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Path Analysis of Technology Integration and Social Systems on the Quality of Primary Healthcare Services

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Abstract. The transformation of primary healthcare services in the digital era requires not only the adoption of technology but also the strength of social systems capable of integrating and sustaining innovation. This study aims to analyze how technology integration and social systems jointly influence the quality of primary healthcare services and to examine the mediating role of social systems in enhancing the effectiveness of technology adoption. This study applied a quantitative approach using Structural Equation Modeling (SEM). A total of 250 respondents, consisting of healthcare professionals and administrative staff from 15 urban community health centers, participated in the survey. Standardized questionnaires were employed to measure the constructs of technology integration, social systems, and primary healthcare service quality. Data were analyzed using AMOS to examine both direct and indirect pathways among variables. The path analysis results indicated that technology integration significantly influenced service quality ($p < 0.001$). Social systems also had a direct and significant effect on service quality ($p < 0.01$). Moreover, technology integration exerted a significant effect on social systems ($p < 0.001$), creating an indirect mediating effect on service quality ($\beta = 0.19$). The model demonstrated excellent fit indices ($\chi^2/df = 1.89$; CFI = 0.95; TLI = 0.94; RMSEA = 0.046). These findings indicate that improving primary healthcare quality depends not only on digital technology adoption but also on the mediating role of social systems in maximizing its impact. This study contributes an empirical SEM-based model that enriches theoretical understanding and provides practical guidance for healthcare managers to balance technological investments with organizational culture and human resource development for sustainable quality improvement.

Keywords: Technology Integration, Social System, Path Analysis, Service Quality, Primary Healthcare

1 Introduction

The advancement of information technology has instigated a profound transformation in healthcare delivery systems across various levels of public health services, particularly within primary healthcare settings [1,2]. The integration of technological innovations, including Electronic Health Records (EHR), telemedicine, digital health applications, and cloud-based information management systems, has substantially enhanced the efficiency, accuracy, and accessibility of healthcare provision [3,4]. The adoption of such technologies facilitates the optimization of administrative processes, strengthens interdepartmental coordination, and expedites clinical decision-making processes [5]. However, the effectiveness of technological integration is contingent not only upon

the availability of technological infrastructure and resources but also upon the organizational preparedness and the adaptability of social actors in embracing digitally driven service reforms.

The social system within healthcare organizations plays a crucial role in optimizing the achievement of service quality [6]. This system encompasses interpersonal relationships among healthcare professionals, leadership structures, organizational culture, communication patterns, and mechanisms for interprofessional collaboration[7–9]. A conducive social system fosters coordination and trust, thereby strengthening the effectiveness of technology utilization [10]. Conversely, a social system that is less adaptive to innovation often becomes a major barrier to the adoption and integration of new technologies. Therefore, the social system can be regarded as a determining factor that mediates the relationship between technological implementation and the desired service outcomes.

Primary healthcare services hold a strategic role as the frontline of a nation's healthcare system [11,12]. They represent the initial point of contact between the community and the health system, encompassing promotive, preventive, curative, and basic rehabilitative functions. The quality of primary healthcare is significantly influenced by the facility's capacity to manage resources effectively, integrate technological innovations, and establish a social system that fosters collaboration and innovation [13,14]. Nevertheless, many primary healthcare facilities across various regions continue to face challenges in optimizing technology utilization due to limitations in human resources, digital infrastructure, and the insufficient social readiness of organizations to embrace change.

Previous studies on digital transformation in primary healthcare have predominantly emphasized technological determinants such as infrastructure readiness, system usability, and cost efficiency, while giving limited attention to the social dimensions that mediate technology adoption and service outcomes. Research by Frennert et al. [15] and Steele Gray, C. et al. [16] highlights that leadership, communication, and interprofessional collaboration significantly influence the success of digital health implementation; however, these studies remain largely qualitative and do not empirically quantify the mediating mechanisms of social systems. Similarly, research by Aldhi, I. F. et al. [17], organizational readiness frameworks identify social and cultural factors as critical for successful technology integration, yet the majority of investigations treat them as contextual variables rather than as mediators within a causal model. Consequently, there is a notable gap in quantitative evidence employing path analysis or similar statistical approaches to examine how technological integration and social systems jointly determine the quality of primary healthcare services. Addressing this gap, the present study proposes an analytical model that integrates these two dimensions to provide a more comprehensive and evidence-based understanding of how socio-technological synergy shapes healthcare service quality.

