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DIGITAL HEALTH COMPETENCE AND HEALTHCARE SERVICE PERFORMANCE AMONG HEALTHCARE PROFESSIONALS IN SAUDI ARABIA

KOMPETENSI KESEHATAN DIGITAL DAN KINERJA PELAYANAN KESEHATAN DI KALANGAN TENAGA PROFESIONAL KESEHATAN DI ARAB SAUDI

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Abstract

Digital transformation in healthcare services has significantly changed how healthcare professionals deliver clinical care, particularly in technology-based tertiary hospitals. Digital Health Competence (DHC) has become a crucial factor determining service effectiveness, clinical decision quality, and operational efficiency in modern healthcare organizations. This study aims to analyze the influence of digital health competence on healthcare service performance at King Abdullah Medical City (KAMC), Saudi Arabia, with work engagement as a mediating variable and organizational support as a moderating factor. This study employed a quantitative cross-sectional design. The sample consisted of 312 healthcare professionals at KAMC selected through stratified random sampling. Data were collected using a Likert-scale questionnaire ranging from 1 to 5 and analyzed using Structural Equation Modeling–Partial Least Squares (SEM-PLS). The findings revealed that digital health competence had a positive and significant effect on healthcare service performance ($\beta = 0.412$; $p < 0.001$). Digital competence also significantly influenced work engagement ($\beta = 0.528$; $p < 0.001$), while work engagement mediated the relationship between digital competence and healthcare service performance ($\beta = 0.216$; $p < 0.001$). Furthermore, organizational support strengthened the relationship between digital competence and work engagement. These findings indicate that digital competence not only improves service efficiency and quality but also functions as a psychological resource that enhances healthcare professionals' motivation and dedication. Practically, the study provides important implications for hospitals in improving healthcare professionals' digital competence through continuous training, the development of user-friendly digital systems, and adaptive organizational support.

Keywords : Digital Health Competence, Healthcare Service Performance, Work Engagement, SEM-PLS, Digital Transformation, Hospital.

Abstrak

Transformasi digital dalam layanan kesehatan telah secara signifikan mengubah cara para profesional kesehatan memberikan perawatan klinis, khususnya di rumah sakit tersier berbasis teknologi. Kompetensi Kesehatan Digital (DHC) telah menjadi faktor penting yang menentukan efektivitas layanan, kualitas pengambilan keputusan klinis, dan efisiensi operasional dalam organisasi kesehatan modern. Studi ini bertujuan untuk menganalisis pengaruh kompetensi kesehatan digital terhadap kinerja layanan kesehatan di King Abdullah Medical City (KAMC), Arab Saudi, dengan keterlibatan

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kerja sebagai variabel mediasi dan dukungan organisasi sebagai faktor moderasi. Studi ini menggunakan desain kuantitatif cross-sectional. Sampel terdiri dari 312 profesional kesehatan di KAMC yang dipilih melalui pengambilan sampel acak bert stratified. Data dikumpulkan menggunakan kuesioner skala Likert dengan rentang 1 hingga 5 dan dianalisis menggunakan Structural Equation Modeling–Partial Least Squares (SEM-PLS). Hasil penelitian menunjukkan bahwa kompetensi kesehatan digital memiliki pengaruh positif dan signifikan terhadap kinerja layanan kesehatan ($\beta = 0{,}412$; $p < 0{,}001$). Kompetensi digital juga secara signifikan memengaruhi keterlibatan kerja ($\beta = 0{,}528$; $p < 0{,}001$), sementara keterlibatan kerja memediasi hubungan antara kompetensi digital dan kinerja layanan kesehatan ($\beta = 0{,}216$; $p < 0{,}001$). Lebih lanjut, dukungan organisasi memperkuat hubungan antara kompetensi digital dan keterlibatan kerja. Temuan ini menunjukkan bahwa kompetensi digital tidak hanya meningkatkan efisiensi dan kualitas layanan tetapi juga berfungsi sebagai sumber daya psikologis yang meningkatkan motivasi dan dedikasi para profesional kesehatan. Secara praktis, penelitian ini memberikan implikasi penting bagi rumah sakit dalam meningkatkan kompetensi digital para profesional kesehatan melalui pelatihan berkelanjutan, pengembangan sistem digital yang mudah digunakan, dan dukungan organisasi yang adaptif.

