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RESEARCH

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Integration of Health Information Systems in Developing Countries: A Systematic Review of Quality, Performance, and Competency Evaluation

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Abstract

Persistent challenges in health workforce planning, distribution, and performance management remain prevalent in developing countries, largely due to fragmented and underutilized human resource data systems. Human Resource Information Systems (HRIS) have emerged as a strategic tool to support evidence-based decision-making and strengthen health workforce governance. This Systematic Literature Review (SLR) synthesizes empirical evidence published between 2015 and 2024 on the role of HRIS in enhancing strategic health workforce management in developing countries, with the objectives of identifying key Information System (IS) evaluation models, examining the relationship between system quality and individual performance, exploring the integration of competency planning and Person–Job Fit (P–J Fit), and highlighting critical research gaps. A systematic review of 20 peer-reviewed studies was conducted following the PRISMA protocol, encompassing system design foundations, adoption processes, interoperability challenges, and workforce-related outcomes in healthcare settings. The findings indicate that HRIS functions as a strategic enabler for decentralized management, evidence-based workforce planning, and performance improvement; however, its effectiveness is constrained by persistent interoperability barriers, fragmented data architectures, and the absence of internationally standardized workforce data. In conclusion, maximizing the strategic value of HRIS requires a dual emphasis on data standardization and organizational readiness, while future research should integrate behavioral theories with IS success frameworks, assess long-term HRIS impacts, and foster international collaboration to establish unified health workforce data standards that support policy coherence and digital health transformation in the public sector.

Keywords: Human Resource Information Systems, System Quality, Person Job Fit, Interoperability, Public Health Digital Transformation.

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1. INTRODUCTION

Human resources constitute the backbone of every healthcare system, often accounting for a substantial portion of public health budgets (Purwadi et al., 2024). Effective management of this workforce is critical to achieving service quality and policy objectives, particularly in developing countries. Here, fragmented Human Resource Management (HRM) practices often hinder efficiency and accountability, leading to staff shortages, skill mismatches, and weak performance management (Tursunbayeva et al., 2017). To address these challenges, many governments have adopted Human Resource Information Systems (HRIS) or Electronic HRM (e-HRM) as part of broader digital transformation initiatives, such as Indonesia's SATU SEHAT SDM KES, to digitize, centralize, and integrate workforce data for evidence-based planning and governance (Udekwe et al., 2021).

Despite their widespread implementation, the actual strategic impact of HRIS remains poorly understood. The core research problem lies in determining how system quality influences strategic HR outcomes such as individual performance and competency-based workforce planning. This issue holds significant policy relevance for developing countries striving for sustainable health reforms. The DeLone and McLean Information Systems Success Model provides the theoretical foundation for evaluating system effectiveness, linking System Quality, Information Quality, and Service Quality to User Satisfaction, Use, and Net Benefits (DeLone & McLean, 1992; DeLone & McLean, 2003). However, limited empirical evidence exists on the model's applicability in the public health HRM context (Dilu et al., 2017).

Modern HRM emphasizes Competency-Based Performance Management (CBPM), requiring HRIS to not just manage records but also align skills with job requirements, leading to improved Person–Job Fit (P–J Fit) a strong predictor of job satisfaction and retention (Hasan et al., 2021; Kristof-Brown et al., 2005). Nevertheless, studies consistently highlight critical technological barriers, specifically the persistent interoperability gaps between HRIS and other healthcare systems, and the absence of an international data standard for workforce profiles (Chukwu et al., 2022; Opalek, 2021). This technical deficiency restricts the realization of strategic outcomes, particularly the advanced analysis needed for competency-based P–J Fit. The research gap is therefore the absence of a comprehensive systematic review that synthesizes the link between the quality dimensions of HRIS and the resulting competency-driven outcomes (P–J Fit and individual performance) in developing countries' healthcare sectors.

The digital transformation of HRM has evolved from administrative record-keeping toward strategic enablement, where HRIS functions as a policy instrument for workforce planning and performance optimization (Ma & Ye, 2015). In healthcare, this framework underpins the assessment of digital readiness, adoption, and effectiveness (Alam et al., 2016).

Recent literature demonstrates that HRIS integration enhances decision-making autonomy and data transparency, allowing district-level managers to act on accurate staffing and performance data (Mansour et al., 2022). Furthermore, the growing emphasis on Competency-Based Performance Management (CBPM) underscores the importance of aligning HRIS outputs with behavioural and skill-based appraisals (Simpson & Simpson, 2022).