The objective of this study is to analyze the influence of technology integration and social systems on the quality of primary healthcare services by employing a path analysis approach. This research is expected to make a theoretical contribution to the development of a socio-technological integration model within the context of primary healthcare, while also providing practical insights for policymakers and healthcare facility managers in formulating strategies to enhance service quality through the collaboration between technological innovation and adaptive social systems.

2 Methods

This study employed a quantitative approach with an explanatory research design [18] aimed at examining the causal relationships among technology integration, social systems, and the quality of primary healthcare services. This approach was selected because it enables the testing of both direct and indirect effects among variables through structural modeling analysis. The Structural Equation Modeling (SEM) method using AMOS software [19] was applied to analyze the data, as this technique allows simultaneous testing of latent variable relationships and their measurement indicators in a comprehensive manner.

The study population consisted of all healthcare professionals and administrative staff working in 15 community health centers (*Puskesmas*) located in urban areas of Majalengka, Cirebon, Kuningan, and Indramayu. A proportionate stratified random sampling technique was employed to ensure that each professional group (physicians, nurses, midwives, pharmacists, and administrative

staff) was proportionally represented in the sample. A total of 250 respondents completed the questionnaire validly, including 120 medical personnel and 130 administrative staff. This sample size meets the minimum requirement for SEM analysis, which is at least five to ten times the number of estimated parameters. Respondent characteristics are shown in Table 1.

Table 1. Respondent Characteristics

Characteristic	Category	N=250	%
Gender	Male	98	39.2
	Female	152	60.8
Position	Medical staff	120	48.0
	Administrative staff	130	52.0
Length of service	< 5 years	87	34.8
	5–10 years	102	40.8
	> 10 years	61	24.4

The research instrument was a standardized questionnaire developed based on established theories and previous empirical studies concerning technology integration adopted from Bayramzadeh and Aghaei [20], organizational social systems adopted from Rafi'i, et al. [21], and healthcare service quality adopted from Darzi, et al. [22]. The questionnaire consisted of three main constructs, each measured using several indicators on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). Operationalization of research variables are shown in Table 2.

Table 2. Operationalization of Research Variables

Variable / Construct	Main Dimensions	Indicators
Technology Integration (X1)	1. Technology adoption 2. System interoperability 3. Utilization of digital applications	1. Use of electronic health records (EHR); 2. Integration of patient data across units; 3. Utilization of cloud-based applications; 4. Level of technical training and support
Social System (X2)	1. Communication 2. Collaboration 3. Leadership support 4. Organizational culture	1. Information sharing among staff; 2. Interprofessional collaboration; 3. Support from health center leadership for innovation; 4. Adaptive values toward technological change
Service Quality (Y)	1. Effectiveness 2. Efficiency 3. Timeliness 4. Patient satisfaction	1. Service appropriateness to patient needs; 2. Service waiting time; 3. Accessibility of health information; 4. Patient satisfaction with services

The data analysis procedure consisted of four main stages: (1) Instrument validity and reliability testing using Confirmatory Factor Analysis (CFA) to ensure that each indicator adequately represents its respective construct; (2) Model fit evaluation to assess the alignment between the theoretical model and empirical data, based on fit indices such as Chi-square/df, Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Root Mean Square Error of Approximation (RMSEA); (3) Structural relationship testing, aimed at examining the causal effects among latent variables through path coefficient estimation; and (4) Mediation analysis, employing the bootstrapping method to identify the mediating role of the social system in the relationship between technology integration and the quality of primary healthcare services.