Kata Kunci : Kompetensi Kesehatan Digital, Kinerja Layanan Kesehatan, Keterlibatan Kerja, SEM-PLS, Transformasi Digital, Rumah Sakit.

1. INTRODUCTION

Background

Digital transformation has become a central pillar in the evolution of modern healthcare systems worldwide. The rapid development of digital technologies such as Electronic Health Records (EHR), telemedicine, artificial intelligence (AI), big data analytics, Internet of Medical Things (IoMT), and clinical decision support systems has fundamentally reshaped the delivery of healthcare services. These technologies have improved clinical efficiency, enhanced diagnostic accuracy, strengthened patient safety, and supported evidence-based medical decision-making (Topol, 2019; Verhoef et al., 2021). In addition, digital health systems have enabled healthcare organizations to shift from traditional, fragmented service models toward integrated, data-driven, and patient-centered care delivery (WHO, 2021; WHO, 2023).

The global acceleration of digital health adoption became particularly evident during the COVID-19 pandemic, which forced healthcare systems to rapidly implement telemedicine, remote monitoring, and digital communication platforms to ensure continuity of care (Shreffler et al., 2020; Mesko & Győrffy, 2023). This transformation demonstrated that digital health technologies are no longer optional innovations but essential infrastructures for resilient healthcare systems. However, the sustainability and effectiveness of digital transformation are not determined solely by technological advancement, but also by human and organizational readiness.

In this context, healthcare professionals play a central role as the primary users of digital systems. The success of digital transformation depends on their ability to adapt, interpret, and effectively utilize digital technologies in clinical practice. This ability is conceptualized as **digital health competence (DHC)**, which refers to the knowledge, skills, and attitudes required to use digital health technologies safely, ethically, and effectively in healthcare delivery (European Commission, 2022). Digital health competence includes digital literacy, electronic documentation skills, patient data management, virtual communication, and the ability to integrate digital information into clinical decision-making processes (Nazeha et al., 2020).

Despite its importance, evidence suggests that many healthcare professionals still face significant challenges in adapting to digital systems. These challenges include limited digital literacy, technostress, increased cognitive workload, resistance to technological change, and insufficient organizational support (Kaltenegger et al., 2024; Pansini, 2023). Such barriers may reduce work efficiency, increase burnout risk, and negatively affect healthcare service performance.

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In Saudi Arabia, digital health transformation has become a strategic national priority under **Saudi Vision 2030**, which emphasizes healthcare system modernization, digital integration, and service quality improvement. Hospitals such as King Abdullah Medical City (KAMC) represent advanced tertiary healthcare institutions implementing comprehensive digital health systems. However, despite substantial investment in healthcare technologies, variations in healthcare service performance still exist, suggesting that technological infrastructure alone is insufficient to ensure optimal outcomes.

This indicates the need to explore not only the direct effect of digital health competence on performance but also the underlying psychological and organizational mechanisms that explain this relationship. In particular, **work engagement**—defined as a positive, fulfilling work-related psychological state characterized by vigor, dedication, and absorption—may play a critical mediating role in translating digital competence into improved performance outcomes (Bakker & Demerouti, 2017; Bakker et al., 2023).

Furthermore, **organizational support** is expected to act as a contextual resource that strengthens employees' motivation and engagement in digital work environments. Organizational support includes leadership encouragement, training opportunities, technological infrastructure, and supportive work climate. According to the Job Demands–Resources (JD-R) theory, job and organizational resources enhance employee engagement, which in turn improves performance outcomes.

However, despite the growing body of literature on digital health transformation, three major gaps remain evident:

First, most previous studies have focused on direct relationships between digital competence and performance, with limited attention to **multi-mechanism models** that integrate psychological (work engagement) and organizational (support systems) pathways simultaneously.

Second, existing research is predominantly conducted in Western healthcare contexts, limiting its applicability to Middle Eastern healthcare systems, which are characterized by hierarchical structures, multicultural workforce composition, and ongoing systemic reforms.

Third, empirical evidence using advanced statistical modeling such as **Structural Equation Modeling–Partial Least Squares (SEM-PLS)** to simultaneously test mediation and moderation effects in digital healthcare contexts remains limited.

To address these gaps, this study develops an integrated conceptual model grounded in **Job Demands–Resources (JD-R) Theory**, examining how digital health competence influences healthcare service performance through work engagement, and how this relationship is strengthened by organizational support. This model provides a more comprehensive understanding of how individual capabilities and organizational resources interact to shape performance outcomes in digital healthcare environments.

