Proceedings of the International Conference on Education, Economics, Business, Entrepreneurship, and Finance (ICEBEF)
Volume 4 (2026)

IMPACT OF DIGITAL LEARNING ON HUMAN RESOURCE MANAGEMENT: A LITERATURE REVIEW

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ABSTRACT
The digital transformation in healthcare education and training has driven significant changes in human resource management (*HRM*).[3] Digital learning, including e-learning, m-learning, and virtual simulations, has been shown to contribute to improving healthcare workforce knowledge and skills, thereby enhancing workforce professionalism.[1] This review aims to evaluate the impact of digital learning on HR management based on five recent articles that include quantitative, quasi-experimental, systematic reviews, and narrative studies. The results indicate that digital learning provides flexibility, cost-effectiveness, and better engagement in workforce development. However, barriers such as limited infrastructure, low digital literacy, and excessive workload remain challenges. This study emphasizes the importance of adaptive HRM strategies that integrate digital technology to improve the quality of healthcare services.
Key words: *digital learning; human resource management; e-learning; healthcare*

INTRODUCTION

The development of information technology has driven a major transformation in the healthcare sector. One aspect significantly impacted is the education and training of healthcare workers. In the digital era, hospitals and healthcare institutions are required not only to improve the quality of their services but also to ensure their workforce has competencies relevant to current developments. This makes digital learning in the form of e-learning, virtual training, and technology-based simulations a strategic instrument in human resource management (HRM).[1]

Human Resource Management (HRM) in the healthcare sector plays a crucial role in ensuring the availability of a competent, trained, and adaptable workforce. Challenges such as globalization, disease progression, patient demands, and resource constraints necessitate HRM's adoption of innovations in staff training and development.[1] Digital learning offers flexibility, cost efficiency, and broader accessibility, helping HRM address these challenges.[5] The COVID-19 pandemic has accelerated the adoption of digital learning. The closure of face-to-face classes and social restrictions have forced healthcare institutions to shift to online learning methods.[2] Although initially a stopgap measure, this practice has proven effective in improving the knowledge, skills, and competencies of healthcare workers.[4]

However, the implementation of digital learning also faces obstacles, such as limited technological infrastructure, low digital literacy, and organizational cultural resistance. Therefore, this literature review aims to explore the impact of digital learning on HRM in the healthcare sector, by reviewing empirical evidence from six international studies.[3,5]

METHOD

This review uses a literature review approach guided by PRISMA. The articles analyzed include empirical research, quasi-experimental studies, scoping reviews, and systematic reviews relevant to the theme of digital learning in healthcare HR management.

PICO Framework

- Population (P): health workers (nurses, doctors, hospital managers, administrative staff).
- Intervention (I): digital learning (e-learning, m-learning, virtual simulation).
- Comparison (C): traditional learning or no training.
- Outcome (O): retention of knowledge, skills, performance, job satisfaction, HR management implications.

Inclusion criteria: peer-reviewed articles 2019–2025; healthcare/management focus; assessing the effectiveness of digital learning. Exclusion criteria: opinion/editorial; non-healthcare participants.

Article selection yielded five primary publications for analysis. Articles were selected based on their main topics: digital learning, HRM, and the healthcare sector. Article types included case studies, systematic reviews, and narrative reviews.[1-5]

1. **Bawaningtyas et al. (2021)** – A case study at Siloam Sriwijaya Hospital, Indonesia, on the influence of e-learning and organizational commitment on nurse performance. Using regression analysis techniques with 113 respondents[1]
2. **Gupta et al. (2022)** – An evaluative study of a virtual-based quality training program in Qatar, using pre- and post-surveys and focus group discussions[2]
3. **Alsharari et al. (2025)** – Systematic review of the effectiveness of virtual simulation in nursing education, based on experimental studies[3]
4. **Aryee et al. (2024)** – Systematic review of the effectiveness of e-learning programs for capacity building of health workers, including 44 international articles[4]
5. **Cunha et al (2025)** - Quasi-experimental study providing digital learning to 168 nurses in Portugal[5]

The analysis was conducted by comparing the main findings of each article, then synthesizing them into major themes: competency improvement, HRM effectiveness, implementation challenges, and policy implications.

RESULTS AND DISCUSSION

1. **E-learning and Nurse Performance (Indonesia)**

   Bawaningtyas et al.'s (2021) study used 113 inpatient and outpatient nurse respondents at Siloam Sriwijaya Hospital Palembang.[1] The analysis method used was multiple linear regression. The results showed that e-learning had a positive but insignificant effect on nurse performance, while organizational commitment had a significant effect. This indicates that although digital technology supports learning, organizational culture, leadership, and supervision remain more decisive in influencing performance. This study highlights the importance of integrating digital learning with HRM strategies that consider the motivation and commitment of healthcare workers.