Based on the conceptual framework, the following hypotheses were proposed: (H1) Technology integration has a positive effect on the quality of primary healthcare services. (H2) The social system

has a positive effect on the quality of primary healthcare services. (H3) Technology integration has a positive effect on the social system. (H4) The social system mediates the effect of technology integration on the quality of primary healthcare services.

3 Results And Discussion

3.1 Validity and Reliability Results

To ensure the accuracy and consistency of the measurement model, Confirmatory Factor Analysis (CFA) was conducted for all latent constructs: Technology Integration (X1), Social System (X2), and Service Quality (Y). The validity of each indicator was assessed based on the Standardized Factor Loading (λ), while reliability was evaluated using Composite Reliability (CR) and Average Variance Extracted (AVE) values. The summarized results of the CFA, including factor loadings, CR, and AVE values, are presented in Table 3.

Table 3. Validity and Reliability Test Results

Construct	Indicator Range (λ)	Composite Reliability (CR)	Average Variance Extracted (AVE)	Evaluation
Technology Integration (X1)	0.71 – 0.87	0.91	0.66	Valid & Reliable
Social System (X2)	0.68 – 0.85	0.89	0.64	Valid & Reliable
Service Quality (Y)	0.72 – 0.88	0.93	0.69	Valid & Reliable

All standardized loadings were statistically significant at $p < 0.001$, confirming that each observed variable contributed meaningfully to its respective latent construct. The CR values exceeded 0.70 and AVE values were above 0.50 for all constructs, establishing strong internal consistency and convergent validity.

To further confirm discriminant validity, the Fornell-Larcker criterion was applied. The square roots of AVE for each construct were greater than their corresponding inter-construct correlations, demonstrating that each construct was empirically distinct. Therefore, the measurement model exhibited good psychometric properties, justifying its use in the subsequent structural model analysis.

3.2 Goodness of Fit Results

The structural model analysis using Structural Equation Modeling (SEM) began with a model fit assessment to ensure that the theoretical framework was consistent with the empirical data. The estimation results indicated that $\chi^2/df = 1.89$, CFI = 0.95, TLI = 0.94, and RMSEA = 0.046. All indices satisfied the recommended thresholds for an acceptable model fit, namely $\chi^2/df \leq 3.00$, CFI ≥ 0.90, TLI ≥ 0.90, and RMSEA ≤ 0.08. Accordingly, the research model demonstrated a strong level of goodness of fit and was deemed appropriate for testing the causal relationships among latent variables in this study.

Table 4. Model Fit Indices

Fit Index	Estimated Value	Criterion	Evaluation
χ^2/df	1.89	≤ 3.00	Good
CFI	0.95	≥ 0.90	Good
TLI	0.94	≥ 0.90	Good
RMSEA	0.046	≤ 0.08	Good

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The results presented in Table 4 confirm that all fit indices meet the ideal criteria, indicating that the proposed model adequately represents the empirical relationships among the studied variables.

3.3 Path Analysis Results

Following confirmation of model validity, causal relationships among latent variables were examined through path analysis. The results revealed that technology integration had a significant positive effect on primary healthcare service quality, with a path coefficient of $\beta = 0.45$ and $p < 0.001$. This finding implies that higher levels of technology integration within community health centers (*Puskesmas*) lead to greater efficiency, timeliness, and overall service quality improvements.

Furthermore, the social system demonstrated a direct and significant effect on service quality ($\beta = 0.32$; $p < 0.01$), underscoring that social factors such as effective communication, interprofessional collaboration, and leadership support play an essential role in enhancing service delivery.

In addition, technology integration was found to significantly influence the social system ($\beta = 0.52$; $p < 0.001$), suggesting that technological adoption in the workplace strengthens social interaction, improves coordination, and fosters an adaptive organizational culture toward change.

To examine indirect effects, a mediation analysis using the bootstrapping method was conducted. The findings showed that the social system mediates the relationship between technology integration and service quality, with an indirect coefficient of $\beta = 0.19$ and $p < 0.05$. This indicates that the effect of technology integration on service quality is partially transmitted through a robust and adaptive social system.