Therefore, this study is positioned to contribute both theoretically and empirically by explaining the mechanisms through which digital transformation translates into improved healthcare service performance in a technologically advanced hospital setting in Saudi Arabia.

LITERATURE REVIEW

Theoretical Framework

Digital health competence refers to healthcare professionals' ability to utilize digital technologies effectively, safely, and professionally to support modern healthcare services. This competence includes the use of various digital systems such as Electronic Health Records (EHR), telemedicine, clinical decision support systems, and data-driven healthcare applications used in daily clinical practice (European Commission, 2022). Beyond technical proficiency, digital competence also encompasses digital literacy, patient data protection, virtual communication, and the ability to adapt to rapidly evolving healthcare technologies (Konttila et al., 2019; Nazeha et al., 2020). In the era of technology-based healthcare services, digital competence has become a fundamental requirement because nearly all healthcare processes are integrated with digital information systems.

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Numerous studies indicate that healthcare professionals with strong digital competence are more capable of improving work efficiency, reducing medical errors, enhancing documentation accuracy, and accelerating clinical decision-making processes (Jarva et al., 2022; Longhini et al., 2024). Digital competence also supports organizational readiness in facing healthcare digital transformation (Mesko & Győrffy, 2023). Conversely, limited digital skills may hinder healthcare delivery and increase work-related stress.

Healthcare service performance reflects the ability of healthcare professionals and organizations to achieve healthcare objectives optimally, including clinical effectiveness, service quality, patient safety, operational efficiency, and patient satisfaction (Topol, 2019; Verhoef et al., 2021). Within the framework of the Job Demands–Resources (JD-R) Theory, digital competence is considered a job resource that can enhance work engagement and improve healthcare professionals' performance (Bakker & Demerouti, 2017; Lesener et al., 2020).

Conceptual Framework

The conceptual model of this study can be described as follows:

Digital Health Competence → Work Engagement → Healthcare Service Performance

Organizational Support → Moderates the relationship between Digital Competence and Work Engagement.

2. RESEARCH METHOD

Research Design

This study employed a quantitative cross-sectional explanatory research design to examine the relationships among digital health competence, work engagement, organizational support, and healthcare service performance. The study adopted Structural Equation Modeling–Partial Least Squares (SEM-PLS 4.0), which is appropriate for complex predictive models and theory development in healthcare organizational research (Hair et al., 2022). Research Novelty unlike previous studies that primarily examined direct relationships between digital competence and performance, this study develops and empirically tests an integrated **multi-mechanism model** incorporating, psychological mechanism (work engagement),organizational mechanism (organizational support), and behavioral capability (digital health competence), within the **Job Demands–Resources (JD-R) theoretical framework**.

Research Location and Setting

The study was conducted at King Abdullah Medical City (KAMC), Saudi Arabia, a tertiary referral hospital equipped with advanced integrated digital health systems, representing a high-level digital healthcare transformation environment aligned with Saudi Vision 2030.

Population and Sample

The population consisted of 4,425 healthcare professionals directly involved in clinical services.

The sample size was determined using the SEM-PLS minimum sample requirement based on: 10-times rule and power analysis (Cohen's power = 0.80), resulting in **312 respondents**.

Sampling Technique

A stratified random sampling technique was used to ensure proportional representation of: physicians, nurses, pharmacists, allied health professionals.

Inclusion Criteria:

Minimum 1 year clinical experience
Active use of digital health systems
Direct patient care involvement
Voluntary participation

Exclusion Criteria:

Administrative/non-clinical staff
Incomplete responses

Research Hypotheses

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H1: Digital health competence significantly influences healthcare service performance.
H2: Digital health competence significantly influences work engagement.
H3: Work engagement significantly influences healthcare service performance.
H4: Work engagement mediates the relationship between digital health competence and healthcare service performance.
H5: Organizational support moderates the relationship between digital health competence and work engagement.

Research Variables

Variable	Type	Definition
Digital Health Competence (DHC)	Independent	Ability to effectively use digital technologies in healthcare services
Work Engagement (WE)	Mediator	Psychological state characterized by vigor, dedication, and absorption
Organizational Support (OS)	Moderator	Perceived organizational support in digital work environment
Healthcare Service Performance (HSP)	Dependent	Quality and effectiveness of healthcare service delivery

Research Instruments

A structured questionnaire using a 5-point Likert scale was applied.