2. **Virtual Training for Quality Improvement (Qatar)**

   Gupta et al. (2022) developed a virtual quality training program at a tertiary cardiac hospital in Doha, Qatar.[2] The program lasted 6 weeks with 137 participants from various professions: nurses, doctors, occupational therapists, technicians, and administrative staff. Before and after the program, participants completed questionnaires assessing their understanding of quality concepts. The average post-test score increased significantly compared to the pre-test ($p<0.001$; Cohen's $d=6.63$). More than 80% of participants reported increased confidence in leading quality projects in the workplace. These findings demonstrate that digital learning not only increases knowledge but also builds clinical leadership capacity, which is essential for HRM.

3. **Virtual Clinical Learning in Nursing Education**

   Alsharari et al. (2025) reviewed 24 articles using RCT or quasi-RCT designs.[3] The interventions included virtual simulations (VR, AR, mixed reality). Results showed significant improvements in problem-solving skills (effect range 0.2–0.9), communication (0.4–0.7), and core nursing competencies (0.3–0.9). Simulations allow students to practice in realistic conditions without risk to patients. This has a direct impact on HRM as graduates entering the workforce are better prepared clinically.

4. **eLearning for Global Capacity Building**

   Aryee et al. (2024) reviewed 44 articles from various countries.[4] Forms of eLearning include *synchronous, asynchronous, blended learning* , and *self-learning* . All approaches have been shown to be effective in improving knowledge and skills. Supporting factors include previous positive experiences, user-friendly interface design, and the relevance of content to daily work practices. Identified barriers include limited personal computers, low digital literacy, high workloads, lack of managerial support, and limited ICT infrastructure.

5. **Effectiveness of M-Learning on Nurses' Skills**

   Cunha et al. (2025) conducted a quasi-experimental study on 168 nurses in Portugal. Assessments were conducted before and after the training. The results showed a significant increase in knowledge, from 59.97% before to 84.05% after the training. 93.45% of participants completed the 13-module m-learning program. The m-learning system proved effective and cost-effective, although it required infrastructure readiness from both instructors and participants.[5]

Digital learning has proven to be a strategic instrument for HRM in the healthcare sector. In Indonesia, the effectiveness of e-learning is still strongly influenced by organizational commitment,[1] while in Qatar, virtual training programs have proven significant in increasing staff capacity.[2] Globally, virtual simulation has been shown to be effective in improving clinical and communication skills.[3] Meanwhile, systematic reviews and quasi-experimental studies have shown that eLearning can improve the competence of healthcare workers, despite infrastructure and literacy challenges.[4,5]

Implications for HRM include:

1. Effectiveness of Digital Learning on Clinical Staff
   Evidence from Indonesia, Qatar, and Portugal, through systematic reviews and quasi-experimental studies, indicates that e-learning and virtual training effectively improve clinical knowledge and skills.[1-5] Nurses, as the backbone of healthcare services, can leverage the flexibility of e-learning to meet annual training obligations. Virtual simulation has been shown to improve *the clinical readiness* of nursing students, thereby reducing the burden on HRM during new staff orientation.[4]
2. Impact on HRM Strategy
   For hospital managers, digital learning expands opportunities *for continuing professional development* (CPD). HRM at the strategic level needs to ensure that managers and clinical staff receive digital learning training that is relevant, measurable, and aligned with the organization's needs.[1-5]
3. Comparison of Developing vs. Developed Countries
   Developed countries (e.g., Qatar) have a more developed technological infrastructure, enabling digital learning programs to run smoothly.[2] Conversely, in Indonesia, the impact remains limited without strong

organizational support. This emphasizes that implementing digital learning is not just about technology, but also about leadership, organizational culture, and HRM policies.

4. Implementation Barriers and Mitigation Strategies
   Barriers such as limited infrastructure, low digital literacy, and high workloads are global issues.[5] Mitigation strategies include:
   - Provides device and network access.
   - Provide basic digital literacy training.
   - Align workload with learning opportunities.
   - Cultivating an organizational culture that supports innovation.
5. Theoretical and Practical Implications
   Theoretically, digital learning strengthens the concept of technology -*enabled HRM* . Practically, hospitals can leverage e-learning as a sustainable solution for human resource development, reducing the cost of face-to-face training, and expanding access to global resources.[4]

CONCLUSION

Digital learning has been shown to have a positive impact on HRM in the healthcare sector. E-learning, virtual training, and clinical simulations can improve the competence, productivity, and retention of healthcare workers. However, successful implementation is heavily influenced by organizational support, technological infrastructure, and digital literacy.[1-5] HRM needs to develop adaptive strategies that integrate digital technology into training and HR development systems. Key recommendations include increasing infrastructure investment, developing digital competency-based curricula, and supporting policies that facilitate learning innovation.[3,5]

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