Table 5. Path Analysis Results (SEM)

Relationship Between Variables	Path Coefficient (β)	p-value	Result
Technology Integration → Service Quality	0.45	0.000 < 0.001	Significant
Social System → Service Quality	0.32	0.008 < 0.01	Significant
Technology Integration → Social System	0.52	0.000 < 0.001	Significant
Technology Integration → Service Quality (via Social System)	0.19	0.041< 0.05	Significant (Mediation)

As shown in Table 5, all relationships among variables exhibited positive and statistically significant coefficients. These results indicate that increasing technology integration directly improves service quality while indirectly strengthening the social system, which in turn enhances the overall organizational effectiveness in delivering primary healthcare services.

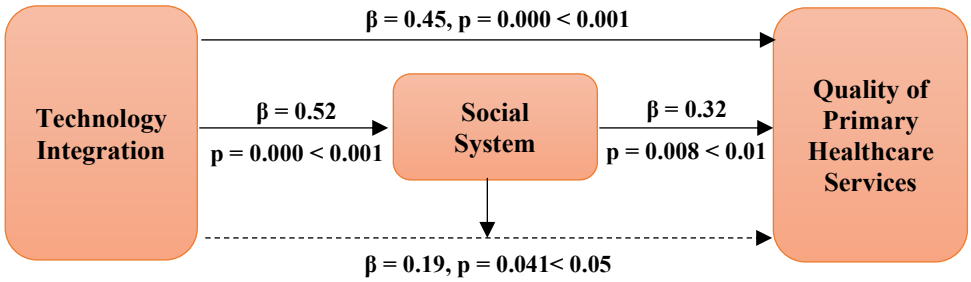

Fig. 1. Visualization of Path Analysis Results (SEM)

Figure 1 illustrates the structural relationship model derived from the path analysis conducted using Structural Equation Modeling (SEM). The model demonstrates that Technology Integration has a direct and significant effect on the Quality of Primary Healthcare Services, as well as an

indirect effect mediated by the Social System. Furthermore, the Social System exerts a direct influence on service quality, underscoring the importance of communication, interprofessional collaboration, and leadership support in enhancing the effectiveness of technological implementation within primary healthcare facilities.

3.4 Hypothesis Testing Results

Hypothesis testing was conducted based on path analysis results and the corresponding significance (p-value). All proposed hypotheses were supported, as the relationships among variables were found to be statistically significant, both directly and through mediation effects. Summary of hypothesis testing are shown in Table 6.

Table 6. Summary of Hypothesis Testing

Hypothesis Code	Statement	Result	Description
H1	Technology integration has a positive effect on the quality of primary healthcare services.	Accepted	Significant direct effect ($p < 0.001$)
H2	The social system has a positive effect on the quality of primary healthcare services.	Accepted	Significant direct effect ($p < 0.01$)
H3	Technology integration has a positive effect on the social system.	Accepted	Significant direct effect ($p < 0.001$)
H4	The social system mediates the effect of technology integration on the quality of primary healthcare services.	Accepted	Significant mediation effect ($p < 0.05$)

Overall, the findings confirm that improving the quality of primary healthcare services depends not only on technological implementation but also on the strength of the social system within healthcare organizations. While technology integration enhances operational mechanisms and service efficiency, its effectiveness is optimized only when supported by a communicative, collaborative, and adaptive social system. Therefore, digital transformation in the primary healthcare sector requires a balanced approach that combines technological investment with the development of organizational social capacity to ensure sustainable quality improvement in healthcare delivery.

3.5 The Effect of Technology Integration on the Quality of Primary Healthcare Services

The findings reveal that technology integration exerts a positive and significant influence on the quality of primary healthcare services. This indicates that the implementation of digital systems such as electronic health records (EHRs), online patient registration, and teleconsultation platforms enhances service efficiency, accuracy, and timeliness. Within community health centers, the integration of technology enables healthcare workers to provide faster, more transparent, and patient-centered services.