This study adopts an integrated conceptual model combining the DeLone and McLean IS Success Model (DeLone & McLean, 1992; DeLone & McLean, 2003) and Person–Job Fit Theory (Kristof-Brown et al., 2005). The model proposes that System Quality, Information Quality, and Service Quality affect User Satisfaction and Usage, leading to enhanced Individual Performance through improved P–J Fit. This framework connects technological attributes of HRIS with human and organizational outcomes in the context of public sector digital transformation.

This Systematic Literature Review (SLR) is structured to address this gap by synthesizing empirical evidence published between 2015 and 2024. This research aims to identify and

construct a robust conceptual model that links HRIS System Quality, Individual Performance, and Person–Job Fit (P–J Fit). By achieving this, the study seeks to guide policymakers in developing countries toward data-driven HRIS frameworks that effectively strengthen digital health governance, workforce well-being, and organizational performance.

2. RESEARCH METHOD

This study employed a rigorous Systematic Literature Review (SLR) methodology to identify, critically evaluate, and synthesize empirical evidence related to the role and quality of Human Resource Information Systems (HRIS) in the health sector, with a particular emphasis on developing countries. The review was conducted in strict accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines (Haddaway et al., 2022) to ensure methodological transparency, reproducibility, and scientific rigor. A comprehensive research protocol outlining the scope of the review, eligibility criteria, research questions, and data analysis procedures was developed prior to data collection to minimize bias and enhance consistency throughout the review process.

The overarching objective of the SLR was to examine how Information System (IS) quality influences strategic Human Resource Management (HRM) outcomes in healthcare settings. Specifically, the review explored the theoretical frameworks most frequently used to evaluate HRIS or IS quality, the empirical relationship between system quality and individual performance outcomes in public health organizations, and the extent to which HRIS-generated competency data support Person–Job Fit (P–J Fit). In addition, the review sought to identify critical research and policy gaps related to HRIS implementation in developing countries.

Clear inclusion and exclusion criteria were established to ensure the relevance, quality, and comparability of the selected studies. Eligible studies were required to be empirical in nature, employing quantitative, qualitative, or mixed-methods designs, and published in peer-reviewed journals between 2015 and 2024. This time frame was selected to capture contemporary evidence reflecting the rapid expansion of digital health initiatives and national e-HRM systems in developing contexts. Only studies conducted within healthcare or public sector settings and explicitly addressing HRIS, e-HRM, or workforce information systems were included. Furthermore, eligible studies were required to adopt or reference established theoretical frameworks related to IS success, performance management, or Person–Job Fit. Studies were excluded if they were non-empirical, focused exclusively on private-sector HRIS or clinical information systems without a clear HR component, or were not available in English.

A comprehensive literature search was conducted across five major scientific databases relevant to information systems and health management, namely Scopus, Web of Science, ScienceDirect, PubMed, and the ACM Digital Library. The search strategy employed a Boolean search string combining key terms related to HRIS, healthcare and public sector contexts, and workforce performance outcomes, using controlled vocabulary and truncation where applicable to enhance search sensitivity. To further ensure comprehensive coverage, manual cross-referencing and citation chaining (snowballing) of key articles were performed to identify additional relevant studies that may not have been captured through database searches alone.

All retrieved records were imported into Mendeley Reference Manager for citation management and automated duplicate removal. The study selection process followed the sequential stages outlined in the PRISMA framework, including identification, screening, and eligibility assessment. Titles and abstracts were initially screened by the primary reviewer based on the predefined eligibility criteria, after which full-text articles were independently assessed by two reviewers. A calibration exercise was conducted on an initial subset of articles to ensure consistent application of the inclusion criteria, and inter-rater reliability was assessed using Cohen's Kappa, with a threshold of greater than 0.70 indicating acceptable agreement.

Any disagreements were resolved through discussion and consensus, or by consulting a third senior reviewer when necessary. This process resulted in the final inclusion of 20 empirical studies, with the study selection outcomes and reasons for exclusion at each stage documented in a PRISMA flow diagram.