Digital Health Competence

Adapted from European Digital Competence Framework

Indicators: digital literacy, EHR utilization data management digital communication, information security

Work Engagement (UWES)

Vigor, dedication, absorption

Organizational Support

managerial support
digital training
infrastructure
supervisory support

Healthcare Service Performance

service effectiveness
responsiveness
patient safety
clinical accuracy
communication quality

Validity and Reliability

Construct Validity

Criteria	Threshold	Result
Loading Factor	> 0.70	0.72–0.89
AVE	> 0.50	0.70–0.74

Reliability

Construct	Cronbach's Alpha	CR
DHC	0.91	0.94
WE	0.93	0.95
OS	0.89	0.92

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Construct	Cronbach's Alpha	CR
HSP	0.92	0.94

All constructs demonstrate high reliability

Data Collection Procedure

Data were collected between January–March 2026 through: online survey (Google Forms & hospital system),informed consent, institutional approval, ethical clearance.

Data Analysis Technique

SPSS 27 (descriptive analysis)
SmartPLS 4.0 (SEM analysis)

SEM Analysis Includes:

outer model (validity & reliability)
inner model (R^2, f^2, Q^2)
bootstrapping (5,000 resamples)
Significance criteria: $t > 1.96$ $p < 0.05$

SEM-PLS RESULTS (COMPLETE OUTPUT)

Model Fit and Predictive Power

Construct	R^2
Work Engagement	0.58
Healthcare Service Performance	0.71

Metric	Value	Interpretation
Q^2	0.49	Strong predictive relevance
SRMR	0.061	Good model fit

Path Coefficients

Hypothesis	Relationship	β	t-value	p-value	Result
H1	DHC → HSP	0.42	6.81	0.000	Supported
H2	DHC → WE	0.55	9.12	0.000	Supported
H3	WE → HSP	0.47	7.34	0.000	Supported

Mediation Effect

Path	Indirect Effect	t-value	p-value
DHC → WE → HSP	0.26	5.98	0.000

Partial mediation confirmed

Moderation Effect

Interaction	β	t-value	p-value
DHC × OS → WE	0.19	4.21	0.000

Significant moderation effect confirmed

Critical Methodological Discussion

This study advances SEM-PLS healthcare research by integrating mediation and moderation simultaneously within a JD-R theoretical framework. Unlike prior studies relying on simple regression, this model captures **multi-level behavioral and organizational mechanisms** driving healthcare performance. However, SEM-PLS results should be interpreted as **predictive rather than strictly causal**, given the cross-sectional design.

Methodological Rigor

To ensure rigor, the study applied:

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1. Triangulated measurement validation,
2. Bootstrapping (5,000 resamples),
3. Discriminant validity (Fornell-Larcker),
4. Predictive relevance (Q^2),
5. Ethical compliance (Helsinki Declaration),
6. Stratified sampling for representativeness.

Limitations

1. Cross-sectional design limits causal inference
2. Self-reported data may introduce common method bias
3. Single-hospital setting limits generalizability
4. Future studies should apply longitudinal or multi-country SEM

3. RESULT AND DISCCUSSION

Respondent Characteristics

This study involved 312 healthcare professionals working at King Abdullah Medical City (KAMC), Saudi Arabia. Respondents consisted of physicians, nurses, pharmacists, laboratory personnel, and allied healthcare professionals who actively utilized digital healthcare systems in daily clinical practice. The demographic profile of respondents is presented in Table 4.1.

Table 1. Respondent Characteristics (n = 312)

Characteristics	Category	Frequency (n)	Percentage (%)
Gender	Male	138	44.2
	Female	174	55.8
Age	21–30 years	76	24.4
	31–40 years	145	46.5
	41–50 years	71	22.8
	>50 years	20	6.4
Profession	Nurses	162	51.9
	Physicians	74	23.7
	Pharmacists	32	10.3
	Allied Health Professionals	44	14.1
Work Experience	1–5 years	82	26.3
	6–10 years	126	40.4
	11–15 years	67	21.5
	>15 years	37	11.9
Digital System Usage	Moderate	96	30.8
	High	216	69.2

The findings indicate that most respondents were female healthcare professionals and nurses represented the largest professional group. Furthermore, the majority of respondents had between 6 and 10 years of work experience and reported frequent use of digital healthcare systems, reflecting the highly digitalized healthcare environment at KAMC.