Theoretically, these findings support the Technology Acceptance Model [23,24], which asserts that perceived usefulness and ease of use influence organizational performance improvement. They also align with the Socio-Technical Systems Theory [25], which emphasizes the need for harmony between technical systems and social structures within an organization. Previous studies, including those by Liaw, S.-T., et al. [26] and Haleem, A., et al. [27], have shown similar results, highlighting that digital health adoption contributes substantially to improving the quality and responsiveness of primary healthcare. Hence, this study reinforces the argument that technological integration is a key determinant of efficiency and service quality in frontline healthcare delivery.

3.6 The Effect of Social Systems on the Quality of Primary Healthcare Services

The results also demonstrate that social systems significantly affect the quality of primary healthcare services. A strong social system is reflected in effective communication, interprofessional collaboration, and leadership support that fosters innovation and adaptability. In community health centers, cohesive interpersonal relations and teamwork among medical and administrative staff enhance service coordination and reinforce a culture of patient safety.

This finding supports Social Systems Theory [28,29], which posits that organizational effectiveness depends on the system's ability to regulate interpersonal relations toward collective goals. Song, H. et al. [30] similarly found that collaborative work cultures and open communication within healthcare organizations contribute to higher patient satisfaction and better service outcomes. Thus, social systems serve as the cultural and structural foundation that sustains service quality and organizational resilience in the healthcare sector.

3.7 The Effect of Technology Integration on Social Systems

The study further reveals that technology integration positively influences social systems within healthcare organizations. Digital implementation not only provides operational tools but also transforms the social environment by fostering coordination, transparency, and trust among team members. For example, the use of integrated health information systems allows medical professionals and administrative staff to share patient data in real time, thereby enhancing teamwork and reducing organizational silos.

This result aligns with Socio-Technical Systems Theory [31,32], which asserts that technological and social subsystems are interdependent components of an integrated organizational framework. Study by Lekkas and Souitaris [33] similarly observed that the adoption of digital platforms in public services strengthens communication networks and builds collective adaptability. Accordingly, technology acts not only as an enabler of efficiency but also as a catalyst for developing collaborative, knowledge-sharing, and innovation-driven workplace cultures.

3.8 The Mediating Role of Social Systems between Technology Integration and Service Quality

The analysis confirms that social systems play a significant mediating role in the relationship between technology integration and service quality. This suggests that the positive impact of technology on healthcare performance largely depends on the organization's social readiness and capacity for adaptation. In other words, technology alone cannot improve service quality without the presence of social factors such as human competence, collaboration, and an organizational culture supportive of digital transformation.

This mediating mechanism extends the findings of Cresswell and Sheikh [34], who argue that many digital health initiatives fail not because of technical deficiencies but due to inadequate social and cultural preparedness. From a theoretical perspective, the mediation underscores the importance of the human factor and organizational culture as crucial enablers linking technology adoption to service outcomes [35]. Therefore, the success of digital transformation in primary healthcare depends on the synergistic balance between technological investment and the development of adaptive social systems.

4 Conclusion

This study concludes that the quality of primary healthcare services is determined not solely by the adoption of technology but also by the strength of the social systems that support its implementation. The findings from the structural model demonstrate that technology integration directly improves service quality and organizational efficiency while simultaneously reinforcing the social system through enhanced coordination, communication, and trust among healthcare professionals. Furthermore, the mediating role of social systems highlights that the effectiveness of technological

innovation depends on the organization's ability to adapt socially and culturally to new digital environments.

In a broader sense, this research underscores the importance of adopting a socio-technical perspective in healthcare transformation. For sustainable improvement in primary healthcare, digital investment must be balanced with efforts to strengthen human capacity, leadership, and collaborative culture. The proposed empirical model provides a theoretical contribution to the literature on digital health management and offers practical guidance for policymakers and healthcare administrators in designing human-centered digital transformation strategies that align technological innovation with social empowerment, ultimately enhancing the quality and sustainability of primary healthcare services.