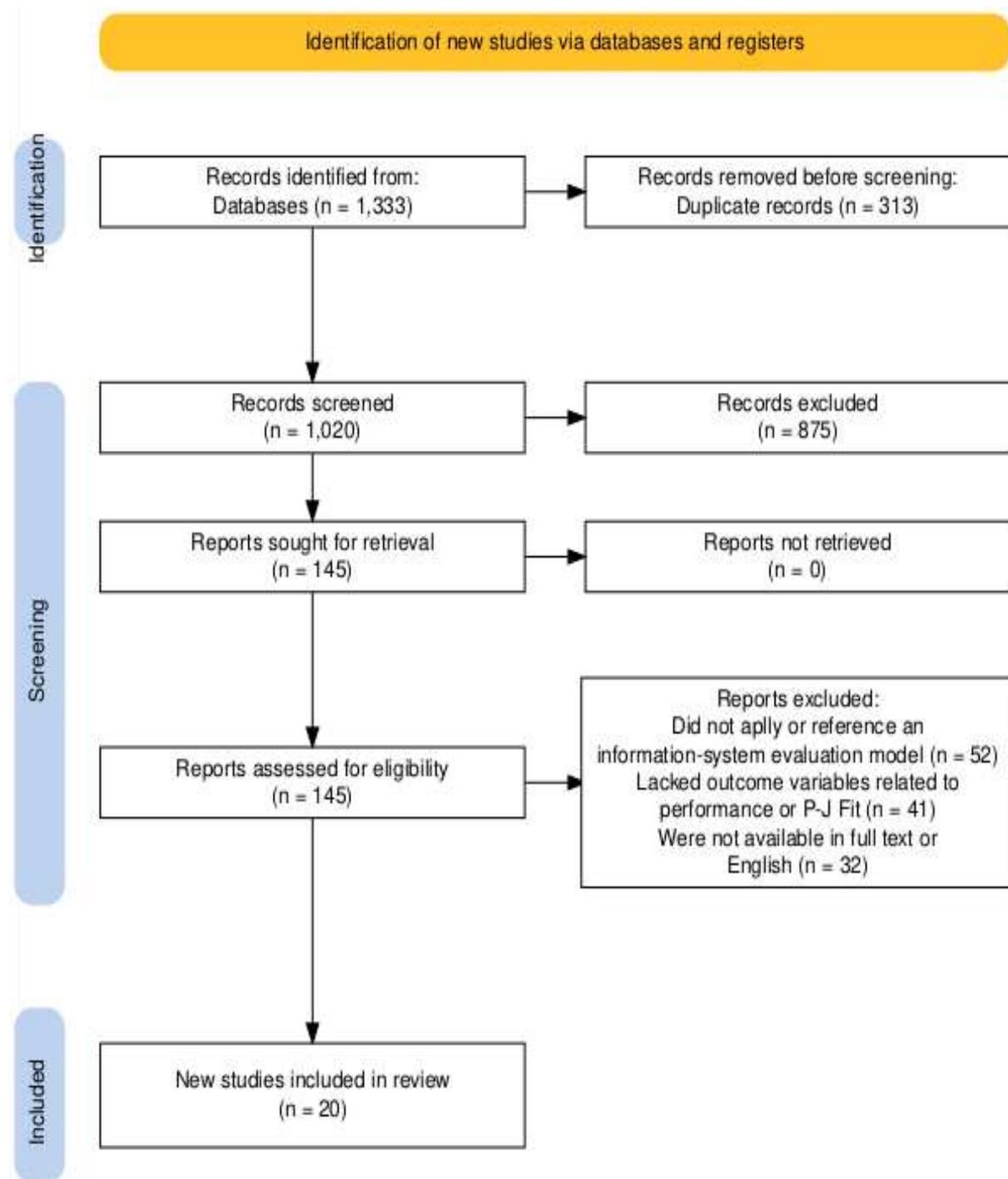


Figure 1. PRISMA 2020 flow diagram illustrating the systematic identification, screening, eligibility, and inclusion process for 20 empirical studies on Human Resource Information Systems (HRIS) in healthcare (2015–2024) (Haddaway et al., 2022).

Data extraction was conducted using a standardized form that was piloted prior to full implementation to ensure consistency and relevance. For each included study, key information was systematically captured, including author and year of publication, country or region, study

design, primary HRIS focus area, theoretical framework employed, key outcome variables, and principal findings. To minimize extraction bias and enhance data accuracy, the extraction process was independently performed by two reviewers, followed by a detailed cross-check to identify and resolve any discrepancies through discussion and consensus.

The methodological quality of the included studies was critically appraised using a modified version of the Joanna Briggs Institute (JBI) Critical Appraisal Tools tailored to the respective study designs, such as checklists for cross-sectional and qualitative research. The appraisal criteria emphasized the clarity of research objectives, the appropriateness of the methodological approach, the validity and robustness of data analysis, and the transparency of results reporting. Based on these criteria, each study was classified as high, moderate, or low methodological quality. Rather than serving as an exclusion criterion, the quality ratings were used to sensitize the interpretation of findings, with results from lower-quality studies being interpreted cautiously to reduce the risk of bias in the overall synthesis.