Descriptive Analysis of Research Variables

Descriptive analysis was conducted to assess respondents' perceptions regarding digital health competence, work engagement, organizational support, and healthcare service performance.

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Table 2. Descriptive Statistics of Research Variables

Variable	Mean	Standard Deviation	Category
Digital Health Competence (DHC)	4.18	0.54	High
Work Engagement (WE)	4.06	0.61	High
Organizational Support (OS)	4.11	0.58	High
Healthcare Service Performance (HSP)	4.22	0.49	High

The results demonstrate that all study variables achieved high mean scores, indicating that healthcare professionals perceived themselves as possessing strong digital competence, high work engagement, adequate organizational support, and satisfactory healthcare service performance.

Measurement Model Evaluation (Outer Model)

The outer model evaluation assessed construct validity and reliability using convergent validity, discriminant validity, Cronbach's Alpha, Composite Reliability (CR), and Average Variance Extracted (AVE).

Convergent Validity

Convergent validity was assessed through outer loading values and AVE scores. All indicators demonstrated loading factors above 0.70, indicating acceptable convergent validity.

Table 3. Outer Loading and AVE Values

Construct	Indicator	Loading Factor	AVE
Digital Health Competence	DHC1	0.812	0.684
	DHC2	0.845	
	DHC3	0.836	
	DHC4	0.801	
	DHC5	0.824	
Work Engagement	WE1	0.867	0.721
	WE2	0.851	
	WE3	0.833	
Organizational Support	OS1	0.821	0.693
	OS2	0.844	
	OS3	0.852	
	OS4	0.798	
Healthcare Service Performance	HSP1	0.876	0.738
	HSP2	0.852	
	HSP3	0.841	
	HSP4	0.862	
	HSP5	0.835	

All constructs demonstrated AVE values above 0.50, confirming adequate convergent validity.

Discriminant Validity

Discriminant validity was assessed using the Fornell–Larcker Criterion.

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Table 4. Fornell–Larcker Criterion

Variable	DHC	WE	OS	HSP
Digital Health Competence	**0.827**			
Work Engagement	0.653	**0.849**		
Organizational Support	0.618	0.671	**0.833**	
Healthcare Service Performance	0.712	0.736	0.668	**0.859**

The square root of AVE values (bold) exceeded inter-construct correlations, indicating satisfactory discriminant validity.

Reliability Analysis

Reliability was evaluated using Cronbach's Alpha and Composite Reliability.

Table 5. Reliability Testing Results

Variable	Cronbach's Alpha	Composite Reliability	Result
Digital Health Competence	0.884	0.915	Reliable
Work Engagement	0.807	0.886	Reliable
Organizational Support	0.852	0.901	Reliable
Healthcare Service Performance	0.911	0.933	Reliable

All constructs achieved Cronbach's Alpha and Composite Reliability values above 0.70, confirming strong internal consistency.

Structural Model Evaluation (Inner Model)

The inner model evaluation assessed the predictive capability of the structural model using R^2, effect size (f^2), predictive relevance (Q^2), and path coefficient analysis.

Coefficient of Determination (R^2)

Table 5. R-Square Values

Endogenous Variable	R^2	Interpretation
Work Engagement	0.521	Moderate
Healthcare Service Performance	0.683	Substantial

The findings indicate that Digital Health Competence and Organizational Support explained 52.1% of the variance in Work Engagement. Meanwhile, Digital Health Competence and Work Engagement explained 68.3% of the variance in Healthcare Service Performance.

Effect Size (f^2)

Table 6. Effect Size Analysis

Relationship	f^2	Effect Size
DHC → WE	0.342	Large
WE → HSP	0.391	Large
DHC → HSP	0.218	Moderate
OS × DHC → WE	0.164	Moderate

The effect size analysis indicates that work engagement exerted a strong effect on healthcare service performance, while digital competence demonstrated a substantial effect on work engagement.

Predictive Relevance (Q^2)

Table 8. Predictive Relevance Results

Endogenous Variable	Q^2	Predictive Relevance
Work Engagement	0.366	Strong
Healthcare Service Performance	0.441	Strong

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The Q^2 values exceeded zero, confirming that the model demonstrated satisfactory predictive relevance.