References

1. Kruszyńska-Fischbach, A., Sysko-Romańczuk, S., Napiórkowski, T. M., Napiórkowska, A. & Kozakiewicz, D. Organizational e-Health Readiness: How to Prepare the Primary Healthcare Providers' Services for Digital Transformation. *International Journal of Environmental Research and Public Health* **19**, 3973 (2022).
2. Sulayao, J. R. B., Nurdiana, A. & Hartiningrum, C. Y. Users' Perceptions of Mobile Health Apps: Usability, Communication Enhancement, and Healthcare Service Improvement. *International Journal of Nursing Information* **4**, 52–62 (2025).
3. Blhaj, K. M. S., Dhameria, V. & Muazeib, A. I. M. The Role of Telemedicine in Digital Transformation Based on Patient Perceptions of Healthcare Accessibility and Efficiency. *International Journal of Nursing Information* **4**, 10–20 (2025).
4. AbuKhousa, E., Mohamed, N. & Al-Jaroodi, J. e-Health Cloud: Opportunities and Challenges. *Future Internet* **4**, 621–645 (2012).
5. Algresha, M. A. H. *et al.* The Impact of Modern Health Administration Practices on the Integration of Medical Records, Medical Secretaries, and Hospital Management to Enhance Healthcare Quality. *Journal of International Crisis and Risk Communication Research* **7**, 281 (2024).
6. Al-Assaf, K., Bahroun, Z. & Ahmed, V. Transforming Service Quality in Healthcare: A Comprehensive Review of Healthcare 4.0 and Its Impact on Healthcare Service Quality. *Informatics* **11**, 96 (2024).
7. Wei, H., Corbett, R. W., Ray, J. & Wei, T. L. A culture of caring: the essence of healthcare interprofessional collaboration. *Journal of Interprofessional Care* **34**, 324–331 (2020).
8. Kaundinya, K. B. Organizational theory – a three-dimensional tool to analyze and enhance collaboration in healthcare systems. *Journal of Business and Socio-economic Development* **4**, 210–221 (2024).
9. Stucky, C. H., Wymer, J. A. & House, S. Nurse Leaders: Transforming Interprofessional Relationships to Bridge Healthcare Quality and Safety. *Nurse Leader* **20**, 375–380 (2022).
10. Xiao, M., Luo, S. & Yang, S. Synergizing Technology and Tradition: A Pathway to Intelligent Village Governance and Sustainable Rural Development. *Journal of the Knowledge Economy* **16**, 1768–1823 (2024).
11. Islam, Q. M. Innovation in Primary Healthcare in the Twenty-first Century. *Journal of Health Management* **23**, 129–142 (2021).
12. Freijser, L. *et al.* The role of hospitals in strengthening primary health care in the Western Pacific. *The Lancet Regional Health - Western Pacific* **33**, 100698 (2023).
13. Kosiol, J., Silvester, T., Cooper, H., Alford, S. & Fraser, L. Revolutionising health and social care: innovative solutions for a brighter tomorrow – a systematic review of the literature. *BMC Health Services Research* **24**, 809 (2024).
14. Erku, D. *et al.* Digital Health Interventions to Improve Access to and Quality of Primary Health Care Services: A Scoping Review. *International Journal of Environmental Research and Public Health* **20**, 6854 (2023).
15. Frennert, S. *et al.* 'It increases my ability to influence my ways of working': A qualitative study on digitally mediated patient management in primary healthcare. *Scandinavian Journal of Caring Sciences* **37**, 88–105 (2023).
16. Steele Gray, C. *et al.* Digitally mediated relationships: How social representation in technology influences the therapeutic relationship in primary care. *Social Science & Medicine* **353**, 116962 (2024).
17. Aldhi, I. F. *et al.* Bridging Digital Gaps in Smart City Governance: The Mediating Role of Managerial Digital Readiness and the Moderating Role of Digital Leadership. *Smart Cities* **8**, 117 (2025).
18. Wahidin, W., Gutierrez, G., Osman, K., Akkapin, S. & Tan, M. L. T. Digital Simulations in Science Learning: A Student Perspective on Interactive, Engagement, Conceptual Understanding, and Learning Satisfaction. *International Journal of Educational Qualitative Quantitative Research* **4**, 36–46 (2025).
19. Zhang, H. Structural Equation Modeling. in *Models and Methods for Management Science* (ed. Zhang,

