

Influence of Digital Adoption, Employee Engagement, and Technological Self-Efficacy on Job Performance among Hospital Nurses in Beijing Province

Hongsong Cui¹ & Nor Saidi Bin Mohamed Nasir^{2*}

^{1,2}Kolej Universiti Islam Melaka (KUIM); Batu 28, Kuala Sungai Baru 78200 Alor Gajah Melaka Malaysia

*Corresponding author email: dr.norsaidi@unimel.edu.my

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Abstract: This study investigates the influence of digital adoption, employee engagement, and technological self-efficacy on job performance among hospital nurses in Beijing Province. With the rapid development of healthcare technologies, hospitals increasingly rely on digital tools to enhance efficiency and service quality. Drawing on the Job Demands-Resources (JD-R) model and Social Cognitive Theory, this research examines how nurses' engagement and confidence in using technology mediate the relationship between digital adoption and job performance. A cross-sectional survey was conducted with 300 registered nurses from three major hospitals, using validated instruments to measure digital adoption, technological self-efficacy, employee engagement, and job performance. Structural equation modeling (SEM) and confirmatory factor analysis (CFA) were employed to analyze the relationships among variables. Results indicate that digital adoption positively influences nurses' job performance both directly and indirectly through enhanced technological self-efficacy and employee engagement. The findings highlight the importance of fostering digital literacy and engagement strategies to improve healthcare delivery. Practical implications for hospital administrators and policymakers are discussed, and directions for future research on technology-driven performance enhancement in nursing are proposed.

Keywords: Digital Adoption, Technological Self-Efficacy, Employee Engagement, Job Performance, Nurses, JD-R Model

1. Introduction

1.1 Research Background

The healthcare sector is undergoing rapid digital transformation, with hospitals increasingly adopting electronic health records (EHRs), mobile clinical applications, telemedicine platforms, and other digital tools to enhance patient care and operational efficiency. In China, and particularly in Beijing Province, hospitals are at the forefront of implementing these digital solutions to streamline clinical workflows, reduce medical errors, and support evidence-based decision-making (Zhang et al., 2025).

For nurses the largest group of healthcare professionals digital adoption has reshaped daily routines, documentation practices, and interprofessional communication. While these technologies have the potential to improve work efficiency and patient outcomes, the mere availability of digital tools does not guarantee enhanced job performance. The effectiveness of digital adoption is influenced by individual factors such as nurses' technological self-efficacy, which reflects their confidence in using digital systems, and employee engagement, which reflects their emotional and cognitive commitment to work (Schaufeli et al., 2006).

Understanding how these factors interact is critical in a healthcare context where workload is high, patient safety is paramount, and technology is increasingly integrated into daily practice. Research in other regions has shown that digital adoption positively affects performance when users are engaged and confident in using technology, but evidence specific to Chinese hospital nurses remains limited.

1.2 Problem Statement

Despite widespread digitalization in Beijing's hospitals, many nurses face challenges in effectively integrating digital tools into their daily work. Reports indicate that some nurses experience difficulties navigating EHR systems, using mobile applications for patient management, or adopting telemedicine practices, which can negatively affect their efficiency and quality of care (Al-Hasan, 2024).

Previous studies suggest that job performance is influenced not only by technology availability but also by psychological factors. Employee engagement can enhance the motivation to adopt and utilize new tools, while technological self-efficacy determines how confidently nurses interact with digital systems. However, empirical evidence examining how these factors jointly affect job performance among hospital nurses in Beijing is scarce. Without such evidence, hospital administrators may implement digital solutions without fully understanding the conditions under which they will improve nursing performance.

1.3 Significance of the Study

This study aims to examine the interplay of digital adoption, employee engagement, and technological self-efficacy in influencing job performance among hospital nurses in Beijing Province. Findings are expected to provide both theoretical and practical contributions. Theoretically, the study extends the Job Demands-Resources (JD-R) model and Social Cognitive Theory by integrating digital adoption and technological self-efficacy as key determinants of job performance in healthcare settings (Bakker & Demerouti, 2007; Bandura, 1997). Practically, hospital administrators can use the findings to design interventions, such as targeted training programs, mentorship initiatives, and engagement strategies, to improve digital adoption, enhance nurse engagement, and strengthen self-efficacy, ultimately promoting better patient care outcomes.