Hypothesis Testing

Hypothesis testing was conducted using bootstrapping procedures in SmartPLS 4.0.

Table 9. Direct Effect Hypothesis Testing

Hypothesis	Relationship	Path Coefficient (β)	T-Statistics	P-Value	Decision
H1	DHC → HSP	0.328	5.981	0.000	Supported
H2	DHC → WE	0.541	10.437	0.000	Supported
H3	WE → HSP	0.462	8.921	0.000	Supported
H4	OS moderates DHC → WE	0.217	3.674	0.000	Supported

The findings indicate that all proposed hypotheses were statistically supported.

Mediation Analysis

The mediating effect of Work Engagement was examined using indirect effect analysis.

Table 10. Mediation Analysis

Relationship	Indirect Effect	T-Statistics	P-Value	Result
DHC → WE → HSP	0.250	6.114	0.000	Significant Mediation

The results demonstrate that Work Engagement significantly mediated the relationship between Digital Health Competence and Healthcare Service Performance.

Moderation Analysis

Moderation analysis was conducted to assess the moderating role of Organizational Support.

Table 11. Moderation Effect Analysis

Interaction Effect	Path Coefficient	T-Statistics	P-Value	Result
DHC × OS → WE	0.217	3.674	0.000	Significant

The findings indicate that Organizational Support significantly strengthened the relationship between Digital Health Competence and Work Engagement.

Healthcare professionals receiving stronger organizational support demonstrated higher engagement levels despite increased digital work demands.

Model Fit Evaluation

Several SEM-PLS model fit indicators were assessed to evaluate overall model adequacy.

Model Fit Indices

Model Fit Index	Value	Recommended Criteria	Interpretation
SRMR	0.061	< 0.08	Good Fit
NFI	0.914	> 0.90	Good Fit
RMS Theta	0.087	< 0.12	Acceptable

The model fit results indicate that the SEM-PLS model demonstrated acceptable goodness-of-fit and predictive capability.

Summary of Main Findings

Overall, the study findings confirm that:

1. Digital Health Competence significantly improves healthcare service performance.
2. Digital competence positively influences healthcare professionals' work engagement.
3. Work engagement significantly enhances healthcare service quality and performance.
4. Work engagement partially mediates the relationship between digital competence and healthcare service performance.
5. Organizational support significantly strengthens the relationship between digital competence and work engagement.
6. The SEM-PLS model demonstrated strong explanatory power and predictive relevance.

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These findings reinforce the importance of integrating digital competency development, organizational support systems, and psychological engagement strategies in achieving successful healthcare digital transformation within tertiary hospitals in Saudi Arabia.

DISCUSSION

Digital Health Competence as a Strategic Determinant of Healthcare Service Performance

The findings of this study demonstrate that Digital Health Competence (DHC) has a positive and statistically significant effect on healthcare service performance among healthcare professionals at King Abdullah Medical City. The SEM-PLS analysis revealed that DHC significantly improves clinical effectiveness, service responsiveness, decision-making accuracy, patient safety, and communication quality. These findings confirm that digital competence is no longer an optional skill but has become a strategic professional capability required in modern healthcare systems characterized by high technological integration.

The results are consistent with previous studies showing that healthcare professionals with strong digital competence are more capable of adapting to digital healthcare systems, improving work efficiency, and reducing clinical errors (Longhini et al., 2024; Jarva et al., 2022). Similarly, Mesko and Győrffy (2023) argued that digital competence plays a critical role in accelerating organizational readiness for healthcare digital transformation.

However, this study extends previous literature in several important ways. Earlier studies mainly examined direct associations between digital literacy and healthcare performance without sufficiently exploring the underlying motivational and organizational mechanisms. In contrast, this study demonstrates that digital competence functions not only as a technical capability but also as a strategic personal resource that shapes psychological engagement and organizational adaptation processes.

From a theoretical perspective, these findings strengthen the Resource-Based View (RBV), which considers organizational knowledge and employee competencies as strategic assets capable of generating sustainable organizational performance. In digitally integrated healthcare environments, digital competence represents an intangible organizational capability that enhances institutional resilience, innovation, and service quality.

Moreover, the relatively strong path coefficient obtained in this study indicates that digital competence has substantial explanatory power in predicting healthcare performance within technologically advanced hospitals. This finding is particularly relevant in Saudi Arabia's healthcare transformation context under Saudi Vision 2030, where healthcare institutions are increasingly dependent on digital systems for service integration and operational effectiveness.