H.) 363–381 (Springer Nature Singapore, 2022). doi:10.1007/978-981-19-1614-4_10.
20. Bayramzadeh, S. & Aghaei, P. Technology integration in complex healthcare environments: A systematic literature review. *Applied Ergonomics* **92**, 103351 (2021).
21. Rafi'i, M. R., Hanif, S. A. M. & Bin Daud, F. Exploring the link between healthcare organizational culture and provider work satisfaction: a systematic review. *BMC Health Services Research* **25**, 904 (2025).
22. Darzi, M. A., Islam, S. B., Khursheed, S. O. & Bhat, S. A. Service quality in the healthcare sector: a systematic review and meta-analysis. *LBS Journal of Management & Research* **21**, 13–29 (2023).
23. Anggraeni, R., Wati, N. L., Martin, N. M. & Tio, L. Digital Aromatherapy Solutions: Leveraging Lemon Scent Technology to Alleviate Nausea and Vomiting in Pregnant Women. *International Journal of Nursing Information* **4**, 21–30 (2025).
24. Aburbeian, A. M., Owda, A. Y. & Owda, M. A Technology Acceptance Model Survey of the Metaverse Prospects. *AI* **3**, 285–302 (2022).
25. Thomas, A. Digitally transforming the organization through knowledge management: a socio-technical system (STS) perspective. *European Journal of Innovation Management* **27**, 437–460 (2024).
26. Liaw, S.-T., Georgiou, A. & Marin, H. Evaluation of Digital Health & Information Technology in Primary Care. *International Journal of Medical Informatics* **144**, 104285 (2020).
27. Haleem, A., Javaid, M., Singh, R. P. & Suman, R. Telemedicine for healthcare: Capabilities, features, barriers, and applications. *Sensors International* **2**, 100117 (2021).
28. Sales, A., Mansur, J. & Roth, S. Fit for functional differentiation: new directions for personnel management and organizational change bridging the fit theory and social systems theory. *Journal of Organizational Change Management* **36**, 273–289 (2023).
29. Syarifudin, A. & Muttaqin, M. A. Tech-Supported Strategic Management, Digital Leadership, and Play-Based Interactive Learning: A Multilevel Survey of Quality Improvement in Early Childhood Education. *International Journal of Educational Qualitative Quantitative Research* **4**, 47–60 (2025).
30. Song, H. *et al.* Team dynamics, clinical work satisfaction, and patient care coordination between primary care providers. *Health Care Management Review* **42**, 28–41 (2017).
31. Malatji, M., Von Solms, S. & Marnewick, A. Socio-technical systems cybersecurity framework. *Information & Computer Security* **27**, 233–272 (2019).
32. Zarei, E., Biglari, B. & Yazdi, M. Safety Causation Analysis in Sociotechnical Systems. in *Safety Causation Analysis in Sociotechnical Systems: Advanced Models and Techniques* (ed. Zarei, E.) 1–20 (Springer Nature Switzerland, 2024). doi:10.1007/978-3-031-62470-4_1.
33. Lekkas, C.-K. & Souitaris, V. Bureaucracy Meets Digital Reality: The unfolding of urban platforms in European municipal governments. *Organization Studies* **44**, 1649–1678 (2023).
34. Cresswell, K., Williams, R. & Sheikh, A. Bridging the growing digital divide between NHS England's hospitals. *Journal of the Royal Society of Medicine* **114**, 111–112 (2021).
35. Al-Shanti, A., Jebreel, M., Qabajeh, M., Nassoura, A. & Airout, R. The role of organizational antecedents in fostering accounting intelligence adoption: The mediating influence of organizational culture. *Human Systems Management* **43**, 495–511 (2024).