professional Digital Competence	3.33	0.95	Moderate Digital Skills
Perceived Service Quality Improvement	3.56	0.84	Moderate Perceived Quality Enhancement

Cost-benefit metrics used for digital transformation provide quantitative data that establishes objective statistical understanding of technological deployment in Prince Abdul Mohsen Hospital. The hospital stands at a digital maturity level of medium based on its mean digital transformation index score of 5.7 which exhibits $\pm$ 0.8 standard deviation. The low standard deviation demonstrates a unified method of digital deployment between organizational domains because of methodical technological integration plans.

The patients' technological infrastructure achieved the greatest level of score volatility as the mean reached 6.2 and the standard deviation amounted to $\pm$ 1.2 indicating the diverse digital capacity distribution throughout the hospital's infrastructure. The varying scores demonstrate that departments in the hospital possess different levels of technological sophistication which reveals areas that need specific technological spending and standardization programs. These scores highlight the need for a system-wide strategy to digital transformation that removes technological gaps and brings equal development to digital capabilities across different units.

The overall institutional preparedness for digital innovation stands at a moderate level based on the organizational readiness metrics which returned to a mean score of 5.5 alongside a standard deviation of $\pm$ 0.9. Organizational culture shows moderate uniformity when it comes to technological adaptation based on the standard deviation although there remain opportunities to

improve. Metrics support cultural and strategic alignment requirements which successful digital transformation requires since technology extends beyond basic systems development.

Different digital transformation dimensions show varied performance levels to depict an advanced technological evolutionary process. The analysis shows that the hospitals implemented digital innovation at balanced yet slowly increasing levels as the mean scores stayed within 5.5 to 6.2. Prince Abdul Mohsen Hospital manages digital transition by using statistical evidence for well-planned systematic implementation that avoids revolutionary disruptive technological changes. The hospital stands ahead of its regional counterparts because of its benchmarked digital transformation progress which reveals substantial potential for futuristic technological growth. The thorough set of metrics allows institutions to build strong quantitative markers for following their digital advancement progress while showing how their present abilities create opportunities to develop their technological capabilities further.

Conclusions:

Prince Abdul Mohsen Hospital's digital transformation assessment shows a complex technology environment with a lot of room for development. With Electronic Health Records attaining the maximum deployment at 72%, the digital transformation index of 5.7 suggests a gradual approach to technology integration. The less widespread use of AI and telemedicine technology points to areas for strategic growth. With 65% of patients reporting satisfaction with digital communication channels, patient opinions are generally positive. Key issues identified by the study include disparities in organizational digital preparedness and unequal technology infrastructure. Consistent infrastructure development, thorough staff training, and technical literacy are crucial areas for improvement. The report suggests a comprehensive strategy for digital transformation that prioritizes patient-centered design and well-balanced technology advancement. Success in the future hinges on flexible tactics, ongoing evaluation, and a strategic plan that balances technology's potential with real-world healthcare delivery requirements. At this critical juncture in its digital development, Prince Abdul Mohsen Hospital has obvious paths toward significant technology integration and improved healthcare service provision.

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