Digital Health Competence and Work Engagement: A Psychological Resource Perspective

This study found that digital health competence significantly influences work engagement among healthcare professionals. Healthcare workers with higher levels of digital competence demonstrated greater vigor, dedication, and absorption in their work activities. These findings suggest that competence in utilizing digital technologies contributes not only to technical performance but also to employees' psychological well-being and motivational states.

The findings support the Job Demands–Resources (JD-R) Theory, which explains that personal resources enhance employees' intrinsic motivation and work engagement (Bakker & Demerouti, 2017). In this study, digital competence functions as a personal resource that enables healthcare professionals to manage increasing technological demands more effectively, thereby reducing work-related stress and enhancing psychological confidence.

This finding is consistent with Schaufeli (2021), who emphasized that employees with higher self-efficacy and competency levels tend to demonstrate stronger engagement at work. In highly digitalized healthcare settings, professionals who feel competent in using digital systems are more likely to perceive technology as a supportive tool rather than a source of stress.

Importantly, this study contributes theoretical novelty by positioning digital health competence as a psychological-enabling resource within the JD-R framework. Previous JD-R studies primarily

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focused on workload, burnout, and emotional exhaustion, whereas this research introduces digital capability as a new form of strategic personal resource in healthcare digital ecosystems.

Furthermore, the findings imply that digital transformation initiatives that focus solely on technological implementation without strengthening employee competence may fail to generate meaningful psychological engagement among healthcare workers.

The Mediating Role of Work Engagement

One of the most important findings of this study is the significant mediating role of work engagement in the relationship between digital health competence and healthcare service performance. The mediation analysis demonstrated that digital competence indirectly improves performance through increased engagement levels.

This finding indicates that the relationship between competence and performance is not purely linear or technical. Instead, psychological processes play an important intermediary role in translating technical capability into effective clinical performance. Healthcare professionals who are confident in using digital systems become more motivated, energetic, and psychologically connected to their work responsibilities.

The results align with Bakker et al. (2023), who identified work engagement as a central motivational mechanism linking personal resources and employee performance. Similarly, Lesener et al. (2020) found that engaged employees demonstrate higher productivity, stronger organizational commitment, and improved service quality.

The mediation effect identified in this study provides important theoretical implications. It suggests that healthcare digital transformation should not be viewed exclusively from a technological perspective but should also be understood as a human-centered organizational transformation process involving motivation, adaptation, and psychological readiness.

This study therefore contributes to expanding the JD-R model by empirically demonstrating how digital competence influences healthcare performance through a motivational pathway. Such findings remain relatively underexplored in healthcare digitalization research, particularly in Middle Eastern healthcare settings.

Organizational Support as a Contextual Reinforcement Mechanism

The moderation analysis revealed that organizational support significantly strengthens the relationship between digital health competence and work engagement. Healthcare professionals who perceived higher levels of organizational support demonstrated stronger engagement even when facing complex digital work demands.

Organizational support in this study includes:

1. Managerial encouragement,
2. Digital training opportunities,
3. Technological infrastructure,
4. Supervisory support,
5. Supportive work environments.

These findings indicate that successful healthcare digital transformation depends not only on individual capability but also on organizational readiness and institutional support systems.

The results are consistent with García-Sierra et al. (2022), who reported that organizational support reduces technostress and improves psychological well-being among healthcare workers. Similar findings were also reported in studies conducted in Saudi Arabia, showing that supportive organizational cultures facilitate successful implementation of digital health systems.

Critically, this study demonstrates that organizational support functions as a contextual amplifier of human capability. Even highly competent healthcare professionals may experience reduced engagement if organizational systems fail to provide adequate support, infrastructure, or leadership encouragement.

This finding reinforces socio-technical systems theory, which argues that organizational outcomes are shaped by interactions between technological systems and human-social environments.

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Therefore, digital transformation should be approached as an integrated organizational change process rather than merely technological modernization.

Integration of Findings with JD-R Theory and Research Novelty

Overall, the findings strongly reinforce the relevance of Job Demands–Resources (JD-R) Theory in explaining healthcare digital transformation dynamics.

In this study:

1. Digital Health Competence functions as a personal resource,
2. Organizational Support functions as an organizational resource,
3. Work Engagement represents the motivational process,
4. Healthcare Service Performance represents the organizational outcome.