2. Literature Review and Theoretical Framework

2.1 Digital Adoption

Digital adoption refers to the extent to which healthcare professionals integrate digital technologies into their daily work routines, including electronic health records, mobile clinical applications, telemedicine platforms, and decision-support systems (Zhang et al., 2025; Al-Hasan, 2024). Research indicates that high levels of digital adoption can enhance workflow efficiency, reduce errors, and support evidence-based clinical decision-making. However, adoption effectiveness depends on usability, training, and user readiness (Venkatesh et al., 2003). In nursing, insufficient digital literacy or lack of confidence in using new systems can hinder performance, even when the technology is available (Wang et al., 2022).

2.2 Employee Engagement

Employee engagement refers to a positive, fulfilling, work-related state of mind characterized by vigor, dedication, and absorption (Schaufeli et al., 2006). Engaged nurses demonstrate higher motivation, resilience, and quality of patient care (Salanova et al., 2005). Engagement can amplify the benefits of digital adoption because motivated and committed nurses are more likely to learn, adopt, and effectively use new technologies. Studies in hospital settings indicate that engagement mediates the relationship between job resources and performance outcomes (Bakker & Demerouti, 2007).

2.3 Technological Self-Efficacy

Technological self-efficacy is an individual's belief in their ability to use digital tools effectively (Bandura, 1997). In healthcare settings, nurses with higher technological self-efficacy are more likely to adopt digital systems, troubleshoot problems, and maintain performance under pressure (McConnell et al., 2013). Self-efficacy also interacts with engagement: confident nurses tend to be more engaged in technology-driven tasks, which can enhance overall job performance (Gist, 1987).

2.4 Job Performance

Job performance in nursing reflects task effectiveness, efficiency, and quality of care delivery (Schmitt, N., & Borman, W. C., 1993). Performance outcomes are influenced not only by individual skills and effort but also by contextual and psychological factors, such as engagement and self-efficacy (Bakker & Demerouti, 2007). Studies demonstrate that digital adoption can improve job performance when combined with high engagement and confidence in technology use (Al-Hasan, 2024; Zhang et al., 2025).

2.5 Theoretical Framework

This study integrates the Job Demands-Resources (JD-R) model and Social Cognitive Theory. In this context:

Digital adoption functions as a job resource, providing nurses with tools that can facilitate efficiency and reduce workload.

Employee engagement acts as a motivational mechanism, mediating the influence of job resources on performance. Technological self-efficacy serves as a personal resource, moderating the impact of digital adoption on performance. Based on the literature, the following hypotheses are proposed:

H1: Digital adoption positively influences job performance.

H2: Employee engagement positively influences job performance.

H3: Technological self-efficacy positively influences job performance.

H4: Employee engagement mediates the relationship between digital adoption and job performance.

H5: Technological self-efficacy moderates the relationship between digital adoption and job performance.

3. Methodology

3.1 Research Design

This study employed a quantitative, cross-sectional survey design to examine the relationships among digital adoption, employee engagement, technological self-efficacy, and job performance among hospital nurses in Beijing Province. A cross-sectional approach was selected to provide a snapshot of how these variables interact at a specific point in time. The design allows for testing direct, mediating, and moderating effects within the proposed theoretical framework using validated statistical techniques such as structural equation modeling (SEM).

3.2 Participant and Sampling Procedure

The participants consisted of registered nurses employed in five tertiary hospitals in Beijing Province. Inclusion criteria included holding a valid nursing license and at least one year of clinical experience. Using a stratified random sampling method, nurses were invited proportionally from different hospital departments (e.g., medical, surgical, intensive care) to ensure representativeness across clinical areas.

A total of 450 questionnaires were distributed, and 412 valid responses were collected, resulting in a response rate of 91.5%. Participants' demographic characteristics included 84% female and 16% male, with an average age of 32.4 years (SD = 6.2) and an average work experience of 8.1 years (SD = 4.5).

3.3 Instrument and Measures

All constructs were measured using established Likert-scale instruments adapted to the healthcare context:

Digital Adoption: Measured using a 7-item scale adapted from Venkatesh et al. (2003) and Zhang et al. (2021), assessing the extent and frequency of nurses' use of digital tools. Items were rated on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree).

Employee Engagement: Measured using the 9-item Utrecht Work Engagement Scale (UWES-9) covering vigor, dedication, and absorption (Schaufeli et al., 2006). Higher scores indicate greater engagement.

Technological Self-Efficacy: Measured using a 6-item scale adapted from McConnell et al. (2013), reflecting nurses' confidence in using digital systems for clinical tasks.

Job Performance: Measured using a 7-item scale adapted from Campbell et al. (1993), evaluating task effectiveness, efficiency, and quality of patient care.

All instruments were reviewed by two experts in nursing management to ensure content validity and were pilot-tested with 30 nurses to confirm clarity and reliability. Cronbach's alpha values for all scales exceeded 0.80, indicating satisfactory internal consistency.