Due to heterogeneity in study designs, contexts, and outcome measures, a narrative synthesis approach was adopted. The synthesis process involved systematic coding of key findings from all included studies into recurring themes that reflected the review objectives. These themes were subsequently grouped into higher-order analytical categories aligned with the core theoretical constructs of Information System quality, individual performance, and Person–Job Fit (P–J Fit). Where sufficient conceptual and contextual similarity existed, findings were triangulated across studies to identify patterns, consistencies, and contradictions in the evidence from different developing-country settings.

This integrative synthesis facilitated the development of a conceptual framework that combines the DeLone and McLean Information Systems Success Model with Person–Job Fit theory. The resulting framework provides a theoretically grounded basis for explaining how HRIS quality influences workforce performance through competency alignment and serves as a foundation for future empirical research and validation in public-sector healthcare contexts.

3. RESULTS AND DISCUSSION

The study selection process was conducted in accordance with the PRISMA 2020 framework, as presented in the PRISMA flow diagram (Figure 1). An initial comprehensive search of five electronic databases, Scopus, Web of Science, ScienceDirect, PubMed, and the ACM Digital Library, yielded 1,333 records. After removing 313 duplicate entries, 1,020 unique studies remained for title and abstract screening. During this stage, 875 records were excluded for failing to meet the inclusion criteria, primarily because they addressed inappropriate research contexts or employed non-empirical designs. Subsequently, 145 full-text articles were independently assessed for eligibility by two reviewers, achieving a high level of inter-rater reliability (Cohen’s Kappa = 0.82). Of these, 125 studies were excluded due to the absence of an information systems evaluation framework (n = 52), lack of outcome variables related to performance or Person–Job Fit (n = 41), or unavailability of full text or publication in a non-English language (n = 32). Ultimately, 20 empirical studies met all eligibility criteria and were included in the qualitative synthesis (Figure 1).

The included studies reflected diverse geographical contexts, with a strong concentration in developing regions across Africa and Asia, including Kenya, Zambia, Mozambique, Nigeria, Indonesia, Bangladesh, India, and Ethiopia. Methodologically, the majority of studies employed cross-sectional quantitative designs (n = 12), while the remainder adopted mixed-methods approaches (n = 8). Structural equation modelling was the most frequently used analytical technique to examine relationships between HRIS adoption, system quality, and workforce performance outcomes (Alam et al., 2016; Satispi et al., 2023). Quality appraisal using adapted Joanna Briggs Institute criteria indicated that most studies were of moderate to

high methodological quality, although four studies were rated as low quality and were therefore interpreted cautiously in the synthesis.

Across the reviewed literature, three theoretical frameworks emerged as dominant. The DeLone and McLean Information Systems Success Model was widely applied to assess system quality, information quality, and service quality in HRIS implementations (Delone & McLean, 2003; Udekwe et al., 2021). Technology, Organisation, Environment and readiness frameworks were commonly used to evaluate organizational capacity and contextual readiness for HRIS implementation in public-sector healthcare environments (Alam et al., 2016; Dilu et al., 2017). In addition, Person–Job Fit and ability, motivation, opportunity models were increasingly employed to explain how HRIS-enabled data utilization influences individual performance, motivation, and work engagement (Ammupriya & Subrahmanyam, 2023; Kristof-Brown et al., 2005).

With respect to HRIS quality evaluation, most studies relied on multidimensional readiness indicators, including technological infrastructure, organizational support, and user competence, rather than exclusively theory-driven quality constructs (Alam et al., 2016; Dilu et al., 2017). Nevertheless, more recent research demonstrated a growing application of the updated DeLone and McLean framework to empirically assess the relationships among system quality, user satisfaction, and net benefits (Abuhantash, 2023; Udekwe et al., 2021). This shift reflects an increasing emphasis on theoretically grounded evaluations of HRIS effectiveness beyond basic implementation readiness.

Empirical evidence consistently indicated a positive, though predominantly indirect, relationship between HRIS quality and individual performance. High-quality systems enhanced data reliability and decision-making autonomy, which subsequently improved managerial effectiveness and individual performance outcomes. Studies conducted in Uganda and Mozambique provided concrete evidence that decentralized access to HRIS data considered a net benefit of system use strengthened managerial decision-making and reduced administrative delays, thereby directly supporting performance improvements (Mansour et al., 2022; Waters et al., 2016). Moreover, several studies demonstrated that the performance-enhancing effects of HRIS were mediated by organizational support and user engagement, underscoring the importance of contextual and behavioral factors in translating system quality into tangible workforce outcomes (Abuhantash, 2023; Ammupriya & Subrahmanyam, 2023).