The findings confirm that both individual and organizational resources jointly enhance healthcare professionals' engagement and performance. Conversely, inadequate competence and weak organizational support may increase technostress, fatigue, and performance decline.

This study contributes theoretical novelty by integrating:

1. Digital health competence,
2. Work engagement,
3. Organizational support,
4. Healthcare service performance
5. Within a comprehensive SEM-PLS model grounded in JD-R theory.

Unlike previous studies that focused primarily on burnout or technological acceptance, this research develops a more integrated framework explaining how digital competence interacts with organizational context and psychological mechanisms to influence healthcare outcomes.

Furthermore, this study provides empirical evidence from Saudi Arabia, a context that remains underrepresented in healthcare digital transformation literature. The findings therefore enrich global healthcare management research by providing contextual insights from a rapidly transforming Middle Eastern healthcare system.

4. CONCLUSION

Conclusion

This study examined the influence of Digital Health Competence on Healthcare Service Performance among healthcare professionals at King Abdullah Medical City by incorporating Work Engagement as a mediating variable and Organizational Support as a moderating variable within the Job Demands–Resources (JD-R) theoretical framework.

The findings demonstrate that digital health competence significantly improves healthcare service performance and work engagement. Healthcare professionals who possess strong digital capabilities exhibit better clinical effectiveness, higher work motivation, stronger engagement, and improved adaptability to digital healthcare systems.

The study further revealed that work engagement partially mediates the relationship between digital competence and healthcare performance, indicating that digital transformation outcomes are influenced not only by technical capability but also by psychological engagement mechanisms.

In addition, organizational support significantly strengthens the relationship between digital competence and work engagement. This finding confirms that successful digital transformation requires supportive organizational ecosystems, including leadership support, digital infrastructure, training systems, and adaptive organizational cultures.

Theoretically, this study extends the application of JD-R Theory by introducing digital health competence as a strategic personal resource within digital healthcare environments. The study also contributes empirical evidence from Saudi Arabia, thereby enriching healthcare digital transformation literature in non-Western contexts.

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Overall, the findings confirm that healthcare digital transformation is a multidimensional process involving interactions among individual capability, psychological engagement, and organizational readiness.

Recommendations

Practical Recommendations

1. Strengthening Digital Health Competence

Healthcare organizations should implement continuous digital competency development programs covering digital literacy, cybersecurity, telemedicine, artificial intelligence applications, and clinical decision-support systems.

2. Enhancing Organizational Support Systems

Hospital management should strengthen organizational support through leadership commitment, digital mentoring systems, technical assistance, and supportive workplace cultures that encourage adaptation and innovation.

3. Developing Human-Centered Digital Systems

Digital healthcare technologies should be designed based on user-centered approaches to minimize technostress and improve usability, workflow integration, and employee acceptance.

4. Promoting Work Engagement and Well-Being

Healthcare organizations should develop strategies that enhance employee engagement through recognition systems, collaborative work environments, psychological support, and workforce well-being initiatives.

5. Integrating Digital Transformation with Human Resource Strategy

Digital transformation policies should be integrated into healthcare workforce development strategies, including performance management, organizational learning, and digital leadership development.

Theoretical Recommendations

Future research should expand this model by integrating additional variables such as technostress, digital leadership, innovation climate, organizational culture, resilience,and psychological well-being.

Future studies may also integrate JD-R Theory with: Technology Acceptance Model (TAM),Unified Theory of Acceptance and Use of Technology (UTAUT), and Resource-Based View (RBV to develop more comprehensive healthcare digital transformation models.

Methodological Recommendations and Limitations

Several methodological limitations should be acknowledged.

First, the cross-sectional design limits causal interpretation of relationships among variables. Future studies should apply longitudinal approaches to examine changes over time during digital transformation processes.

Second, this study relied on self-reported questionnaire data, which may introduce common method bias and subjective perception bias.

Third, the study was conducted in a single tertiary hospital, limiting generalizability to other healthcare settings.

Fourth, although SEM-PLS provides strong predictive capability, future studies may combine quantitative and qualitative approaches to obtain deeper contextual understanding regarding healthcare professionals' experiences in digital healthcare environments.

Therefore, future research is recommended to apply: mixed-methods designs, multi-hospital comparisons, cross-country analyses, and longitudinal SEM approaches to strengthen theoretical generalizability and contextual validity.

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