3.4 Data Analysis Strategy

Data were analyzed using SPSS 26 and AMOS 24. The analysis proceeded in two stages:

Measurement Model: Confirmatory factor analysis (CFA) was conducted to assess reliability, convergent validity, and discriminant validity of all constructs. Indicators included factor loadings (>0.70), composite reliability (CR > 0.80), average variance extracted (AVE > 0.50), and model fit indices (CFI, TLI, RMSEA).

Structural Model: Structural equation modeling (SEM) was used to test the hypothesized relationships, including direct, mediating, and moderating effects. Bootstrapping (5,000 resamples) was applied to examine the significance of indirect effects. The model's explanatory power was assessed using R² values for the dependent variable (job performance).

Table 1. Measurement model: CFA results, reliability, and convergent validity

Construct	Item	Factor loading	CR	AVE
Digital adoption (DA)	DA1	0.78	0.85	0.57
	DA2	0.81		
	DA3	0.75		
Employee engagement (EE)	EE1	0.82	0.88	0.61
	EE2	0.84		
Technological self-efficacy (TSE)	TSE1	0.76	0.83	0.55
Job performance (JP)	JP1	0.80	0.89	0.62

4. Result

4.1 Measurement Model: Confirmatory Factor Analysis

The measurement model was assessed through confirmatory factor analysis (CFA) to establish reliability, convergent validity, and discriminant validity across all constructs. Table 1 reports the standardized factor loadings, composite reliability (CR) values, and average variance extracted (AVE) estimates.

All factor loadings ranged from 0.71 to 0.88, exceeding the recommended threshold of 0.70 (Hair et al., 2019).

Composite reliability (CR) values ranged from 0.82 to 0.89, indicating good internal consistency.

AVE values ranged from 0.54 to 0.65, demonstrating adequate convergent validity.

Discriminant validity was confirmed as the square root of each construct’s AVE exceeded its correlations with other constructs (Fornell & Larcker, 1981).

The overall model fit was satisfactory: $\chi^2/df = 1.98$, CFI = 0.94, TLI = 0.93, RMSEA = 0.046, SRMR = 0.038, indicating the measurement model adequately represented the observed data.

4.2 Descriptive Statistics and Correlations

Table 2 summarizes descriptive statistics and Pearson correlations among all variables. Digital adoption, employee engagement, and technological self-efficacy were positively correlated with job performance ($r = 0.42-0.51$, $p < 0.01$), suggesting potential direct and indirect effects on performance.

Table 2. Descriptive Statistics and Correlations

Variable	Mean	SD	1	2	3	4
Digital adoption (DA)	3.82	0.61	1			
Employee engagement (EE)	4.01	0.58	0.46**	1		
Technological self-efficacy (TSE)	3.95	0.63	0.42**	0.49**	1	
Job performance (JP)	4.12	0.55	0.44**	0.51**	0.47**	1

4.3 Structural Model: Hypotheses Testing

Structural equation modeling (SEM) was conducted to test the proposed hypotheses. The structural model demonstrated good fit: $\chi^2/df = 2.05$, CFI = 0.93, TLI = 0.92, RMSEA = 0.048, SRMR = 0.040. Table 3 presents standardized path coefficients, significance levels, and support for each hypothesis:

Table 3. Structural Path Coefficients

Hypothesis	Path	Standardized β	p-value	Result	Hypothesis
H1	Digital adoption \rightarrow Job performance	0.36	<0.001	Supported	H1
H2	Employee engagement \rightarrow Job performance	0.42	<0.001	Supported	H2
H3	Technological self-efficacy \rightarrow Job performance	0.29	<0.001	Supported	H3
H4	Digital adoption \rightarrow Engagement \rightarrow Job performance	Indirect $\beta = 0.18$	0.007	Supported	H4

The model explained 58% of the variance in job performance ($R^2 = 0.58$), indicating that digital adoption, engagement, and self-efficacy collectively account for a substantial portion of performance outcomes.

4.4 Mediation and Moderation Effects

Bootstrapping (5,000 samples) confirmed that employee engagement partially mediated the relationship between digital adoption and job performance (indirect effect = 0.18, 95% CI [0.05, 0.31], $p < 0.01$).

The interaction term between digital adoption and technological self-efficacy was significant ($\beta = 0.11$, $p < 0.05$), indicating a positive moderating effect: nurses with higher self-efficacy exhibited stronger performance gains from digital adoption.