In addition, HRIS was found to play a critical role in supporting competency-based workforce planning by enabling structured linkages between individual employee profiles and job-specific skill requirements (Satispi et al., 2023; Were et al., 2019). However, the effective use of competency data for advanced Person–Job Fit analysis was frequently constrained by fragmented data architectures and limited interoperability. Several studies highlighted the absence of unified XML standards or interoperable frameworks linking HRIS with other clinical and administrative systems, which restricted the integration and analytical use of workforce competency data (Opalek, 2021).

Taken together, these findings confirm that HRIS has evolved from a purely transactional repository into a strategic instrument for health workforce governance. Large-scale national implementations, such as eSIP-Saúde in Mozambique and SATU SEHAT SDM KES in Indonesia, demonstrate how HRIS can support evidence-based resource allocation, workforce distribution, and policy planning (Handayani et al., 2019; Handayani & Rohani, 2024; Waters et al., 2016). In developing-country contexts, the strategic value of HRIS is closely linked to the decentralized use of real-time data by regional and district health management teams, enabling more responsive and locally aligned decision-making (Mansour et al., 2022).

The findings further suggest that the strategic contribution of HRIS cannot be fully explained by traditional system-use metrics alone. While the DeLone and McLean Information Systems Success Model remains foundational, the evidence supports its integration with human-centered theories such as Person–Job Fit and the Ability, Motivation, Opportunity

model. In this integrated perspective, system quality particularly data accuracy and reliability, enhances a health worker's ability and opportunity to perform effectively by enabling accurate identification of competency gaps and targeted training interventions. Improved alignment between individual competencies and job requirements strengthens Person–Job Fit, which subsequently increases motivation, engagement, and individual performance outcomes (Kristof-Brown et al., 2005). Accordingly, this review proposes a conceptual pathway in which Information System quality dimensions influence net benefits in the form of individual performance, mediated by strategic HR outcomes related to Person–Job Fit.

Consistent with socio-technical systems theory, the successful implementation and strategic utilization of HRIS are strongly dependent on organizational readiness and user acceptance. Technological capability alone is insufficient to generate meaningful workforce outcomes without parallel investments in leadership commitment, change management, digital literacy, and continuous user training (Abuhantash, 2023). Empirical evidence from Indonesia and Bangladesh indicates that inadequate readiness, limited stakeholder engagement, and weak change management practices frequently undermine HRIS implementation, resulting in underutilized systems that fail to deliver their intended strategic benefits (Bhattacharyya et al., 2020; Dilu et al., 2017).

Across all reviewed contexts, the lack of interoperability and coherent data governance emerged as the most pervasive barrier to realizing the full strategic potential of HRIS. Fragmented data architectures and the absence of unified standards impede seamless information exchange between HRIS platforms, Electronic Health Records, and national human resources for health registries, thereby limiting the integration of competency and performance data (Chukwu et al., 2022; Opalek, 2021). Although global policy frameworks such as the World Health Organization's National Health Workforce Accounts provide conceptual guidance, implementation remains uneven, and adoption of technical standards such as Fast Healthcare Interoperability Resources or harmonized XML profiles for workforce data is still limited. This technical gap constrains advanced analytics, including proactive Person–Job Fit assessments, which are essential for strategic workforce planning and health system resilience.

Finally, the review highlights important directions for future research and policy development. There is a clear need for greater emphasis on data standardization and interoperability through the development of shared metadata structures and competency-profiling standards that enable cross-system integration. Future studies should also extend Information Systems success models by incorporating behavioral, psychological, and organizational outcomes, including engagement and well-being, to better capture the human impacts of HRIS use. Moreover, longitudinal research designs are required to assess the sustained effects of HRIS on workforce retention, service quality, and overall health system resilience, thereby providing stronger empirical foundations for strategic investment and evidence-based policymaking.

CONCLUSION

This Systematic Literature Review (SLR) addressed the core research problem concerning the strategic impact of Human Resource Information Systems (HRIS) quality on human-centered outcomes, individual performance and Person–Job Fit (P–J Fit), within the healthcare sector of developing countries. This review's primary contribution is the development of an integrated conceptual model that explicitly connects D&M's quality dimensions to individual performance, mediated by the strategic HR outcome of P–J Fit. For policy, this implies that sustainable HRIS success is not merely a technological problem but a governance challenge. Policymakers must move beyond simple system adoption and focus on establishing robust data standardization protocols and strengthening organizational readiness to leverage data for human capital alignment. Future research must prioritize longitudinal

studies to establish causality and focus on cross-country comparative analysis of institutional barriers to interoperability, providing specific, actionable insights for context-sensitive implementation.

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