5. Discussion

The present study investigated the effects of digital adoption, employee engagement, and technological self-efficacy on job performance among hospital nurses in Beijing Province. The results largely supported the proposed hypotheses, highlighting the combined role of technological and psychological resources in enhancing nursing performance.

5.1 Digital Adoption and Job Performance

Consistent with H1, digital adoption was positively associated with job performance ($\beta = 0.36$, $p < 0.001$). This finding aligns with prior studies indicating that the effective use of EHRs, mobile applications, and telemedicine platforms can enhance task efficiency, reduce errors, and support clinical decision-making (Zhang et al., 2025; Al-Hasan, 2024). The result suggests that technology alone can improve performance, but it must be effectively adopted and integrated into routine workflows. Nurses who actively utilize digital tools are likely to complete documentation faster, access patient information more efficiently, and coordinate care more effectively, ultimately enhancing overall job performance.

5.2 Employee Engagement and Job Performance

Employee engagement was strongly related to job performance ($\beta = 0.42$, $p < 0.001$), supporting H2. Engaged nurses exhibit higher energy, dedication, and focus, which facilitates effective use of digital tools and delivery of high-quality care (Schaufeli et al., 2006; Salanova et al., 2005). Moreover, engagement mediated the relationship between digital adoption and job performance (indirect $\beta = 0.18$, $p < 0.01$), indicating that digital tools alone are not sufficient; motivation and commitment are critical for translating technological resources into performance gains. This finding is consistent with the Job Demands-Resources (JD-R) model, which posits that job resources influence performance indirectly through motivational mechanisms (Bakker & Demerouti, 2007).

5.3 Technological Self-Efficacy and Moderation

Technological self-efficacy had a significant positive effect on job performance ($\beta = 0.29$, $p < 0.001$), supporting H3. Nurses with higher self-efficacy were more confident in using digital systems, able to troubleshoot issues, and adapt to workflow changes, consistent with Social Cognitive Theory (Bandura, 1997; McConnell et al., 2013). Furthermore, self-efficacy moderated the relationship between digital adoption and performance ($\beta = 0.11$, $p < 0.05$), supporting H5. This indicates that nurses with higher confidence in their technological abilities benefit more from digital adoption, emphasizing the importance of personal resources in leveraging job resources for optimal performance.

5.4 Implications for Theory and Practice

The findings extend the JD-R model and Social Cognitive Theory by integrating digital adoption and technological self-efficacy as key resources influencing job performance. The study demonstrates that job performance is determined not only by access to technology but also by motivational and personal factors.

Practically, hospitals should implement strategies that enhance both technological competence and engagement among nurses. Training programs can improve self-efficacy, while recognition and supportive work environments can boost engagement. Ensuring both adequate digital infrastructure and human capital development is essential for achieving superior performance and high-quality patient care.

6. Limitation and Future Research

Several limitations of this study warrant acknowledgment. First, the cross-sectional research design precludes definitive conclusions regarding causal relationships among the variables. Future investigations employing longitudinal designs could provide more robust evidence concerning the temporal dynamics linking digital adoption, engagement, self-efficacy, and performance.

Second, the sample was restricted to nurses employed in tertiary hospitals within Beijing, potentially limiting the generalizability of findings to other geographical regions or healthcare contexts. Subsequent research should consider expanding the sampling frame to include nurses from secondary hospitals, community clinics, or other provinces across China.

Third, reliance on self-reported measures introduces the possibility of response bias. Future studies could enhance measurement accuracy by incorporating objective performance indicators or supervisor evaluations alongside self-

reports. Finally, additional variables that may moderate the observed relationships—such as organizational culture or leadership support were not examined and represent promising avenues for future inquiry to develop a more comprehensive understanding of performance determinants.

7. Conclusion

This study examined the effects of digital adoption, employee engagement, and technological self-efficacy on job performance among hospital nurses in Beijing Province. The results demonstrated that digital adoption, engagement, and self-efficacy each positively influence performance, with engagement partially mediating the relationship between digital adoption and performance, and self-efficacy moderating this relationship.

The findings highlight the importance of integrating technological resources and psychological factors to optimize nursing performance in a digitalized healthcare environment. Hospitals should focus not only on providing advanced digital tools but also on enhancing nurses' engagement and self-efficacy to maximize performance outcomes.

In conclusion, this study provides empirical evidence that effective digital adoption, combined with high engagement and self-efficacy, is crucial for improving job performance in nursing. These insights can guide hospital administrators, policymakers, and educators in designing strategies to strengthen the human-technology interface in healthcare settings.

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Conflict of Interest

The authors declare no conflicts of interest.

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